



CONFIDENTIAL

**LEEDE OIL AND GAS, INCORPORATED
BARNES NO.1-31
NW SE SEC.31-T17S-R41W
KIOWA COUNTY, COLORADO**

**WELLSITE GEOLOGY
by
RSAY ENTERPRISES
RANDY SAY-INDEPENDENT GEOLOGIST
WHEAT RIDGE, COLORADO**

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WELL DATA

OPERATOR: Leede Oil and Gas, Inc., Denver, CO.
WELL NAME: Barnes NO.1-31.
FIELD NAME/PROSPECT: Wildcat- Jace Field Area.
LOCATION: 1920' fsl 1500' fel NW SE SEC.31-T17S-R41W,
Kiowa Co., CO.
ELEVATION: 3922'-Ground; 3932'-KB.
SPUD/COMPLETION: 11/23/91 / 12/2/91.
STATUS: Plugged and abandoned 12/3/91.
HOLE SIZE: 12.250"-378'-Surface; 7.825"-TD[5450'].
CASING: 8.625"-378'-Surface; No production casing run.
DRILL COLLARS/PIPE: 6.25"/4.50".
TOTAL DEPTH: 5450'(-1518')-Driller; 5448'(-1516')-Electric Log.
CONTRACTOR: Murfin Drilling Co., RIG NO.24, Wichita, KS.
GEOLOGIST: Randy Say-RSay Enterprises.
ENGINEER: Bud Shreves-Consultant, San Antonio, TX.
MUD COMPANY: Service Mud Company, Denver, CO.
MUD TYPE: NATIVE (SURFACE-4000'); GEL-CHEM {4000'-TD[5450']}.
MUDLOGGING: Hotwire manned by wellsite geologist.
DRILL STEM TEST: DST NO.1 5044'-5154'[110']-Morrow Sand Test.
CORE: None.

ELECTRIC LOGS: Halliburton Logging Services, Liberal, KS.
ENGINEER: Tim Gable.

LOGS RUN	INTERVAL
DIL-GR-SP	3450'-5442'
SLD-DSN-GR-CAL	3450'-5445'
BHC-SONIC-GR	378'-5439'

BIT RECORD

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NO	MAKE	TYPE	SIZE	DEPTH OUT	FOOTAGE	HOURS	FT/HR	DEVIATION/DEPTH
1	STC	FDS	12.250	378	378	4.57	82.71	0.75-257'
2	HTC	ATJ05	7.825	2658	2280	23.25	98.06	1.00-2464'
3	HTC	ATJ22	"	5450	2792	117.5	23.76	MISRUN-5450'

ELECTRIC LOG FORMATION AND ZONE TOPS

FORMATION/ZONE	DEPTH (FEET)	DATUM (KB-3932')
Fort Hays	700	+3232
Codell	780	+3152
Dakota	1214	+2718
Morrison	1656	+2276
PERMIAN	1838	+2094
Blaine	2060	+1872
Cedar Hills	2448	+1484
Stone Corral	2654	+1278
Stone Corral (BASE)	2682	+1250
Neva	3406	+ 526
Foraker	3478	+ 454
Virgil Stage(PENN)	3598	+ 334
Shawnee/Topeka	3876	+ 56
Lansing Kansas City	4162	- 230
Marmaton	4562	-630
-Pawnee Member	4632	-700
-Fort Scott Member	4690	-758
Cherokee	4716	- 784
Atoka	4864	- 932
Morrow Shale (SONIC)	5016	-1084
Morrow Shale (STRAT)	5024	-1092
Morrow SS V1	5041	-1109
Morrow SS V1-BASE	5051	-1119
Morrow SS V4	5080	-1148
Morrow SS V4-BASE	5088	-1156
Morrow SS V6	5124	-1192
Morrow SS V6-BASE	5144	-1212
Lower Morrow/KEYES	5156	-1224
MISS-St. Genevieve	5220	-1288
Spargen	5406	-1474
TOTAL DEPTH(DRILLER)	5450	-1518
TOTAL DEPTH(ELECTRIC LOG)	5448	-1516

