

# Robert L. Milford

PETROLEUM GEOLOGIST  
Wichita, Kansas

## GEOLOGISTS' REPORT

DRILLING TIME AND SAMPLE LOG

OPERATOR: **Murfin Drilling Company, Inc.**  
 LEASE: **Schmidt-Vap 'A' #1-26**  
 LOC. SPOT: **80'S & F1E OF E2 W6 NW**  
 LOC. FOOTAGE: **1,400' FINL 1,100' FWL**

SEC: **26** TWP: **4S** RNG: **31W**  
 COUNTY: **Rawlins** STATE: **Kansas**  
 API: **15-152-21111-00-00**

CONTRACTOR: **Murfin Drilling Co., Inc.** RIG NO.: **7**  
 DRILLING STARTED: **2-11-2015** COMPLETED: **2-24-2015**  
 MUD DISPLACED: **3,070** MUD TYPE: **Chemical**  
 DRILLING TIME (HEFT FROM): **3,650'** TO: **RTD**  
 SAMPLES SAVED FROM: **3,650'** TO: **RTD**  
 SAMPLES EXAMINED FROM: **3,650'** TO: **RTD**  
 GEOLOGICAL SUPERVISION FROM: **3,650'** TO: **RTD**

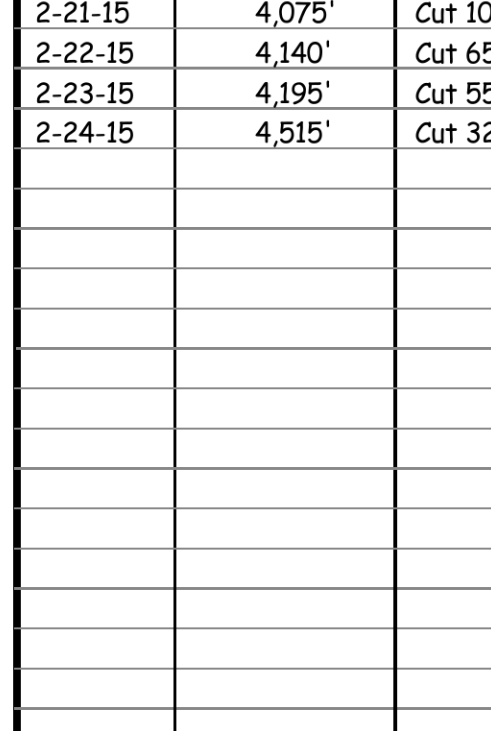
FORMATION NAME	TOP DATUM	SAMPLE DATUM
Stone Corral	2,691' +248'	3,758' -819'
Lopeka	3,756' -817'	3,921' -982'
Heebner	3,921' -982'	3,924' -985'
Lansing	3,969' -1030'	3,972' -1033'
Stark	4,137' -1198'	4,140' -1201'
B/KC	4,185' -1246'	4,187' -1248'
Pawnee	4,291' -1352'	4,293' -1354'
Cherokee	4,381' -1442'	4,383' -1444'
Mississippi	not on log	4,495' -1556'
Total Depth	4,514'	4,515' -1576'

ELEVATIONS  
 KB: **2,939'**  
 GL: **2,934'**

MESSENGERS FROM: \_\_\_\_\_  
 CASING RECORD  
 Conductor: \_\_\_\_\_  
 Surface: **8.5/8" @ 220'**  
 w/ 200 sacks cement  
 Production: **5.1/2" @ 4491'**  
 w/ 450 sacks cement

ELECTRICAL SURVEYS:  
 Pioneer Wireline: \_\_\_\_\_  
 Dual Induction Log \_\_\_\_\_  
 Dial Compensated - \_\_\_\_\_

Porosity Log \_\_\_\_\_  
 Microsensitivity Log \_\_\_\_\_  
 Borehole Compensated-Sonic Log \_\_\_\_\_



