

Robert D. Hendrix

Petroleum Geologist

GEOLOGIST'S REPORT

DRILLING TIME AND SAMPLE LOG

COMPANY **Murfin Drilling Co. Inc.**

ELEVATIONS

LEASE **McClurg #2-12**

FIELD **Brumm West**

LOCATION **1860'fsl & 1320'fsl**

SEC **12** TWP **2S** RGE **37W**

COUNTY **Cheyenne** STATE **Kansas**

CONTRACTOR **Murfin Drilling Co. Inc. Rig #3**

SPUD **12/17/2018** COMP **12/17/2018**

RTD **4900'** LITD **4900'**

MUD UP **3600'** TYPE MUD **Chemical**

SAMPLES SAVED FROM **3990'** TOTID

DRILLING TIME KEPT FROM **3990'** TOTID

SAMPLES EXAMINED FROM **3990'** TOTID

GEOLOGICAL SUPERVISION FROM **3897'**

GEOLOGIST ON WELL **Robert D. Hendrix**

FORMATION TOPS

ANHYDRITE

STOTLER

TOPEKA

OREAD

LANSING

STARK

BKC

FT. SCOTT

EXCELLO

KB **3380'**

DF

GL **3375'**

Measurements Are All From **Kelly Bushing**

CASING

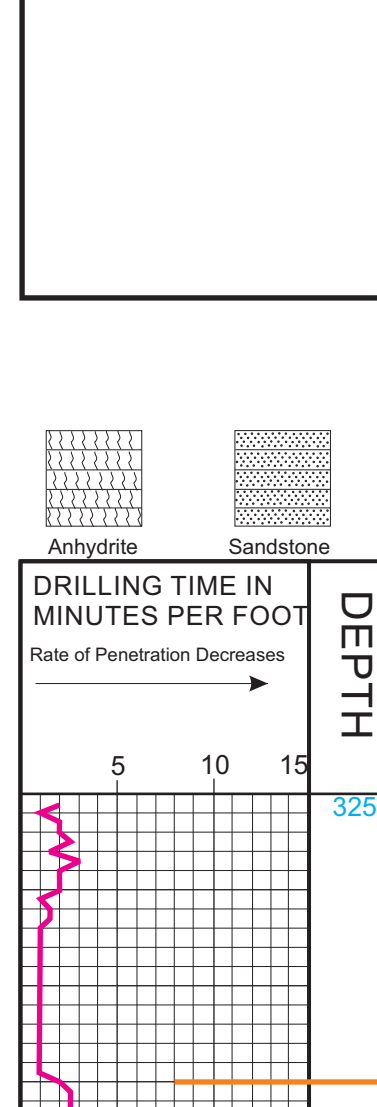
CONDUCTOR SURFACE **8-5.8" at 303'**

PRODUCTION **5.12c @ 4900'**

ELECTRICAL SURVEYS

Density/Resistivity/Neutron/Gravimetric/Photoelectric Well-Log Services

AP# 15-023-21501



REMARKS:

LEGEND



DEPTH	LITHOLOGY	SAMPLE DESCRIPTION	REMARKS
3250	Anhydrite		Anhydrite 3280 (+100)
3300	Anhydrite		Base Anhydrite 3310 (+70)
3350	Limestone	Limestone: gray to tan, f.xln, sl fossiliferous, 3 pieces black stain, no vis por, nfo	Geologist on location 3897' at 11:20 pm 12/10/2018 at Bit change from PDC to Button. Strap at of hole 1.8' long to board.
3400	Shale	Shale: red, gray, silty	
3450	Limestone	Limestone: white to tan, f-mxln, fossiliferous, sl interxn por, fr dark stain, nfo, no odor	
3500	Shale	Shale: gray, green, red	
3550	Limestone	Limestone: white, f-xln, chalky, v-fossiliferous, no vis por, fr black stain, gilsonite, nfo, no odor	
3600	Shale	Shale: gray, red, silty	
3650	Limestone	Limestone: white, f-xln, sl chalky, v-fossiliferous, no vis por, fr black stain, nfo, no odor	
3700	Shale	Shale: gray, green, red	
3750	Limestone	Limestone: white, m-xln, v-fossiliferous, sl interxn por, gd black stain, nfo, no odor	
3800	Shale	Shale: gray, red, silty	
3850	Limestone	Limestone: white, f-xln, chalky, pyritic, oolitic, fossiliferous, fr interxn por, gd black spotty to sat stain, gilsonite, slsfo, faint odor	Topeka 4089 (-709) wt 8.8, vis. 60, lcm 4# Morgan Mud, Dave Lines
3900	Dolomite	Dolomite: white to tan, f.xln, sl chalky, granular, sl fossiliferous, no vis por, ns	
3950	Shale	Shale: gray, red, black, silty	
4000	Limestone	Limestone: white, f.xln, mostly dense, oolitic in part, no vis por, small amt spotty black stain, nfo, no odor	
4050	Limestone	Limestone: white, f-mxln, fossiliferous, no vis por, ns	
4100	Shale	Shale: gray, green, red, silty	
4150	Sandstone	Sandstone: pale green, fr-grm, sub-md, well sorted, soft, no vis por, ns	
4200	Shale	Shale: gray, green, red, silty	
4250	Limestone	Limestone: white, f.xln, sl chalky, oolitic, fossiliferous, no vis por, black stain, gilsonite, nfo, no odor	DST #1 4173-4244 30-60-60-90 1st open: blow built to 2" 2nd open: blow built to 1" no returns Rec: 25' ocm 10/90 hydro: 2068-2020 psi ff: 20-25 psi lf: 28-35 psi sip: 522-514 psi bht: 139° F
4300	Limestone	Limestone: white, f.xln, sl chalky, oolitic, fossiliferous, no vis por, ns	
4350	Shale	Shale: gray, red, purple, silty	
4400	Shale	Shale: gray, silty	
4450	Limestone	Limestone: tan, f.xln, granular, oolitic, mostly dense, no vis por, black stain, gilsonite, nfo, no odor	Oread 4229 (-846) 8:00am, 12/12/2018 wt 9.0, vis. 61, lcm 4# Morgan Mud, Dave Lines
4500	Limestone	Limestone: white, f.xln, sl chalky, fossiliferous, pr interxn por, gd dark sat stain, slsfo, gd odor	
4550	Limestone	Limestone: white, f.xln, chalky, fossiliferous, sl pyritic, pr vug por, fr dark spotty stain, slsfo, no odor	
4600	Shale	Shale: black carbonaceous, gray	
4650	Limestone	Limestone: brown, v-xln, dense, sl pyritic, sl fossiliferous, no vis por, ns	
4700	Shale	Shale: black, gray, brown, silty	
4750	Sandstone	Sandstone: gray, fr-grm, well sorted, sub md, sl pyritic, friable, calcareous, no vis por, sl spotty stain, nfo, no odor	
4800	Shale	Shale: black, gray, brown, silty	
4850	Limestone	Limestone: brown, f.xln, mostly dense, mostly fossiliferous, fr pp to interxn por, scattered dark surface stain, nfo, no odor	Lansing 4311 (-931) DST #2 4315-4386 30-60-30-60 1st open: bob 1 1/2 min 1st shut in: no return 2nd open: bob 2 3/4 min 2nd shut in: no return Rec: 922' water 498' mcw-w-so 30/70 425' wcm-w-so 10/90 hydro: 2113-1993 psi lf: 156-659 psi ff: 668-855 psi sip: 927-929 psi bht: 151° F chl: 34,000 ppm rw: 0.299 @ 49° F
4900	Limestone	Limestone: tan to brown, f.xln, mostly dense, sl fossiliferous, no vis por, scattered dark sat stain, nfo, no odor	
4950	Limestone	Limestone: tan, f.xln, sl chalky, fossiliferous, scattered vug por, pr surface stain, slsfo, no odor	