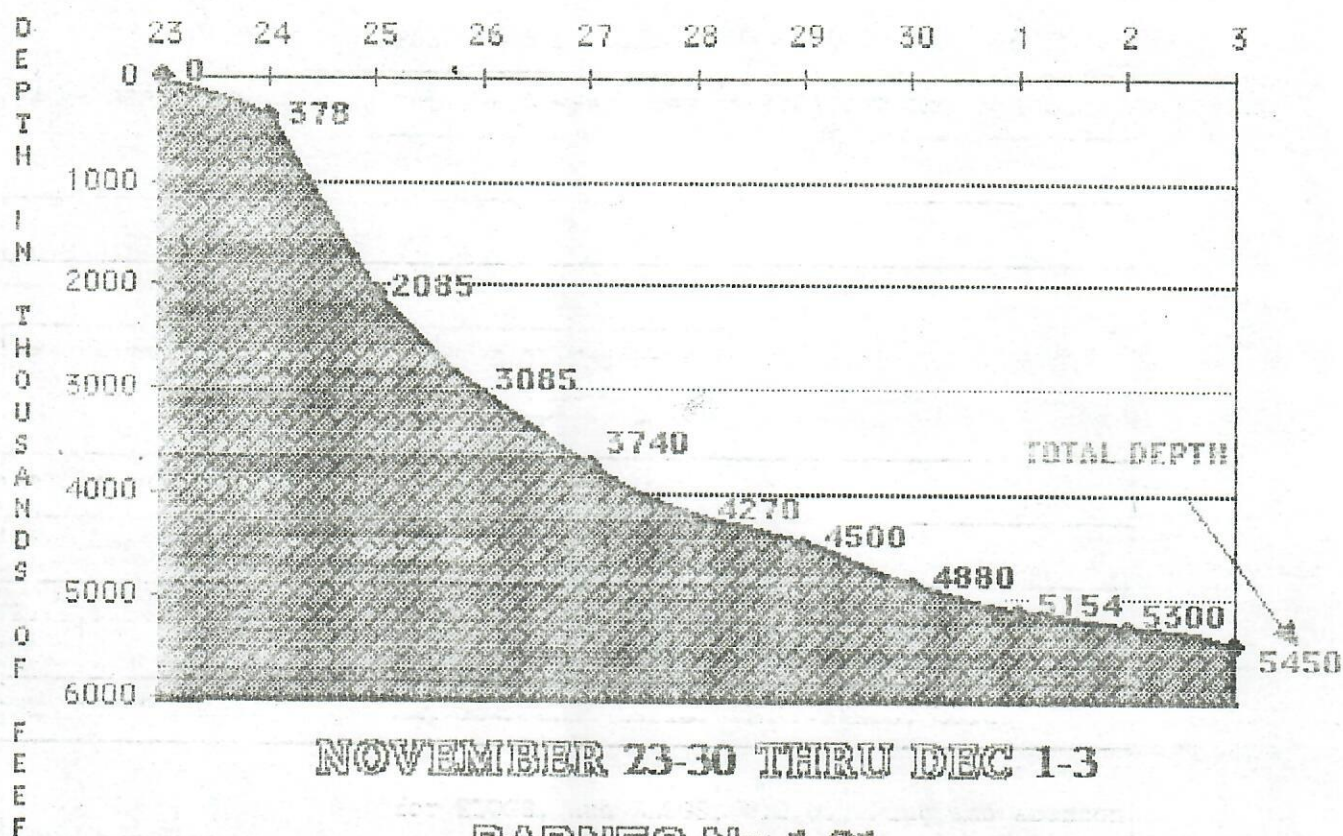
DAILY DRILLING CHRONOLOGY

DATE	DEPTH	24HR FOOTAGE	DRILLING ACTIVITIES
11/ 23	0000	0000	Rig up, Spud well w/NB1 [12.25"], Drlg Surf Hole to 378', Circ & Cond, TOOH for SURF CSG.
24	378	378	Run 8.625"-Surf csg to 378', CMT Csg, W.O.C.
25	2085	1707	Drlg cmt w/NB2[7.825"], Drlg, DS, Drlg.
26	3085	1000	Drlg, TOOH for NB3 @ 2658', TIH, Drlg.
27	3740	655	Drlg, DS, Drlg.
28	4270	30	Drlg, TOOH for hole in 2 drill collars-4340' TIH, Drlg to 4349', TOOH for hole in 1 pipe @ 4349', TIH, Drlg.
29	4500	230	Drlg, DS, Drlg.
30	4880	380	Drlg, CFS @ 5115', Resume Drlg.
12/1	5154	274	Drlg, CFS @ 5154', TIH for DST NO.1 [5044'-5154'], Run DST NO.1, TOOH w/DST NO.1.
2	5300	154	Lay down test tools, TIH w/rrNB3, Drlg.
3	5450	150	Drlg, Reach TD[5450'], Circ & Cond Hole, TOOH for ELOGS, Run ELOGS, W.O.O., Plug and abandon