DATE	7:00 AM DEPTH	REMARKS
2-17-15	0'	Spud @ 2:30 pm. Plug down @ 6:15 pm. Drilled out plug @ 2:15 am on 2-18-15 w/ PDC bit
2-18-15	800'	Cut 800' in last 24 hrs. Cut 580' in 4.75 hrs w/ PDC bit.
2-19-15	3,450'	Cut 2,650' in last 24 hrs. 22.25 hrs drlg. Bit trip @ 3609' (ran button bit)
2-20-15	3,975'	Cut 525' in last 24 hrs; 16.5 hrs drlg. DST #1 @ 4007'
2-21-15	4,075'	Cut 100' in last 24 hrs; 3.5 hrs drlg. DST #2 @ 4075', DST #3 @ 4140'
2-22-15	4,140'	Cut 65' in last 24 hrs; 3.25 hrs drlg. DST #4 @ 4195'
2-23-15	4,195'	Cut 55' in last 24 hrs; 3.5 hrs drlg. RTD 4515' @ 4:15 am on 2-24-15
2-24-15	4,515'	Cut 320' in last 24 hrs; 15.25 hrs drlg. Ran production casing.

**Remarks**

The electric log measurements correlate from 2' to 3' higher to the drilling measurements.

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

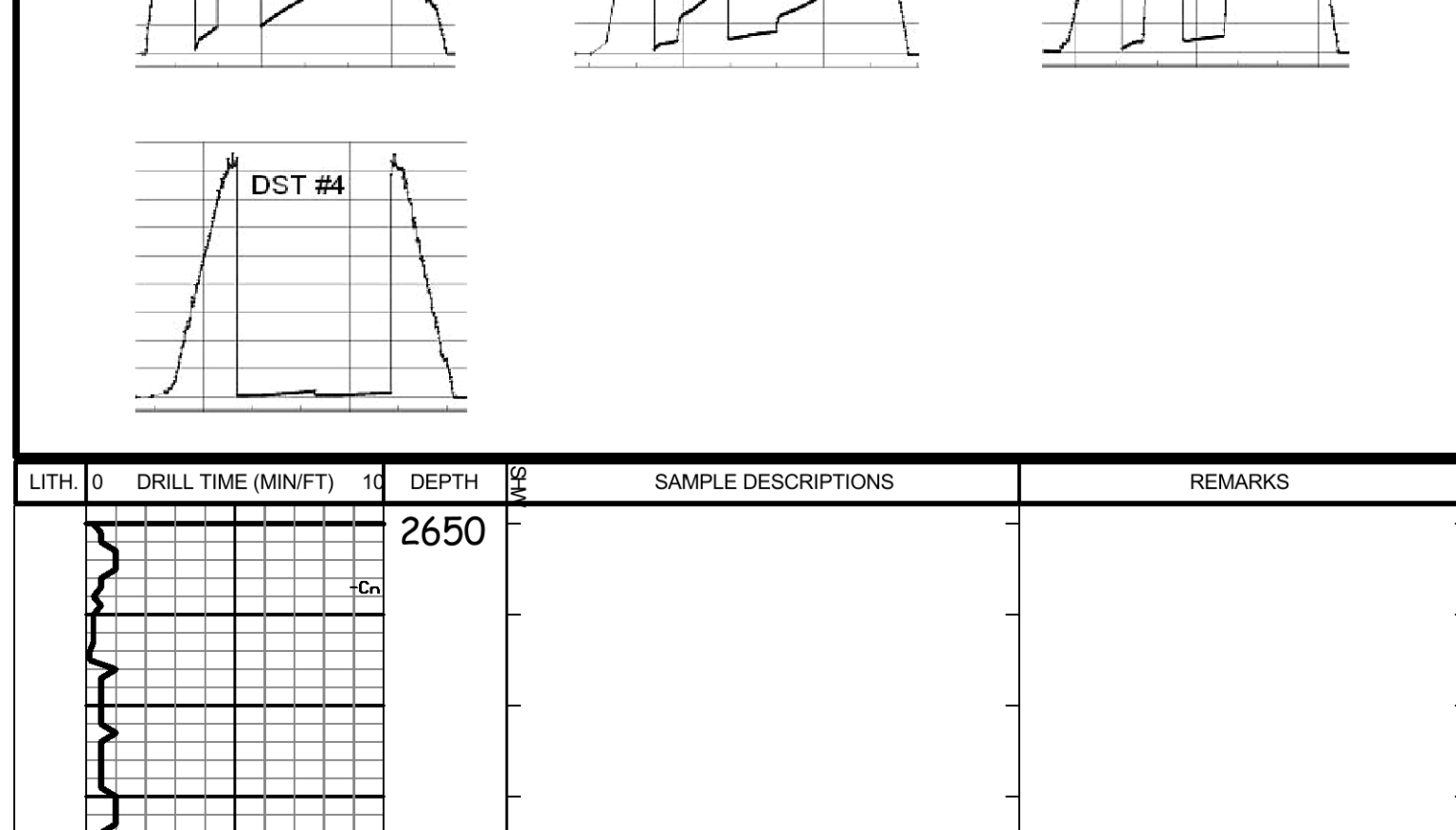
The drilling samples were deposited at the Kansas Geological Survey office in Wichita.