5000	Shale	Shale: red, gray	
5050	Sandstone	Sandstone: lt gray, v-fnrgm, well sorted, md, sl biotitic, calcareous, no vis por, gd dark stain w gilsonite, nfo, no odor	
5100	Shale	Shale: red, gray, brown, green	
5150	Limestone	Limestone: tan to white, f.xln, sl chalky, fossiliferous, no vis por, pr surface stain, nfo, no odor	
5200	Shale	Shale: red, gray	
5250	Limestone	Limestone: white, mxln, sl chalky, oolitic in part, v-fossiliferous, fr interxn to foss por, dark sat stain, gdsfo, gd odor	DST #3 4395-4440 30-60-60-90 1st open: built to 4 1/2" 2nd open: built to 7 1/2" no returns Rec: 118' hmco 30/70 120' glp hydro: 2193-2073 psi lf: 21-39 psi ff: 43-69 psi sip: 1248-1179 psi bht: 134° F gravity: 37°
5300	Limestone	Limestone: white, f.xln, sl chalky, fossiliferous, mostly dense, no vis por, fr dark stain, slsfo, gd odor	
5350	Shale	Shale: gray	
5400	Limestone	Limestone: tan, f.xln, dense, fossiliferous, no vis por	
5450	Shale	Shale: gray, red, black	
5500	Limestone	Limestone: white, f-mxln, fossiliferous, fr foss por, dark sat stain, frsfo w oil sheen, gd odor	
5550	Limestone	Limestone: white, f-mxln, sl cherty, fossiliferous, no pr pp to vug por, black spotty stain, slsfo, gd odor	
5600	Shale	Shale: gray black, red	
5650	Limestone	Limestone: brown, f.xln, hard, dense, fossiliferous, no vis por	
5700	Shale	Shale: gray lt to dark, red, blocky	
5750	Limestone	Limestone: white, f.xln, sl chalky, sl pyritic, sl fossiliferous, pr interxn por, dark spotty to sat stain, slsfo, fr odor	
5800	Shale	Shale: gray red, brown	
5850	Limestone	Limestone: tan to white, f.xln, pyritic, sl fossiliferous, fr interxn por, pr spotty to sat stain, slsfo, fair odor	DST #4 4437-4525 30-60-60-90 1st open: bob 14 min 1st shut in: return built to 1/2" 2nd open: bob 18 min 2nd shut in: return built to 5 3/4" Rec: 117' wcm 20/25/55 59' gwmc 10/20/30/40 124' gwmc 20/30/50 87' mco 30/70 285' glp hydro: 2236-2043 psi lf: 31-115 psi ff: 129-177 psi sip: 1303-1267 psi bht: 145° F gravity: 34° chlorides: 21,000 ppm
5900	Limestone	Limestone: white, f-mxln, sl chalky, oolitic in part, fossiliferous, fr pp to vug/foss por, fr to dark sat stain, frsfo, good odor	
5950	Shale	Shale: gray, black, red	
6000	Shale	Shale: gray red, brown, sandy	
6050	Limestone	Limestone: white to lt gray, f.xln, sl chalky, sl oolitic, fossiliferous, no vis por	Stark 4525 (-1145)
6100	Shale	Shale: red, gray, brown	
6150	Limestone	Limestone: white to tan, f-mxln, v-chalky, sl cherty, sl pyritic, fossiliferous, fr vug por, 3 pieces lt spotty sat stain, nfo, faint odor	BKC 4580 (-1200) 8:00am, 12/15/2018 wt 9.2, vis. 56, lcm 5# Morgan Mud, Dave Lines
6200	Shale	Shale: red, gray	
6250	Limestone	Limestone: gray to white, f-mxln, sl chalky, sl oolitic, fossiliferous, no vis por	
6300	Shale	Shale: red, gray, green, brown	
6350	Limestone	Limestone: tan to white, f.xln, chalky, fossiliferous, no vis por	
6400	Shale	Shale: gray, blocky, silty	
6450	Shale	Shale: red, brown, gray, purple, silty, sandy	
6500	Limestone	Limestone: white to tan, f-mxln, chalky, sl cherty, sl oolitic, fossiliferous, pr interxn to foss por, lt sat stain, prsfo mostly on break, faint odor	Ft. Scott 4710 (-1330)
6550	Shale	Shale: gray dark to light, red, black	
6600	Limestone	Limestone: tan to white, f-mxln, fossiliferous, granular, cherty, no vis por	
6650	Limestone	Limestone: tan to gray, f.xln, foss, dense, no vis por	
6700	Shale	Shale: dark gray, gray	
6750	Shale	Shale: black carbonaceous, gray, red, silty	
6800	Shale	Shale: dark gray, gray, red, silty	
6850	Limestone	Limestone: white to tan, f.xln, sl chalky, oolitic in part, fossiliferous, 5 pieces, pr interxn por, lt sat stain, slsfo on break, no odor	
