

Robert L. Milford

PETROLEUM GEOLOGIST
Wichita, Kansas

GEOLOGIST'S REPORT

DRILLING TIME AND SAMPLE LOG

OPERATOR **Murfin Drilling Company, Inc.**

LEASE **Solk #1-33**

LOC SPOT **SE SE SE**

LOC FOOTAGE **330' FS, 330' FEL**

SEC. **33** TWP. **25** R. **36W**

COUNTY **Rawlins** STATE **Kansas**

CONTRACTOR **Murfin Drilling Co., Inc.** REG. NO. **8**

DRILLING STARTED **6/2-2013** COMPLETED **8-16-2013**

MUD DISPLACED **3,335** MUD TYPE **Chemical**

DRILLING TIME KEPT FROM **3:20** TO **RTD**

SAMPLES SAVED FROM **3:20** TO **RTD**

SAMPLES EXAMINED FROM **3:50** TO **RTD**

GEOLOGICAL SUPERVISION FROM **3:50** TO **RTD**

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ELEVATIONS
KB **3,261'**
GL **3,256'**

MEASUREMENTS FROM KA

CASING RECORD

CONDUIT

Surface **8.5' @ 386'**
w/ 350 sacks cement

Production **5.1/2" @ 473'**
w/ 450 sacks cement

Electrical Surveys:

Diaphragm Induction Log

Dual Compensated -

Porosity Log

Microseistivity Log

Borehole Compensated -

SONIC LOG

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FORMATION NAME	LOG TOP	LOG DATUM	SAMPLE TOP	SAMPLE DATUM
Stone Corral	3,100'	+151'	3,111'	+150'
Neva	3,610'	-349'	3,608'	-347'
Forker	3,729'	-468'	3,728'	-467'
Topeka	3,964'	-703'	3,963'	-702'
Oread	4,089'	-828'	4,088'	-827'
Lansing	4,178'	-917'	4,177'	-916'
B/KC	4,454'	-1193'	4,452'	-1191'
Pawnee	4,583'	-1322'	4,581'	-1320'
Cherokee	4,655'	-1394'	4,653'	-1392'
Total Depth	4,744'	-1483'	4,740'	-1479'

DATE	7:00 AM DEPTH	REMARKS
8-7-13	0'	Spud @ 10:15 am. Plug down @ 5:30 pm. Drilled out plug @ 1:30 am on 8-8-13
8-8-13	840'	Cut 840' in last 24 hrs.
8-9-13	2,420'	Cut 1,580' in last 24 hrs; 21 hrs drlg.
8-10-13	3,470'	Cut 1,050' in last 24 hrs; 22 hrs drlg.
8-11-13	4,110'	Cut 640' in last 24 hrs; 21.75 hrs drlg. DST #1 @ 4220'
8-12-13	4,220'	Cut 110' in last 24 hrs; 4.75 hrs drlg. DST #2 @ 4260'
8-13-13	4,365'	Cut 145' in last 24 hrs; 4.5 hrs drlg. DST #3 @ 4365', DST #4 @ 4404'
8-14-13	4,404'	Cut 39' in last 24 hrs; 2 hrs drlg. DST #5 @ 4600'
8-15-13	4,600'	Cut 196' in last 24 hrs; 10 hrs drlg. RTD 4740' @ 11:07 pm
8-16-13	4,740'	Cut 140' in last 24 hrs; 7.25 hrs drlg. Ran production casing

Remarks

The electric log measurements correlate from 1' to 2' lower to the drilling measurements.

Formation tops and lithology on this report have been corrected to the electric log.

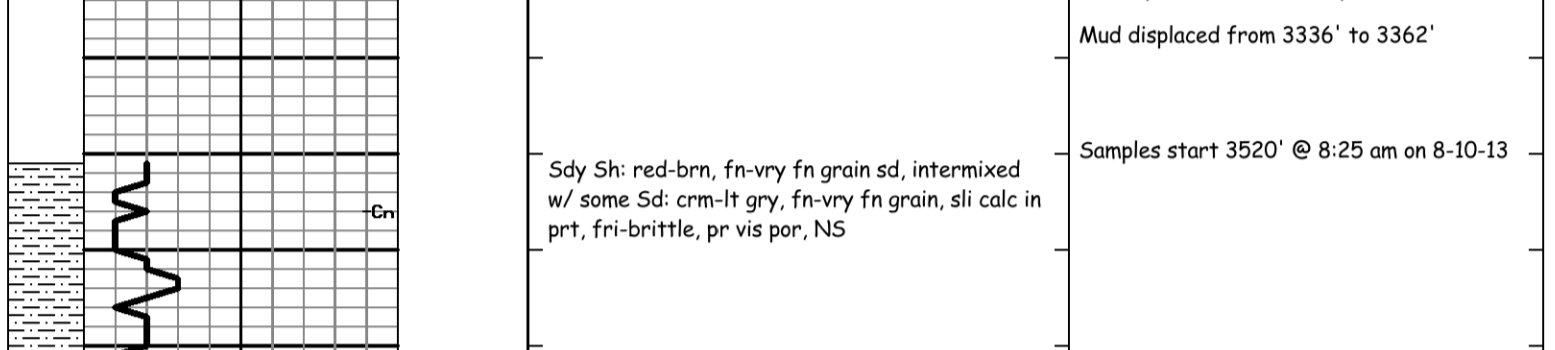
The drilling samples were deposited at the Kansas Geological Survey office in Wichita.