MUD RECORD

DATE	DEPTH	WT	VIS	WL	pH	cK	CL	Ca	LCM #/BBL
23	0000	SPUD	WELL						
24	378	DRLG	WITH	NATIVE	MUD				
25	2085	DRLG	WITH	NATIVE	MUD				
26	3085	9.6	27	80+	7.5	N/C	64,000	1,760	0
27	3740	8.7	40	12.0	11.5	1	8,500	40	0
28	4270	9.1	40	12.4	10.0	1	10,000	40	0
29	4500	9.2	40	13.6	10.0	1	12,500	40	0
30	4880	9.1	49	8.8	10.0	1	9,000	40	1
12/1	5154	9.2	50	8.8	10.0	1	9,000	40	1
2	5450	9.1	51	9.6	10.0	1	10,500	40	2

DAILY DRILLING CHRONOLOGY



SUBJECT WELL		OFFSET/CONTROL WELL NO.1											OFFSET/CONTROL WELL NO.2			OFFSET/CONTROL WELL NO.3					
LEED9116 RSWSG 1991-16		Leede Oil And Gas, Inc. Barnes No. 1-31 1920'fsl 1500'fsl NW SE SEC.31-T17S-R42W Klowa Co., CO Wildcat-Jose Field-Area 12/3/91											Oxy U.S.A.; INC. Southard "A" No.1 1320'fsl 600'fsl W/2 NW SEC.6-T18S-R41W Klowa Co., CO 7/6/91 Jose Field			Amoco Production Company Moore Johnson No.1 330'fsl 3383'fsl NE NW SEC.14-T18S-R43W Greeley Co., KS 9/19/89 Moore-Johnson FLD-DISC			1u1l Drilling Co., Inc. No.1 Lamb SE SW SE SEC 19-T17S-R42W Klowa Co., CO 12/22/89 Wildcat		
TIME STRAT	ROCK STRATIGRAPHIC	PROG	SMPL	DATUM-KB	ELOG	1ST RUN	FLOG	TVD RUN	THICK	ELEV	DIFF.	DIFF.	E-LOG	DATUM-KB	THICK	E-LOG	DATUM-KB	THICK	E-LOG	DATUM-KB	THICK
							3932		3932	NO.1	NO.2	NO.3		3941			3899			4007	
CRETACEOUS	NEOGENE LOESS																				
	FORT HAYS																				
	CODELL						700	3232					682	3259		626	3273				
	DAKOTA						780	3152													
JURASSIC	MORRISON						1214	2718					1200	2741		1156	2743				
PERMIAN	PERMIAN						1656	2276					1542	2399		1520	2379				
	DAY CREEK						1838	2094								1726	2173				
	BLAINE						1986	1946													
	CFDAR HILLS						2060	1872					2038	1903		1954	1945				
	STONE CORRAL						2448	1484					2424	1517		2370	1529				
	STONE CORRAL (BASE)	2690					2654	1278		28			2600	1341		2594	1305				
	NEVA						2682	1250					2670	1271		2616	1283				
	FORAKER						3105	526					3390	551		3358	511				
PENNSYLVANIAN	VIROIL (STAGE)						3478	454								3430	469				
	SHAWNEE/TOPEKA	3870					3598	334								3582	317				
	HEEBNER SHALE						3876	56								3864	35				
	TORONTO LIMESTONE						4098	-166								4047	-148				
	LANSING KANSAS CITY	4560					4122	-190													
	MARMATON						4162	-230					4150	-209		4140	-241				
	-PAWNEE MEMBER						4562	-630					4550	-609		4582	-683	4518	-511		
	-FORT SCOTT MEMBER						4632	-700								4612	-713				
	CHEROKEE						4690	-758								4674	-775				
	ATOKA	4880					4716	-784								4698	-799				
	MORROW SHALE (SONIC)						4864	-932					4860	-919		4947	-1048	4830	-823		
	MORROW SHALE (STRAT)	5055					5016	-1081								5036	-1137				
	MORROW SS V1						5024	-1092	132				5034	-1093	116	5048	-1149	120	5004	-997	136
	MORROW SS V1-BASE						5041	-1109	110							5046	-1149				
	MORROW SS V4						5051	-1119													
	MORROW SS V4-BASE						5080	-1148	8												
	MORROW SS V6						5088	-1156													
	MORROW SS V6-BASE						5124	-1192	20			45				5136	-1237	28			
	LOWER MORROW/KEYES	5180					5144	-1212				53				5164	-1265				
MISSISSIPPIAN	ST. GENEVIEVE	5235					5156	-1224		-15	45	-91	5150	-1209		5168	-1269		5140	-1133	
	SPEOEN	5420					5220	-1288								5216	-1317				
	TOTAL DEPTH (DRILLER)	5470					5406	-1474											5380	-1373	
	TOTAL DEPTH (STRAP)						5450	-1518					5340	-1399		5290	-1391		5441	-1434	
	TOTAL DEPTH (ELECTRIC LOG)												5338	-1397		5297	-1398		5435	-1428	

