

Robert L. Milford

PETROLEUM GEOLOGIST
Wichita, Kansas

GEOLOGISTS' REPORT

DRILLING TIME AND SAMPLE LOG

OPERATOR **Murfin Drilling Company, Inc.**
LEASE **O'Neill #1-14**
LOC SPOT **1201 S & 201 E of C SE NW**

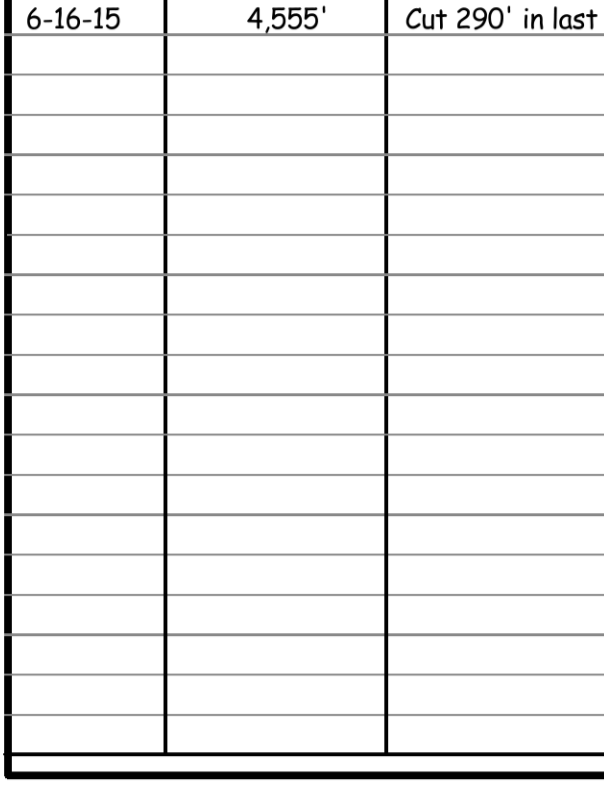
LOC FOOTAGE **2,100' FNL 2,000' FWL**
SEC. **14** TWPSP **35** RANG **32W**
COUNTY **Rawlins** STATE **KANSAS**

API **15-153-21152-00-00**
CONTRACTOR **Murfin Drilling Co., Inc.** RIG NO. **7**
DRILLING STARTED **6-9-2015** COMPLETED **6-16-2015**
MUD DISPLACED **3,004** MUD TYPE **Chemical**
DRILLING TIME KEPT FROM **3,590'** TO **RTD**
SAMPLES SAVED FROM **3,590'** TO **RTD**
SAMPLES EXAMINED FROM **3,590'** TO **RTD**
GEOLOGICAL SUPERVISION FROM **3,590'** TO **RTD**

MEASUREMENTS FROM K&B
CASING RECORD
Casing
Surface **8.5' @ 221'**
w/ 165 sacks cement
Production none

ELEVATIONS
KB **2,918'**
GL **2,913'**

FORMATION NAME	LOG TOP	LOG DATUM	SAMPLE TOP	SAMPLE DATUM
Stone Corral	2,689'	-229'	2,687'	+231'
Topeka	3,690'	-772'	3,690'	-772'
Heebner	3,893'	-935'	3,893'	-935'
Lansing	3,898'	-980'	3,898'	-980'
Stark	4,083'	-1165'	4,083'	-1165'
Pawnee	4,245'	-1327'	4,245'	-1327'
Cherokee	4,322'	-1404'	4,322'	-1404'
Mississippi	4,446'	-1528'	4,446'	-1527'
Arbuckle	not on log		4,545'	-1627'
Total Depth	4,558'	-1640'	4,555'	-1637'