Respectfully submitted,

Robert L. Milford

Drill Stem Test Charts

Drill Stem Test by **Trilobite Testing, Inc.**



LITH.	DRILL TIME (MIN/FT)	DEPTH	SAMPLE DESCRIPTIONS	REMARKS
		3100		Stone Corral 3110' (+151) EL
		3150		B/Stone Corral 3142' (+119) EL
		3500		Call depth 3220' @ 10:50 pm on 8-9-13 Mud displaced from 3336' to 3362'
		3520	Sdy Sh: red-brn, fn-vry fn grain sd, intermixed w/ some Sd: crm-lt gry, fn-vry fn grain, sli calc in prt, fri-brittle, pr vis por, NS	Samples start 3520' @ 8:25 am on 8-10-13
		3550	Sdy Sh: A.A. w/ some soft & gummy, & some Sd: A.A., pr vis por, NS	
		3580	Sdy Sh: red-brn, intermixed w/ some Sd: crm-lt gry, fn-vry fn grain, vry sli calc in prt, some sli shly, soft-brittle, pr vis por, NS	
		3600	Sdy Sh: red-brn, w/ small amt of Sdy Sh: lt gry, fn-vry fn grain	Morgan Mud check @ 3589': 69 Vis, 8.6 Wt, 6.0 WL, 600 ppm Chl, 1# LCM
		3610	Sdy Sh: A.A., some soft & gummy	Neva 3610' (-349) EL
		3650	LS: wh-crm, fxln, fos-ool, vry chky-sub chky, pr por, NS Sdy Sh: red-brn, w/ small amt Sd: gry, some sdy	
		3673	Sdy Sh: red-brn	Red Eagle 3673' (-412) EL
		3700	Sd: lt gry, fn-vry fn grain, sli calc, semi fri-brittle, pr vis por, NS Sdy Sh: A.A., w/ some Sd: red-brn to purple	
		3729	LS: crm-lt gry, fxln, sdy in prt (vry fn grain), fos in prt, sub chky-prtly dns, pr por, NS	Forker 3729' (-468) EL
		3750	Sh: red-brn, sdy in prt, tr cht: red-brn, w/ small amt of Sd: lt gry, fn-vry fn grain, sli calc, semi fri-brittle, pr vis por, NS Sdy Sh: red-brn, some soft & gummy, w/ small amt Sd: A.A., pr vis por, NS	
		3780	Sdy Sh: red-brn, some soft & gummy	
		3800	LS: wh-lt gry, fxln, sdy in prt (vry fn grain), some fos, vry chky-sub chky, pr por, NS LS: tan-brn, fxln, sli fos, some shly, sub chky-prtly dns, pr por, NS	
		3850	LS: wh-lt gry, fxln, fos in prt, vry chky-prtly dns, pr por, NS LS: wh-crm, fxln, fos in prt, some sli shly, some calcite, vry chky-prtly dns, pr por, NS LS: gry, fxln, shly in prt, sub chky-prtly dns, pr por, NS Sh: red-brn, soft & gummy in prt, some gry	
		3886	Sh: A.A. LS: crm-lt gry, fxln, fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, NS Sh: red-brn, some soft & gummy w/ some Calc Sh: lt gry & red-brn Sh: red-brn, some sdy, some gry & grn	Stotler 3886' (-625) EL
		3900	LS: wh-lt gry, fxln, fos in prt, vry chky-prtly dns, pr por, NS Sh: red-brn, sdy in prt, some soft & gummy, some grn Sh: red-brn, some soft & gummy, some gry & grn	
		3950	LS: crm-gry, fxln, sli fos, sli shly in prt, sub chky-prtly dns, pr por, NS Sh: red-brn, soft & gummy in prt, some gry-grn	Topeka 3964' (-703) EL
		4000	LS: crm-gry, fxln, fos in prt, some blk inclusions, sub chky-prtly dns, pr por, vry scat blk tarry-asp sptd-sub stn, NSFO, no odor LS: crm, fxln, sli fos, some shly (red-brn, mottled), sub chky-prtly dns, pr por, tr lt-drk brn sptd-patchy stn, NSFO, no odor	