SHOW EVALUATION

The Leede Oil and Gas, Inc. Barnes No.1-31 [NW SE SEC.31-T17S-R42W, Kiowa Co., CO was drilled as a wildcat well in the Jace Field Area of the Las Animas Arch. Three Morrow sands developed in the Barnes NO.1-31, an UPPER V1 SAND, a Middle V4 SAND, and a LOWER V6 SAND. The V1 SAND developed from 5041'(-1109') to 5051'(-1119') [10' Thick], the V4 SAND from 5080'(-1148') to 5088'(-1156') [8' Thick], and the V6 SAND from 5124'(-1192') to 5144'(-1212') [20' Thick], for a total of 38 feet of sand development in the Morrow section. No sample shows were found in any of the sands [no fluorescence and cut] and electric logs showed all three to be wet zones. Also a conventional test, Drill Stem Test NO.1 [5044'-5154', See Page No.9] was run and recovered 2064 of fluid [190'-Drilling mud, 60' Water, and 1804' of Salt Water]. No oil or gas was recovered in the Drill Stem Test, confirming the sample/electric log interpretation. The other potentially productive horizons, the Pennsylvanian and Mississippian carbonate zones [See SHOWS NO.1-3] listed below] did not warrant testing after sample and electric logs were evaluated and the Barnes NO.1-31 was plugged and abandoned on 12/3/91.

It should be noted that the wellsite geologist misinterpreted the Morrow Shale(STRAT) top [5062'-Sample versus 5024'-Electric Log]. The UPPER Sand, the Morrow V1 SAND was interpreted in the samples to be a sandy zone within the lower Atoka section, which often is observed in cuttings. The V1 SAND was a very to fine grained, dirty sand with no sample shows. Also, the amount of sand percentage in the samples from that interval was low [less than 5%]. Fortunately, the Drill Stem Test interval [DST NO.1 5044'-5154'] enclosed all three sands [V1, V4, and V6] and included the V1 SAND zone in the test.

The UPPER V1 SAND [5041'(-1109') to 5051'(-1119') 10'-THICK] was predominately a very fine to fine grained, dirty and shaley sand, with good porosity in the lower finer grained section of the sand. No hydrocarbon shows were observed in either samples, gas detector, nor in DST NO.1. The sand did develop a fairly clean, porous [16% porosity [SS MATRIX=2.65] in the zone 5044'-5050' and holds potential for a hydrocarbon reservoir. For a more detailed description, see MORROW V1 SAND description listed below.

The MIDDLE V4 SAND [5080'(-1148') to 5088'(-1156') 8'THICK] was a fine to very grained sand with a trace of unconsolidated medium grains toward the base of the zone. The V4 SAND had a dirty matrix with abundant shale partings and kaolinitic clay coatings on most of the grains. The porosity of the V4 was mostly fair 12-14% with some good porosity [18-20%] developing when the sand was clean. No shows of hydrocarbons were observed either in samples, gas detector, nor from DST NO.1. For a more detailed description, see MORROW V4 SAND description listed below.

SHOW EVALUATION

The primary objective in the Barnes NO.1-31, the LOWER V6 SAND [5124'(-1192') to 5144'(-1212') 20' THICK] also was a wet zone as were the sands above it, the V1 and V4 SANDS. The samples did not have any trace of fluorescence nor cut even after several hours of intensive scrutiny. DST NO.1 did not recovery any gas or oil, confirming the sample and electric log interpretation of the V6 SAND as a wet zone. Although no gas was recovered from DST NO.1, a small gas increase was recorded while drilling the zone, 14 units versus an 8 unit background gas. This minor gas increase was probably due to the presence of coal at the top of the V6 SAND horizon and highly carbonaceous shales both above the sand and as shale partings within the sand itself. The V6 SAND generally was a fining upward sequence with the coarse to medium grained fraction at the basal zone and grading upward to a fine grained upper zone. Note that in the detailed V6 SAND description listed below the interval is separated into UPPER, MIDDLE, and BASAL ZONES based mostly on grain size. The V6 SAND averaged 70 percent unconsolidated sand to 30 percent clusters and was feldspathic with an increase in siliceous cement and quartz overgrowths with depth. Some very finely disseminated pyrite and shale partings were observed throughout the V6 SAND. The porosity overall was fair to good [in the 8-14 percent range-using a 2.65 SS MATRIX] and decreasing with the amount of cementation and shale partings. A very rare trace of dead oil coating was observed on some grains, although there were no indications of any other type of oil shows in the V6 SAND samples. For a more detailed description, see MORROW V6 SAND description listed below.