Respectfully submitted,

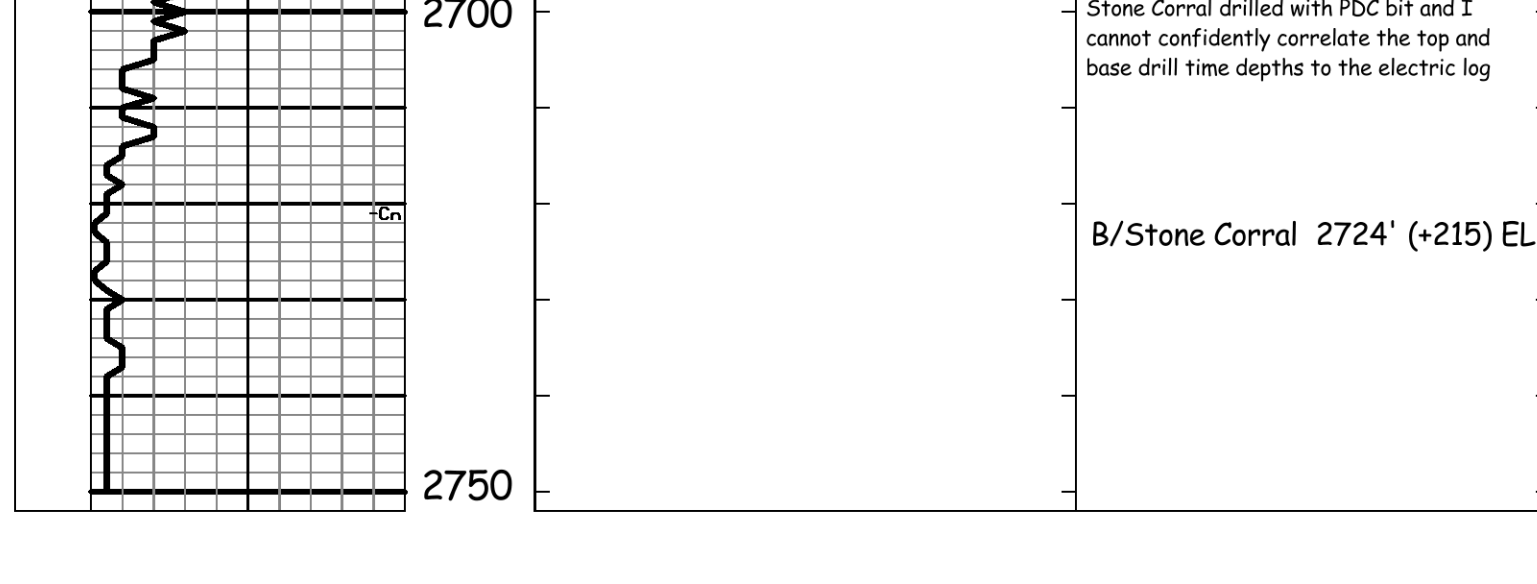
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### Drill Stem Test Charts

Drill Stem Test by Trilobite Testing, Inc.