		4050	LS: crm, fxln, fos in prt, sub chky-prtly dns, pr por, tr brn-blk sptd stn, NSFO, no odor LS: crm-lt gry, fxln, fos, sub chky-prtly dns w/ some chky, pr por, vry scat blk tarry-asp sptd stn, NSFO, no odor LS: A.A., pr por, tr stn, NSFO, no odor Sh: red-brn, some sdy	
		4100	LS: crm-lt gry, fxln, fos in prt, sub chky-prtly dns w/ some chky-vry chky, fr amt blk tarry-asp sptd-sub stn, NSFO, no odor Sh: red-brn, some soft & gummy	
		4150	LS: crm-tan, fxln, fos-ool in prt, sub chky-prtly dns w/ some chky, pr por, fr amt blk tarry-asp sptd-sub stn, NSFO, no odor LS: crm-tan, fxln, sli fos, sub chky-dns, pr por, tr blk tarry-asp sptd-patchy stn, NSFO, no odor LS: lt gry, fxln, shly, sub chky, pr por, NS LS: A.A. w/ Calc Sh: lt gry-purple Calc Sh: A.A. Sh: grn-brn, sli calc w/ Calc Sh: A.A. Sh: red-brn, gry, grn, brn, some calc	4132'-34': problem with Automatic Driller DST #1 4120'-4220' Leavenworth-LKC 'A' IF: blow built to 4" ISI: no blow back FF: blow built to 5" FSI: no blow back Rec: 195' TOTAL FLUID: 5' Free Oil (100% O) 130' OCM (30% O, 70% M) 60' OCMW (20% O, 30% W, 50% M) Chl ppm: 28,000 DST: 600 Mud IFF: 20-59#/30' ISIP: 1227#/60" FFP: 68-106#/60" FSP: 1193#/90"
		4200	Sh: red-brn, gry, grn	Morgan Mud check @ 4175': 62 Vis, 8.9 Wt, 6.4 WL, 600 ppm Chl, 1# LCM
		4250	LS: crm-lt gry, fxln, sli fos-ool, sub chky-prtly dns w/ some chky-vry chky, pr-fr w/ tr gd intrprt-vug por, scat blk tarry-asp sptd-sub stn, S-FSFO, no odor LS: crm-lt gry, fxln, sli fos, sub chky-prtly dns, pr por, NS LS: crm-brn, fxln, sli fos, sub chky-prtly dns, pr por, NS Sh: red-brn, some silty, some gry & grn LS: crm-tan, fxln, sli fos, some shly (red-brn, mottled), sub chky-prtly dns, pr por, tr blk sptd stn, NSFO, no odor Sh: red-brn, gry, grn	DST #2 4195'-4260' LKC 'D' zn IF: blow built to 6.5" ISI: no blow back FF: BOB in 1" FSI: no blow back Rec: 319' Oil Spotted Mud (100% M) (no water in grind out) 289' WW (20% W, 80% M) 186' MW (60% W, 40% M) 372' MW (90% W, 10% M) 1,855' MW (95% W, 5% M) 5' Mud (heavy) (100% M) Chl ppm: 30,000 DST: 600 Mud IFF: 298-980#/30' ISIP: 1309#/60" FFP: 1024-1263#/30' FSP: 1310#/90"
		4300	LS: wh-lt gry, fxln, sli fos-ool, sub chky-prtly dns w/ some chky-vry chky, pr-fr w/ tr gd intrprt-vug por, scat blk tarry-asp sptd-sub stn, S-FSFO, no odor LS: crm-lt gry, fxln, sli fos, sub chky-prtly dns, pr por, NS LS: crm-brn, fxln, sli fos, sub chky-prtly dns, pr por, NS Sh: red-brn, some gry & grn, some lt gry, soft & gummy LS: crm-tan, fxln, sli fos, some shly (red-brn, mottled), sub chky-prtly dns, pr por, tr blk sptd stn, NSFO, no odor Sh: red-brn, gry, grn	DST #3 4259'-4365' LKC 'G' 'I' zn IF: blow built to 0.5" FF: no blow back Rec: 319' Oil Spotted Mud (100% M) 186' MW (60% W, 40% M) 372' MW (90% W, 10% M) 1,855' MW (95% W, 5% M) 5' Mud (heavy) (100% M) Chl ppm: 30,000 DST: 600 Mud IFF: 298-980#/30' ISIP: 1309#/60" FFP: 1024-1263#/30' FSP: 1310#/90"