Structurally, the Barnes NO.1-31 [NW SE SEC.31] was 1 foot high [at the top of the Morrow Shale(STRAT) {5024'(-1092')}]] to the nearest offset/control well, the OXY USA Southard "A" NO.1 [W/2 NW SEC.6-T18S-R41W{5034'(-1093')}]] and 15 feet low at the top of the Lower Morrow. The thickness of the MORROW Section in the Barnes No.1-31 is 132 feet.

The other potentially productive zones, the Pennsylvanian Topeka, Lansing Kansas City, Marmaton, and the Mississippian St. Geneveive developed three other shows [SHOWS NO.1-3]. For a detailed show evaluation, see below. None of these shows warranted testing after electric logs and sample shows were evaluated.

After electric logs were evaluated in conjunction with the sample examination and Drill Stem Test NO.1, the decision was made to plug and abandon the Barnes No.1-31 on 12/3/91.

LANSING KANSAS CITY 4162'(-230').

SHOW NO.1 4290'-4310'(20')(-358').

LITHOLOGY:LS mot ltan-bf xfxl-gran vfri-firm mfos w/chk mtrx & occ calc infilling(incr w/depth); occ slty & dolo; slpyr & shly.

POROSITY: FR-P(decr due to chk & calc infill-oomold).

OIL STAIN:None.

FLOR: 10% mot pale yel.

CUT: 10% slow mlky crush cut.

RESIDUE: None.

SHOW EVALUATION

LANSING KANSAS CITY 4162'(-230').

SHOW NO.2 4546'-4556'(10')(-614').

LITHOLOGY:LS mgy-tan litho fri arg & chky mfos w/occ tr ool slpyr
occ dolo.

POROSITY: FR-occ P(oomold).

OIL STAIN:None.

FLOR: Tr pale yel.

CUT: Tr slow diffuse residual cut.

RESIDUE: None.

MARMATON 4562'(-630').

SHOW NO.3 4566'-4576'(10')(-634').

LITHOLOGY:LS mot tan & brn-ltgy xfxl-gran vfri-mfirm slfos mdolo w/suc
text occ slpyr occ scat carb mat in mtrx.

POROSITY: FR-occ G(intergran-occ oocastic).

OIL STAIN:Occ trace of dead oil stn in mtrx.

FLOR: 10% myel.

CUT: 10% immed slow mlky diffuse strm cut.

RESIDUE: Pale yel flor res.

MORROW SHALE(STRAT) 5024'(-1092').

MORROW V1 SAND 5041'(-1109') to 5051'(-1119') 10' THICK.

LITHOLOGY:SS wh-ltgy; f-vfg; fri-firm; pred clus w/uncon grs scat; sbrd;
wsrt; cal cmt w/occ trace silcmted clus; MTRX(very dirty w/
carb mat, cly, tr glau gra, occ mica flaks); occ tr pyr; SS is
intbd w/SLTST & thin slty LS strgs @ top of zone & is incr
cln w/depth(fg); occ abnt pyr fos casts in smpls.

POROSITY: G-P(decr from calc cmt & mtrx mat).

OIL STAIN:None.

FLOR: None.

CUT: None.

RESIDUE: None.

MORROW V4 SAND 5080'(-1148') to 5088'(-1156') 8' THICK.

LITHOLOGY:SS wh-ltgy-occ trans grs; f-vfg w/tr mg as pred loosely cmted
clus & uncon grs; fri-mfirm; sbrd; msrt; calc & silcmt; occ
tr sbang qtz ovrghs; MTRX(dirty-carb mat & assoc sh prtgs,
kao cly coatings, & occ pyr cmt)l; Ss is occ intbd w/SLTST &
LS strgs; occ tr pyr fos casts.

POROSITY: FR-occ G(decr w/cmt & mtrx mat).

OIL STAIN:None.

FLOR: None.

CUT: None.

RESIDUE: None.

SHOW EVALUATION

MORROW V6 [LOWER] SAND 5124'(-1192') to 5144'(-1212') 20'-THICK.
MORROW SHALE(STRAT) 5024'(-1092').