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DATE	7:00 AM DEPTH	REMARKS
6-9-15	0'	Spud @ 3:30 pm. Plug down @ 8:00 pm. Drilled out plug @ 4:00 am on 6-10-15 w/ PDC bit
6-10-15	700'	Cut 700' in last 24 hrs. (Cut 479' in 3 drlg hrs w/ PDC bit)
6-11-15	3,060'	Cut 2,360' in last 24 hrs. (Cut 479' in 3 drlg hrs w/ PDC bit)
6-12-15	3,745'	Cut 685' in last 24 hrs; 17.5 hrs drlg (6 hrs w/ PDC bit). DST #1 @ 3962'
6-13-15	3,962'	Cut 217' in last 24 hrs; 9.5 hrs drlg. DST #2 @ 4005'
6-14-15	4,085'	Cut 123' in last 24 hrs; 6 hrs drlg. DST #3 @ 4085'
6-15-15	4,265'	Cut 180' in last 24 hrs; 8.75 hrs drlg. RTD 4555' @ 12:21 am on 6-16-15
6-16-15	4,555'	Cut 290' in last 24 hrs; 14 hrs drlg. P&A

Remarks

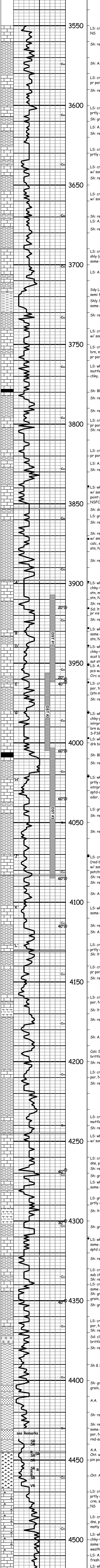
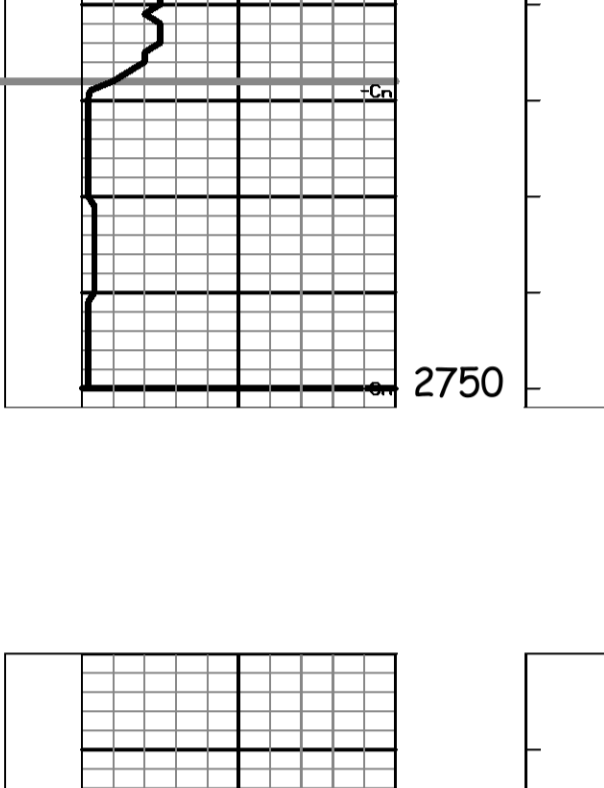
The electric log measurements correlate from 1' to 2' lower to the drilling measurements.