		4350	LS: wh-crm, fxln, fos in prt, sub chky-prtly dns, pr por, NS LS: crm-lt gry, fxln, fos, sub chky-prtly dns, pr por, NS LS: A.A., pr por, NS Sh: red-brn, gry-grn, some brn Sh: A.A. Sh: red-brn, some gry-grn	Morgan Mud check @ 4365': 54 Vis, 9.0 Wt, 6.4 WL, 1,000 ppm Chl, 0.5# LCM
		4400	LS: crm-lt gry, fxln, sli fos, sub chky-prtly dns w/ some chky, pr por, NS Sh: red-brn, gry, some grn Sh: red-brn, some silty & sli calc, some gry-grn LS: crm-lt gry, fxln, sli fos, sub chky-prtly dns w/ some chky, pr por, NS Sh: red-brn, some soft & gummy, some gry-grn LS: wh-tan, fxln, fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, NS	DST #4 4355'-4404' LKC 'J' zn IF: blow built to 0.5" FF: no blow back Rec: 5' Oil Spotted Mud (100% M) IFF: 16-22#/30' ISIP: 988#/60" FFP: 22-27#/30' FSP: 1031#/60"
		4450	Sh: red-brn, gry-grn	caught 5' sample @ 4395' Morgan Mud check @ 4404': 52 Vis, 9.1 Wt, 6.4 WL, 1,000 ppm Chl, 1.5# LCM
		4500	LS: crm-lt gry, fxln, sli fos, sub chky-prtly dns w/ some chky, pr por, NS Sh: red-brn, brn, gry, grn Sh: red-brn, gry, grn LS: crm-tan, fxln, ool-fos in prt, sub chky-prtly dns, pr por, NS Sh: lt gry (calc), red-brn, grn, gry Sh: red-brn (some calc), gry, grn Sh: A.A. Sh: red-brn, some gry-grn	DST #5 4435'-4404' LKC 'J' zn IF: blow built to 1" FSI: no blow back Rec: 5' Oil Spotted Mud (100% M) IFF: 19-21#/30' ISIP: 788#/60" FFP: 22-23#/30' FSP: 780#/60"
		4550	Shly LS: lt-med gry, sli shly-shly, gritty-prtly dns, pr por, NS Sh: lt-med gry, some red-brn & gry, small amt drk gry	Morgan Mud check @ 4600': 61 Vis, 9.1 Wt, 6.0 WL, 1,000 ppm Chl, 1.5# LCM
		4600	LS: wh-lt gry, fxln, fos-ool in prt, sub chky-prtly dns w/ some chky-vry chky, pr-fr w/ tr gd intrprt-vug por, fr amt lt-drk brn sptd-sub stn, S-FSFO, no odor LS: A.A., incrs chky, pr por, vry scat stn, SSFO, no odor Sh: Blk Carb (small amt) LS: crm-gry, fxln, fos in prt, sub chky-prtly dns, pr por, NS Sh: red-brn (some calc), gry, grn LS: crm-lt gry, fxln, fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, NS Sh: Blk Carb & drk gry, red-brn, grn	DST #5 4554'-4600' Pawnee IF: blow built to 1", died back to 0.25" Rec: 5' Oil Spotted Mud (100% M) IFF: 19-21#/30' ISIP: 788#/60" FFP: 22-23#/30' FSP: 780#/60"
		4650	LS: crm-tan, fxln, fos in prt, sub chky-prtly dns, pr por, NS LS: crm-gry, fxln, fos in prt, sub chky-prtly dns, pr por, NS LS: A.A., pr por, NS Sdy LS w/ some Calc Sd: crm, fxln, fn grain sd, sli glauc, sub chky-prtly dns, pr vis por, NS LS: crm-tan, fxln, sli fos, sub chky-prtly dns w/ some chky, pr por, NS Sh: red-brn, gry, grn, brn, tr yell, intermixed w/ Sd: clm-wh, fr-med w/ some crs grains, sli calc in prt, semi fri-brittle, pr vis por, NS Sd: A.A., pr vis por, NS Sh: red-brn, gry, grn, brn, w/ small amt of Sd: A.A., pr vis por, NS Sh: A.A. w/ some Sd: clr, med-crs grain, semi fri, fr-ggd por, NS, & some loose Sd grains, clr, med-crs grain, sub rnd-sub ang, NS	caught 5' sample @ 4675' Ran 10 stand short trip after CFS
		4700		
		4750		R.T.D. 4740' (-1479) L.T.D. 4744' (-1483) Straight Hole Survey @ 4740': 0.125" Dev.