6900	Limestone	Limestone: white to tan, f.xln, sl chalky, pyritic, fossiliferous, no vis por	
6950	Shale	Shale: gray, green, red, brown, silty, sandy	
7000	Limestone	Limestone: white, f.xln, chalky, granular, no vis por	
7050	Limestone	Limestone: tan to white, f.xln, dense, fossiliferous, no vis por, ns	
7100	Shale	Shale: gray, green, red, silty	
7150	Limestone	Limestone: white, f.xln, v-chalky, sl pyritic, sl cherty, fossiliferous, no vis por	Celia 4787 (-1407)
7200	Shale	Shale: gray, red	
7250	Limestone	Limestone: tan to brown, f.xln, dense, fossiliferous, no vis por	
7300	Shale	Shale: gray, red	
7350	Limestone	Limestone: tan to brown, f.xln, dense, fossiliferous, no vis por	
7400	Sandstone	Sandstone: tan to red/brown, m-dgm, sub ang, mod sorted, calcareous, friable, fr intergranular por, ns	
7450	Shale	Shale: gray, green, red, silty, sandy	
7500	Limestone	Limestone: gray to tan, f.xln, v-sandy, sl chalky, fossiliferous, no vis por	
7550	Shale	Shale: gray, purple, red, sandy	
7600	Sandstone	Sandstone: lt green, lt, fr-coarse grm, sub md, mod sorted, calcareous, no vis por	
7650	Shale	Shale: gray, green, red, yellow	
7700	Sandstone	Sandstone: white, lt, md gm, sub md, mod sorted, sl calcareous, fr intergranular por	
7750	Shale	Shale: red, brown, silty, sandy	
7800	Limestone	Limestone: white to tan, f-mxln, v-chalky, sl cherty, sl oolitic, fossiliferous, pr interxn to foss por, lt sat stain, prsfo mostly on break, faint odor	Excello 4756 (-1376)
7850	Shale	Shale: gray dark to light, red, black	
7900	Limestone	Limestone: tan to white, f-mxln, fossiliferous, granular, cherty, no vis por	
7950	Limestone	Limestone: tan to gray, f.xln, foss, dense, no vis por	
8000	Shale	Shale: dark gray, gray	
8050	Shale	Shale: black carbonaceous, gray, red, silty	
8100	Shale	Shale: dark gray, gray, red, silty	
8150	Limestone	Limestone: white to tan, f.xln, sl chalky, oolitic in part, fossiliferous, 5 pieces, pr interxn por, lt sat stain, slsfo on break, no odor	
8200	Limestone	Limestone: white to tan, f.xln, sl chalky, pyritic, fossiliferous, no vis por	
8250	Shale	Shale: gray, green, red, brown, silty, sandy	
8300	Limestone	Limestone: white, f.xln, chalky, granular, no vis por	
8350	Limestone	Limestone: tan to white, f.xln, dense, fossiliferous, no vis por, ns	
8400	Shale	Shale: gray, green, red, silty	
8450	Limestone	Limestone: white, f.xln, v-chalky, sl pyritic, sl cherty, fossiliferous, no vis por	8:00am, 12/16/2018 wt 9.1, vis. 45, lcm 6# Morgan Mud, Dave Lines Switched to PDC bit and drilled to RTD.
8500	Shale	Shale: gray, red	
8550	Limestone	Limestone: tan to brown, f.xln, dense, fossiliferous, no vis por	
8600	Shale	Shale: gray, red	
8650	Limestone	Limestone: tan to brown, f.xln, dense, fossiliferous, no vis por	
8700	Sandstone	Sandstone: tan to red/brown, m-dgm, sub ang, mod sorted, calcareous, friable, fr intergranular por, ns	
8750	Shale	Shale: gray, green, red, silty, sandy	
8800	Limestone	Limestone: gray to tan, f.xln, v-sandy, sl chalky, fossiliferous, no vis por	
8850	Shale	Shale: gray, purple, red, sandy	
8900	Sandstone	Sandstone: lt green, lt, fr-coarse grm, sub md, mod sorted, calcareous, no vis por	
8950	Shale	Shale: gray, green, red, yellow	
9000	Sandstone	Sandstone: white, lt, md gm, sub md, mod sorted, sl calcareous, fr intergranular por	
9050	Shale	Shale: red, brown, silty, sandy	
9100	Limestone	Limestone: white to tan, f-mxln, v-chalky, sl cherty, sl oolitic, fossiliferous, pr interxn to foss por, lt sat stain, prsfo mostly on break, faint odor	RTD 4900 (-1520) 3:00am, 12/17/2018 Geologist off location at 5:00pm, 12/17/2018