V6 SAND-UPPER ZONE 5124'(-1192') TO 5132'(-1200') 8'-THICK.
DRILL RATE:0.5'/ft vs 2.5'/ft; GAS:8 UNITS BEFORE/14 DURING/12 AFTER.

LITHOLOGY:SS trans-wh-occ pale pink/yel(felds);fg-lmg; 95%-uncon/5% clus
 modrd-sbrd; msrt; pred silcmt(very loosely cmted), occ dolo
 cmted clus; MTRX(pred cln w/kao cly ctgs, occ carb mat &
 SH prtgs @ top of zone(gy-gybrn), vf dissem pyr as thin
 microxl coatings on grs [NOTE: abnt hd dns ang xline pyr
 in smpls]; tr poorly dev qtz ovrghs w/assoc dolo cmted
 clus; rare trace scat glau grs @ top zone on fg clus.

POROSITY: EX-G when cln mtrx, decr w/cmted clus.

OIL STAIN:No visible "live", only a rare trace as coatings on grs.

FLOR: None.

CUT: None.

RESIDUE: None.

V6 SAND MIDDLE ZONE 5132'(-1200') to 5140'(-1208') 8'-THICK.
DRILL RATE:0.5-1.0'/ft vs 2.5'/ft; GAS:14 UNITS-BEFORE/12-DURING/11-AFTER

LITHOLOGY:SS wh-trans-incr pale pink/yel(felds); pred mg w/fg & tr cg;
 80%-uncon/ 20%-clus; pred sbrd-incr amt sbang-occ ang; m-
 occ psrt; pred silcmt w/tr qtz ovrghs & assoc dolo cmted
 clus; MTRX(mod-vcln w/kao cly coatings on grs, tr scat carb
 mat(decr evid of SH prtgs), occ xline pyr ctgs on grs aa w/
 tr vf dissem pyr w/in grains; abnt xline pyr in smpls.

POROSITY: G-EX(cln mtrx & none cmted sand) decr w/cmted clus.

OIL STAIN:No "live" oil visible, trace dead bk oil stn coatings on grs.

FLOR: None.

CUT: None.

RESIDUE: None.

V6 SAND BASAL ZONE 5140'(-1208') to 5144'(-1212') 4' THICK.
DRILL RATE:1-1.5'/ft vs 2.5'/ft; GAS= 11 U-BEFORE; 10 U-DURING/AFTER.

LITHOLOGY:SS wh-trans-incr pale pink/yel(incr felds); pred mg-cg w/occ
 tr fg clus; 70%-uncon/30%-clus; sbrd-incr sbang & ang; m-
 psrt; silcmt w/incr abnt qtz ovrghs & assoc dolo cmted
 clus; occ xline pyr coatings on grs aa w/tr vf dissem pyr
 & occ as pyr cmt w/in grains; MTRX(mod cln to incr dirty
 w/depth w/kao cly ctgs incr & as ø infilling, incr amt carb
 mat & SH prtgs toward base of zone(SH-gybrn-occ mgy); occ
 tr LS clasts w/in mtrx of larger clus.

POROSITY: G-incr FR-occ Tight w/depth due to incr dirty mtrx & cement.

OIL STAIN:No "live" oil, rare trace of bk dead oil stn coatings on grs.

FLOR: None.

CUT: None.

RESIDUE: None.

• DRILL STEM TEST

DST NO.1 5044'-5154'(110')-Conventional Test, Morrow V1-V6 Sands.
Trilobite Testing Co., Hays, KS.

TIMES: 10 60 60 120

IO: 10 MIN-Open with strong blow off bottom of bucket in 3 minutes.

ISI:60 MIN- Bled through 2", No blow back on shut in.

FO: 60 MIN-Strong blow off bottom of bucket in 5 minutes.

FSI:120 MIN-No blow back on shut in.

RECOVERY: TOTAL PIPE RECOVERY= 2064'; NOTE: No trace of oil or gas.
190'-Drilling mud [100%-MUD]; 60'-Water Cut Mud [50%-WATER/
[50%-MUD]; 1804'-Salt Water [100%-Water].

Rw=0.09 @ 68 F; CL=53,000ppm.

PRESSURES: IHP=2475; IFP=277-322; ISIP=1024; FFP=Tool plugged on both
both final flow and shut in; FHP=2408. BHT=140 F.

LITHOLOGY

3800-3840 SH ltgy-occ mar/gy mot sft plty arg slcarb mcalc w/LS ltan-crm litho-xfxl fri mchky & slty ϕ -p nsfoc.

3840-3876 SH aa w/intbd LS incr slty & occ fos ϕ -p nsfoc, occ tr pyr.