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



DEPTH (ft)	SAMPLE DESCRIPTIONS	REMARKS
2650	LS: crm-gry, fxltn, fos, sub chky-prtly dns, pr por, NS Sh: red-brn (some soft & gummy) & gry-grn Sh: A.A. w/ some lt gry (some soft & gummy)	Stone Corral 2689' (+229) EL
2700	LS: crm-gry, fxltn, fos in prt, sub chky-prtly dns, pr por, NS Sh: red-brn & gry-grn	B/Stone Corral 2719' (+199) EL
3690	LS: crm-gry, fxltn, sli fos, some shly, sub chky-prtly dns, pr por, NS Sh: gry & red-brn LS: A.A., pr por, NS Sh: red-brn & gry-grn LS: crm-gry, fxltn, sli fos, some shly, sub chky-prtly dns, pr por, NS LS: crm-lt gry, fxltn, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS Sh: red-brn (some soft & gummy), some gry & grn LS: crm-lt gry, fxltn, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS Sh: red-brn (some soft & gummy), some gry & grn LS: crm-tan, fxltn, fos in prt, some ool (crs), some shly (red-brn, mottled), sub chky-prtly dns w/ some chky, pr por, NS LS: A.A., pr por, NS	Topeka 3690' (-772) EL
3750	Sdy LS-Calc Sd: crm-lt gry, fn-vry fn grain sd, semi fri-brittle, pr vis por, NS Shly Sd: red-brn, calc, w/ Sh: red-brn (some sdy, some soft & gummy) Sh: red-brn, some soft & gummy, some sdy LS: crm-tan, fxltn, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS	
3800	LS: crm-lt gry, fxltn, fos in prt, some shly (red-brn, mottled), sub chky-prtly dns w/ some chky, pr por, NS LS: wh-lt gry, fxltn, fos in prt, some shly (red-brn, mottled), sub chky-prtly dns w/ some chky-vry chky, pr por, NS Sh: Blk Carb Sh: red-brn, gry, grn (some soft & gummy) Sh: red-brn (some soft & gummy), some gry & grn	
3850	LS: crm-lt gry, fxltn, fos in prt, sub chky-prly dns, pr por, NS Sh: red-brn (some soft & gummy), some gry & grn LS: crm-lt gry, fxltn, fos in prt, sub chky-prly dns, pr por, NS LS: A.A., pr por, NS Sh: red-brn (some soft & gummy), some gry & grn	Morgan Mud check @ 3851': 55 Vis, 9.2 Wt, 7.2 WL, 1,000 ppm Chl, 4# LCM
3853	LS: wh-lt gry, fxltn, fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, vry scat blk spdt-patchy stn, NSF0, no odor Sh: drk gry (no Blk Carb) LS: gry-tan, fxltn, sli fos, prtly dns, pr por, NS Sh: red-brn, gry, grn	Heebner 3853' (-935) EL
3900	LS: wh-tan, fxltn, sli fos, sub chky-prtly dns w/ some chky, pr por, tr blk tarry-aspd patchy stn, NSF0, no odor Sh: red-brn (some soft & gummy), some gry & grn LS: wh-tan, fxltn, sli fos sub chky-dns w/ some chky-vry chky, pr por, vry scat blk spdt-patchy stn, NSF0, no odor LS: A.A. pr fos por, tr med-drk brn patchy stn, 4 pcs w/ SFO, no odor (found 1st pc in 3960' 20' Circ after resuming drlg, then Circ at 3962') LS: wh-tan, fxltn, sli fos, sub chky-prtly dns, pr por, tr blk tarry-aspd stn, NSF0, no odor (stn may be cavings) Sh: red-brn, gry, grn, brn	Morgan Mud check @ 3951': 55 Vis, 9.2 Wt, 7.2 WL, 1,200 ppm Chl, 4# LCM
3950	LS: wh-tan, fxltn, sli fos sub chky-dns w/ some chky-vry chky, pr por, vry scat blk spdt-patchy stn, NSF0, no odor LS: A.A. pr fos por, tr med-drk brn patchy stn, 4 pcs w/ SFO, no odor (found 1st pc in 3960' 20' Circ after resuming drlg, then Circ at 3962') LS: wh-tan, fxltn, sli fos, sub chky-prtly dns, pr por, tr blk tarry-aspd stn, NSF0, no odor (stn may be cavings) Sh: red-brn, gry, grn, brn	DST #1 3907'-3962' L/KC 'B'-'J' zns IF: blow built to 1" FF: no blow Rec: 15' Mud (100% M) IFF: 22-46#/30" FSIP: 1075#/60" FFP: 27-33#/30" FSIP: 956#/60" Note: some plugging during FFP