LITH.	DRILL TIME (MIN/FT)	DEPTH	SAMPLE DESCRIPTIONS	REMARKS
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Stone Corral 2691' (+248) EL

Stone Corral drilled with PDC bit and I cannot confidently correlate the top and base drill time depths to the electric log

B/Stone Corral 2724' (+215) EL

3650

Sh: gry, some red-brn

LS: crm-lt gry, fxl, fos in prt, sub chky-prtly dns, pr por, NS

LS: crm-gry, fxl, sli fos, some shly, sub chky-prtly dns, pr por, NS

Sh: red-brn (some calc), some gry & grn

LS: crm-lt gry, fxl, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS

LS: crm-tan, fxl, fos-ool in prt, some calcite, sub chky-prtly dns w/ some chky, pr w/ some fr-gd intrprtcal-vug por, NS

Sh: grn, gry, red-brn

LS: wh-lt gry, fxl, fos-ool in prt, some sli shly, sub chky-prtly dns w/ some chky-vry chky, pr w/ some fr-gd intrprtcal-vug por, NS

Sh: red-brn, w/ some Calc Sh-Shly LS: red-brn

LS: crm-lt gry, fxl, sli fos, some shly (red-brn, mottled), sub chky-prtly dns, pr por, NS

Sh: red-brn (some soft & gummy), w/ some gry-grn

Sh: red-brn (mstly soft & gummy, some silty)

Topoka 3756' (-817) EL

3700

LS: wh-lt gry, fxl, fos in prt, some shly (red-brn, mottled), sub chky-prtly dns w/ some chky-vry chky, pr por, NS

LS: crm-lt gry, fxl, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS

Sdy LS-Calc Sd: crm-lt gry, fn-vry fn grain sd, semi brittle-brittle, pr vis por, NS

Shly Sd-Sdy Sh: red-brn, fn-vry fn grain sd, sli calc, pr vis por, NS

Sh: red-brn (some sdy, some soft & gummy)

3750

LS: wh-lt gry, fxl, fos in prt, vry chky-prtly dns, pr por, NS

LS: wh-lt gry, fxl, fos in prt, chky-prtly dns w/ some vry chky, pr por, NS

LS: A.A.

3800

Sh: Blk Carb

LS: tan-brn, fxl, sli fos, prtly dns, pr por, NS

Sd: lt gry, fn-vry fn grain, calc, semi brittle, pr vis por, NS

Sh: red-brn, gry & grn

LS: wh-tan, fxl, fos in prt, vry chky-prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt), some gry-grn

3850

LS: crm, fxl, fos in prt, sub chky-prtly dns, pr por, scat med-drk brn patchy-sub sat stn w/ tr sat stn, S-FSFO, no odor

LS: wh-tan, fxl, fos-ool in prt, vry chky-prtly dns, pr por, vry scat med-drk brn patchy stn, SSFO, no odor

LS: wh-lt gry, fxl, fos in prt, sli pyr, sub chky-prtly dns w/ some chky-vry chky, pr w/ tr fr fos-vug por, NS

3900

Sh: Blk Carb

LS: tan-brn, fxl, sli fos, prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt) & lt gry (soft & gummy in prt) w/ some fr fos-vug por, scat blk w/ some brn spdt-patchy stn, S-FSFO (some thk-hvy oil), no odor

Sd: lt gry, fn-vry fn grain, calc, brittle, pr vis por, scat lt-drk brn & blk patchy-sub sat stn, S-FSFO, vry frnt odor

LS: crm-tan, fxl, ool, sub chky-prtly dns, pr fr w/ tr gd intrtol-small vug por, scat lt-drk brn patchy-sub sat w/ tr sat stn, S-FSFO, no odor

Sh: red-brn (some soft & gummy), some gry & grn

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr w/ some fr fos-vug por, scat blk w/ some brn spdt-patchy stn, S-FSFO (some thk-hvy oil), no odor

Sh: grn, red-brn, gry

LS: crm-tan, fxl, fos, sub chky-prtly dns, pr w/ some fr-gd fos-vug por, scat lt-drk brn patchy-sub sat w/ tr sat stn, S-FSFO, vry frnt odor

LS: red-brn (mstly soft & gummy), some grn & gry

LS: crm-tan, fxl, ool, sub chky-prtly dns, pr fr w/ tr gd intrtol-small vug por, scat lt-drk brn patchy-sub sat w/ tr sat stn, S-FSFO, no odor