SHAWNEE/TOPEKA 3876'(+56').

3876-3920 SH mot mgy-occ pale ten & mar vvsft blk arg slsly w/LS ltgy-tan xfxl-incr gran fri slsly & slfos vchky pyr ϕ -p-vtt nsfoc.

3920-4000 SH aa w/intbd LS strgs mot m-ltgy xfxl-gran fri-firm mfos w/chk mtrx ϕ -p nsfoc and occ tr pyr & calc.

4000-4050 SH bk-ltgy-occ mgy sft-firm blk arg mcarb slcalc w/LS aa.

4050-4098 SH aa incr carb slcalc w/LS strgs intbd and tr pyr.

HEEBNER SHALE 4098'(-166').

4098-4122 SH m-incr dkgy sft blk arg & occ fis slcalc w/LS mot tan-mgy slfos chky ϕ -p nsfoc.

TORONTO LIMESTONE 4122'(-190').

4122-4162 LS mot tan-occ brn & mgy xfxl-occ microxl firm-mfri mfos w/chk mtrx sldolo ϕ -p-fr nsfoc w/SH aa.

LANSING KANSAS CITY 4162'(-230').

4162-4210 LS mot gy-tan litho fri vvfos w/vchky mtrx occ slty ϕ -fr-occ g(oomold) nsfoc w/intbd SH m-dkgy sft vcarb.

4210-4260 LS tan-brn & ltgy litho-xfxl firm mfos w/calc infill slpyr & occ dolo shly ϕ -p-occ fr nsfoc w/SH strgs aa intbd, tr pyr.

4260-4290 LS aa incr fos nsfoc w/SH bk-ltgy-gybrn sft plty arg vvcarb slcalc, trpyr & occ calc.

4290-4310 SHOW NO.1 LS mot ltgy-bf xfxl-gran vfri-firm mfos w/chk mtrx & occ calc infill occ dolo ϕ -FR-P; OILSTN=None; FLOR-10% mot pale yel; CUT-10% slow mlky crush cut; RES=None.

4310-4370 LS mot brn-ltgy-rare tan xfxl-occ microxl firm-mfri arg & vv-chky dolo & gran ϕ -fr-occ p nsfoc w/SH bk-ltgy sft plty-blky arg vvcarb slcalc.

4370-4420 LS aa incr slty & occ tr ool text ϕ -p-occ fr nsfoc w/SH strgs aa, tr pyr & occ calc.

4420-4450 LS mgy-bf litho-gran fri-mfirm sldolo occ slty & mfos w/chk mtrx ϕ -FR-occ p nsfoc w/SH bk-ltgy sft vcarb, tr pyr.

LITHOLOGY

4450-4490 LS mot mgy-bf litho vfri chky slpyr ϕ -p nsfoc w/SH bk-ltgy-occ pale mar & tan slcalc carb, tr pyr & calc.

4490-4546 LS aa occ dolo strgs intbd ϕ -p nsfoc w/SH bk-ltgy-occ gybrn sft plty arg vcarb slsly & occ mica, tr pyr occ tr cht.

4546-4556 SHOW NO.2 LS mgy-tan litho fri arg & chky mfos w/occ tr ool slpyr occ dolo; ϕ -Fr-occ P; OILSTN-None; FLOR-Tr pale yel; CUT-Tr slow diffuse residual cut; RES-None.

4556-4562 LS mot tan-mgy & occ brn litho-xfxl firm-fri vfos w/chky mtrx slsly pyr occ dolo ϕ -p-occ fr nsfoc w/SH strgs bk-gybrn sft plty-blky arg vcarb slcalc, tr pyr & cht.

MARMATON 4562'(-630').

4562-4576. SHOW NO.3 LS mot tan & brn-ltgy xfxl-gran vfri-mfirm slfos mdolo w/suc text occ slpyr occ carb mat in mtrx; ϕ -FR-occ G; OILSTN-occ tr dead oil stn, no "live" oil; FLOR-10% myel; CUT-10% immed slow mlky diffuse strm cut; RES-pale flor yel.

4576-4610 LS aa incr dolo & occ fos w/intbd dolo strgs & carb mat slpyr ϕ -FR nsfoc w/SH strgs intbd, tr cht & pyr.

4610-4632 LS aa nsfoc w/intbd SH mot mgy-bk & occ ltgy sft blky-plty arg & vcarb slmica, tr cht & pyr.

PAWNEE MEMBER 4632'(-700').

4632-4690 LS tan-mgy xfxl-litho fri-mfirm & mfirm fos w/calc infill & occ dolo strgs shly ϕ -p-tt nsfoc w/SH aa, tr pyr & cht.