4000	LS: wh-lt gry, fxltn, ool (small)-fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, NS Sh: Blk Carb Sh: red-brn & gry, some grn	Ran 28 stand short trip prior to DST #1 Straight Hole Survey @ 3962': 0.25' Dev.
4050	LS: wh-brn, fxltn, fos-ool (small) in prt, sub chky-prtly dns w/ some chky-vry chky, pr w/ some fr intraprtcl & tr small vug por, vry scat med-drk brn spdt-sub sat stn, NSF0, no odor LS: wh-lt gry, fxltn, vry chky-prtly dns, pr por, tr drk brn-blk spdt dead stn, NSF0, no odor Sh: Blk Carb Sh: red-brn & gry, some grn	DST #2 3956'-4005' L/KC 'G' zns IF: blow built to 1" FF: no blow Rec: 15' Mud (100% M) IFF: 22-46#/30" FSIP: 1075#/60" FFP: 27-33#/30" FSIP: 956#/60" Note: some minor plugging at end of IFF
4100	LS: crm-lt gry, fxltn, fos-ool in prt, some shly (red-brn, mottled), sli prp, sub chky-prtly dns, pr w/ some fr intraprtcl por; vry scat lt-drk brn patchy-sub sat & tr sat stn, S-FSFO, no odor Sh: red-brn & gry-grn Sh: red-brn & gry-grn Sh: A.A. LS: wh-lt gry, fxltn, sli fos, sub chky-prtly dns w/ some chky, pr por, NS Sh: red-brn & gry-grn Sh: A.A. LS: crm-med gry, fxltn, sli fos, sub chky-prtly dns, pr por, NS Sh: red-brn, gry, grn	DST #3 4003'-4085' Lans 'H'-'J' zns IF: blow built to 9" FF: no blow back Rec: 406' TOTAL FLUID: 2' Free Oil (100% O) 60' MW (80% W, 20% M) 60' MW (50% W, 50% M) Chl ppm: 50,000 DST: 1,200 Mud IFF: 23-73#/30" FSIP: 1300#/60" FFP: 86-149#/60" FSIP: 1276#/90" Note: some minor plugging at end of IFF
4150	LS: crm-med gry, fxltn, sli fos, sub chky-prtly dns, pr por, NS Sh: red-brn, gry, grn LS: crm-brn, fxltn, sli fos, sub chky-prtly dns, pr por, NS Sh: lt gry (some calc), med-drk gry, red-brn, grn Sh: red-brn & gry, some grn Sh: A.A. Calc Sd-Sdy LS: crm-lt gry, fn grain sd, semi fri-brittle, pr vis por, NS Sh: red-brn (some sdy), gry, some grn	DST #2 3956'-4005' L/KC 'G' zns IF: blow built to 4.75" ISI: no blow FF: blow built to 5.25" FSIP: no blow Recovery: 270' TOTAL FLUID 150' WM (30% W, 70% M) 60' MW (80% W, 20% M) 60' MW (50% W, 50% M) Chl ppm: 50,000 DST: 1,200 Mud IFF: 23-73#/30" FSIP: 1300#/60" FFP: 86-149#/60" FSIP: 1276#/90" Note: some minor plugging at end of IFF
4200	LS: crm-tan, fxltn, sli fos, sub chky-prtly dns, pr por, NS Sh: red-brn, gry, grn, brn LS: crm-tan, fxltn, sli fos, some shly (red-brn, mottled), sub chky-prtly dns, pr por, NS Sh: red-brn & gry, some grn LS: wh-tan, fxltn, ool-fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, NS LS: wh-tan, fxltn, ool-fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, NS	Morgan Mud check @ 4005': 56 Vis, 9.2 Wt, 7.2 WL, 1,200 ppm Chl, 4# LCM (12:15 pm, while CFS)
4250	LS: crm-gry, fxltn, some sli shly, sub chky-prtly dns, pr por, NS Sh: red-brn, gry, grn (no Blk Carb) Sh: gry, red-brn, grn LS: wh-brn, fxltn, fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, NS LS: gry-brn, fxltn, sli fos, some shly, sub chky-prtly dns, pr por, NS Sh: lt-gry (some calc) w/ small amt red-brn & grn Sh: gry, some red-brn (no Blk Carb)	Note: samples poor from 4005' to 4085'. Carried large amount of shale in 'H' & 'J' zones which reduced amount of rocks with shows of oil in samples