Sh: red-brn (some soft & gummy), some gry, grn

LS: wh-tan, fxl, fos-ool in prt, sli chy (crm), sli pyr, chky-prtly dns w/ some chky-vry chky, pr-fr fos-small vug por, scat lt-drk brn patchy-sub sat w/ tr sat stn, S-FSFO (some thk-hvy oil), no odor

3950

Sh: Blk Carb (20" Circ smpl)

LS: tan-brn, fxl, sli fos, sub chky-prtly dns, pr por, NS

Sh: red-brn, grn, gry

LS: wh-lt gry, fxl, some fos-ool, sub chky-prtly dns w/ some chky, fr-gd vug w/ some pr-fr intrprtcal por, scat lt-med w/ some drk brn patchy-sub sat w/ tr sat stn, S-FSFO, sli odor

LS: tan-brn, fxl, fos (some fusil), prtly dns, pr por, NS

Sh: red-brn (soft & gummy in prt), some gry & grn

Sh: gry-grn & red-brn

4000

LS: wh-tan, fxl, ool-fos in prt, sub chky-prtly dns, pr por, NS

LS: wh-tan, fxl, ool-fos in prt, sub chky-prtly dns, pr por, NS

Sh: red-brn (some sdy), some gry & grn

4050

LS: wh-tan, fxl, sli fos, sub chky-prtly dns, pr por, NS

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (mstly soft & gummy), some gry & grn

4100

LS: wh-tan, fxl, sli fos, sub chky-prtly dns, pr por, NS

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

4150

LS: wh-tan, fxl, sli fos, sub chky-prtly dns, pr por, NS

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

4200

LS: wh-tan, fxl, sli fos, sub chky-prtly dns, pr por, NS

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

4250

LS: wh-tan, fxl, sli fos, sub chky-prtly dns, pr por, NS

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

4300

LS: wh-tan, fxl, sli fos, sub chky-prtly dns, pr por, NS

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

LS: wh-tan, fxl, sli fos, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (some soft & gummy), gry, grn

4350

Shly LS-Calc Sh: lt-med gry, mst hrd, pr por, NS

LS: lt brn, fxl, prtly dns, pr por, NS

Sh: lt gry (soft & gummy), some med-drk gry, red-brn, & tr Blk Carb

Sh: gry, some red-brn

LS: crm-tan w/ some brn, fxl, fos in prt, chky-prtly dns, pr por, 1 pc w/ brn stn, gd fluor & gd cut, NSFO, no odor, & tr earthy brn dead stn, no fluor & no cut

Sh: red-brn, gry, brn, grn

4400

LS: crm, fxl, some sdy (fn-med grain), some fos, sub chky-prtly dns w/ some chky, pr por, tr med-drk brn spdt dead stn, NSFO, no odor, no fluor, no cut & tr Sd: chl-gry, fr-med grain, sli calc, brittle, pr vis por, NS & Sh: gry-grn & red-brn

LS: crm, fxl, fos in prt, sub chky-prtly dns w/ some chky, pr por, NS

Sh: red-brn (soft & gummy), gry & grn

Sh: red-brn (some soft & gummy), gry & grn, w/ small amt Sd: chl-gry, fr-med grain, sli calc, brittle, pr vis por, NS

Sh: red-brn (some soft & gummy, some sdy), gry, grn, some yell, w/ small amt Sd: A.A. & some loose crs grains, clr, sub rnd-sub ang

Sh: A.A. w/ small amt Sd: chl-gry, fr-med grain, semi fri, pr vis por, NS & some crs loose grains, clr, sub rnd-sub ang

Sh: red-brn (mstly soft & gummy, some sdy), some gry & grn, w/ small amt of Sd clusters & loose grains A.A.

Sh: A.A. w/ small amt Shly Sd: lt grn, fr-med grain, semi fri-semi brittle, pr vis por, NS

Sh: red-brn, some gry & grn w/ Shly Sd-Sdy Sh: red-brn, fr-med grain sd

Sh: red-brn (some soft & gummy), some gry & grn w/ lt yell-lt grn (soft & gummy) & some crm (soft & gummy)

Sh: red-brn (some soft & gummy), some gry, grn, yell, maroon

4450

Chl: wh-yell, fresh & weathered, pin point por in weathered, NS, w/ small amt LS: crm-tan, fxl, sub chky-prtly dns, pr por, NS

Chl: wh-crm w/ some yell, fresh & weathered, fr-gd pin point and vug por, NS, w/ some LS: crm-tan, fxl, sub chky-prtly dns, pr por, NS

4500

Top of Miss. is below start of most log curves drilled Sli Rough to Rough from 4502' -14'

Miss. 4495' (-1556) BT

L.T.D. 4514' (-1575)  
 R.T.D. 4515' (-1576)

Ran 10 stand short trip @ 4515' after CFS Straight Hole Survey @ 4515': 1' Dev.

Mud displaced from 3070' to 3122'

Call depth 3350' @ 5:42 am on 2-19-15

Morgan Mud check @ 3550': 69 Vis, 8.8 Wt, 5.2 WL, 700 ppm Chl, 8# LCM

Bit trip at 3609'. Replaced PDC bit with button bit.

Pipe Strap @ 3609': Strap short 0.78'

Straight Hole Survey @ 3609': 0.5' Dev.

Samples start 3650' @ 3:41 pm on 2-19-15

Rig repair @ 3673', down about 52"

Heebner 3921' (-982) EL

DST #1 3922'-4007' Tor-LKC 'B' zn

IF: BOB in 9" ISI: no blow back

FF: BOB in 11" FSI: no blow back

Rec: 977' TOTAL FLUID:

220' MW (50% W, 50% M)

757' SMCW (96% W, 4% M)

Chl ppm: 29,000 DST: 800 Mud

IFP: 25-227#/30" ISIP: 1286#/60"

FFP: 232-471#/60" FSIP: 1275#/90"

Toronto 3953' (-1014) EL

Lansing 3969' (-1030) EL

Morgan Mud check @ 3990': 46 Vis, 9.3 Wt, 6.4 WL, 800 ppm Chl, 6# LCM

Ran 20 stand short trip prior to DST #1

Pipe Strap @ 4007': Strap short 0.88'

Straight Hole Survey @ 4007': 0.75' Dev.

DST #2 4024'-4075' LKC 'E'-'G' zns

IF: BOB in 6.5" FSI: 9.25' blow back

FF: BOB in 9.5" FSI: 5.5' blow back

Rec: 665' GP & 340' TOTAL FLUID:

200' GOCM (24% G, 75% O, 1% M)

140' GOCM (18% G, 27% O, 55% M)

Oil Gravity 41° API

IFP: 30-107#/30" ISIP: 613#/60"

FFP: 126-186#/60" FSIP: 594#/90"

Morgan Mud check @ 4075': 55 Vis, 9.4 Wt, 6.0 WL, 1,600 ppm Chl, 6# LCM (8:45 am, while TOH for DST)

DST #3 4069-4140' LKC 'H'-'J' zns

IF: BOB in 10.5" FSI: 9.25' blow back

FF: BOB in 6.5" FSI: 5.5' blow back

Rec: 665' GP & 340' TOTAL FLUID:

343' GOCM (24% G, 75% O, 1% M)

140' GOCM (18% G, 27% O, 55% M)

Oil Gravity 41° API

IFP: 21-94#/30" ISIP: 1253#/60"

FFP: 105-140#/60" FSIP: 1171#/90"

Morgan Mud check @ 4195': 54 Vis, 9.4 Wt, 6.0 WL, 1,600 ppm Chl, 6# LCM (8:30 am, during ISIP on DST #3)

Stark 4137' (-1198) EL

DST #4 4137'-4195' LKC 'K'-'L' zns

IF: blow built to 1.25" FF: no blow

Rec: 5' Mud w/ oil spots (1% O, 99% M)

IFP: 13-16#/30" ISIP: 53#/60"

FFP: 18-19#/30" FSIP: 37#/60"

Morgan Mud check @ 4195': 54 Vis, 9.4 Wt, 6.0 WL, 1,600 ppm Chl, 6# LCM (8:30 am, while TOH w/ DST #4)

B/KC 4185' (-1246) EL

Ran another bit (re-run) @ 4195'

Pawnee 4291' (-1352) EL

Cherokee 4381' (-1442) EL