4300	LS: wh-tan, fxltn, fos in prt, sub chky-prtly dns w/ some chky-vry chky, pr por, tr questionab brn spdt dead stn, NSF0, no fluor, no cut, no odor Sh: red-brn, gry, grn (some soft & gummy) LS: crm-tan, fxltn, some shly (red-brn, mottled), sub chky-prtly dns, pr por, NS Sh: red-brn, gry, grn, w/ tr yell & brn LS: crm-tan, fxltn, sli fos, sub chky-prtly dns w/ some chky, pr por, NS Sh: gry, grn, red-brn, & tr Sd: lt gry, fn-vry fn grain, sli calc, semi brittle, pr vis por, NS Sh: gry-grn & red-brn	DST #3 4003'-4085' Lans 'H'-'J' zns IF: blow built to 9" FF: no blow back Rec: 406' TOTAL FLUID: 2' Free Oil (100% O) 60' MW (80% W, 20% M) 60' MW (50% W, 50% M) Chl ppm: 45,000 DST: 1,300 Mud IFF: 21-125#/30" FSIP: 1305#/60" FFP: 134-204#/60" FSIP: 1279#/90"
4350	LS: crm-tan, fxltn, sli fos, sub chky-prtly dns, pr por, NS Sh: red-brn, gry, grn, some yell Sd: clr-crm, fn-med grain, calc, semi fri-semi brittle, pr vis por, NS Sh: red-brn, gry, grn Sh & Sd: A.A. w/ incrs amt of sd, pr vis por, NS	Morgan Mud check @ 4360': 75 Vis, 9.3 Wt, 8.0 WL, 1,800 ppm Chl, 5# LCM
4400	Sh: gry-grn & red-brn, w/ Sd: clr-crm, fn-med grain, calc, semi fri-brittle, pr-fr vis por, NS A.A. Sh: red-brn & gry-grn, w/ Sd: A.A. Sh: red-brn, gry, grn, w/ Sd: clr-crm, fn-med w/ some crs grains, sli calc, semi fri-brittle, pr-fr por, NS, & some loose crs Sd grains, clr-yell, sub med-sub ang	Geolograph malfunctioned after connection at 4430'. The depths were corrected after connection at 4461'
4450	A.A. Chl: wh-crm w/ some yell, fresh & weathered, fr pin-point por in weathered cht, NS Chl: A.A. LS: crm-lt tan, fxltn, some sli dolomitic, sub chky-prtly dns, pr por, NS, w/ good amount of weathered, NS LS: crm-tan, fxltn, some dolomitic, sub chky-prtly dns, pr por, NS, w/ Chl: wh-crm w/ some yell, mostly fresh w/ some sli weathered, NS LS: wh-tan, fxltn, sub chky-prtly dns w/ some chky-vry chky, pr por, NS, w/ Chl: clr-wh-crm & some yell & some transl, mostly fresh w/ some sli weathered, NS LS: A.A. w/ Chl: crm-tan, some transl, mostly fresh w/ some sli weathered, NS LS: wh-tan, fxltn, chly (wh-crm), sub chky-prtly dns w/ some chky-vry chky, pr por, NS LS: A.A.	Miss. 4446' (-1528) EL
4500	LS: crm-lt tan, fxltn, some sli dolomitic, sub chky-prtly dns, pr por, NS, w/ good amount of weathered, NS LS: crm-tan, fxltn, some dolomitic, sub chky-prtly dns, pr por, NS, w/ Chl: wh-crm w/ some yell, mostly fresh w/ some sli weathered, NS LS: wh-tan, fxltn, sub chky-prtly dns w/ some chky-vry chky, pr por, NS LS: A.A.	
4550	LS: crm-tan, fxltn, ool in prt, sub chky-prtly dns, pr por, NS Dol: tan-lt brn, fxltn, prtly dns, pr por, NS Dol: crm-tan, fn w/ some med xln, prtly dns, fr w/ some gd pin point-vug por, NS	Arbuckle 4545' (-1627) DT top of Arb. is below start of most log curves R.T.D. 4555' (-1637) L.T.D. 4558' (-1640) Ran 12 stand short trip @ 4555' after CFS Straight Hole Survey @ 4555': 0.5" Dev.