FORT SCOTT MEMBER 4690'(-758').

4690-4716 LS mot lt-dkgy & bf microxl-xfxl firm-occ vfos w/calc infill sldolo pyr occ carb ϕ -p-tt nsfoc w/intbd DOL & SH strgs.

CHEROKEE 4716'(-784').

4716-4760 SH incr mot gybrn-bk-dkgy sft blky-plty occ slfis arg vcarb occ mica slcalc w/DOL & LS aa, tr cht & pyr.

4760-4800 LS mot tan-ltgy-gybrn xfxl-litho firm-fri mfos w/calc infill occ chky slty dolo ϕ -tt nsfoc w/SH aa, tr pyr 7 cht.

4800-4864 LS tan-occ dkgy-gybrn microxl-litho firm-mfri arg slpyr & dolo w/shly strgs intbd ϕ -p-occ t nsfoc w/SH bk-ltgy-gybrn sft vcarb slmica, tr pyr.

LITHOLOGY

ATOKA 4864'(-932').

4864-4920 LS mot tan-brn microxl-litho incr vfos w/calc infill slpyr
occ calc xls w/in LS and DOL strgs; w/SH bk-gybrn sft carb,
slcalc, tr pyr & cht.

4920-4970 LS aa incr fos & occ pyr w/intbd DOL tan-gy pred gran w/SH
strgs aa, tr cht & pyr.

4970-5016 LS brn-ltgy-occ dkgy microxl-xfxl mfirm vfos w/calc infill
slpyr & dolo slcarb w/SH bk-ltgy sft plty-blky vcarb slcalc.

MORROW SHALE(SONIC) 5016'(-1084').

5016-5024 SH dkgy & tan firm plty occ fis vcarb slmica & incr amt sltst
& uncon qtz grs, no SS dev, incr abnt pyr.

MORROW SHALE(STRAT) 5024'(-1092').

5024-5041 SH bk-incr dkgy & tan firm plty occ fis vcarb slmica & w/incr
amt intbd sltst & occ scat qtz grs w/thin LS strgs, abnt pyr.

MORROW V1 SAND 5041'(-1109').

5041-5051 V1 SS wh-ltgy f-vfg fri-firm pred clus w/scat uncon grs sbrd
wsrt; calc cmt w/occ tr silcmted clus; MTRX(very dirty w/carb
mat, cly, tr glau grs, occ mica flaks); occ tr pyr; intbd w/
sltst & ls strgs; ϕ -G-P; OILSTN-None; FLOR-None; CUT-None.

5051-5080 SH mot bk-dkgy-pale tan/gy sft plty occ fis & splin vcarb
firm-sft; slty slmica pyr w/intbd sltst & ls strgs and occ
tr thin strgs slty vfg ss no shows or ϕ dev, abnt pyr.

MORROW V4 SAND 5080'(-1148').

5080-5088 V4 SS wh-ltgy-oc trans f-vfg w/tr mg as pred loosely cmted
clus; fri-mfirm sbrd; msrt; calc & silcmt occ tr shang qtz
ovrgths; MTRX(dirty carb mat & sh prtgs, kao cly ctgs, pyr
cmt; intbd w/sltst strgs; ϕ -Fr-occ G(when cln); OILSTN-None;
FLOR-None; CUT-None.

5088-5124 SH mot m-dkgy-incr gygn sft plty fis arg & vcarb slty w/intbd
sltst strgs occ fos & vpyr w/intbd thin ls strgs and occ thin
SS strgs; abnt pyr as fos casts and tr coal.

MORROW V6 SAND 5124'(-1192').

5124-5144 V6 SS trans-wh-occ pale pink/yel fg-incr m-cg(base); pred
uncon w/incr cmted clus w/depth; sbrd-shang; silcmt w/qtz
ovrgths and dolo cmted clus; occ sh prtgs; ϕ -EX-G(top) decr
to P-TT(base); OILSTN-tr dead bk oilstn; FLOR-None; CUT-None.

LITHOLOGY

5144-5156 SH mot bk-ltgy-bf-oec gygn sft plty-splin fis arg & vvcarb
slty pyr w/incr amt LS crm-lttan & ltgy litho-occ xfxl fos
& incr chky; abnt pyr.

LOWER MORROW/KEYES 5156'(-1224').

5156-5220 LS tan-occ dkgy & bf xfl-litho firm-mfri incr mfos w/chk mtrx
occ sldolo & pyr ø-p-tt nsfoc w/SH aa incr gybrn-mgy-bk sft
carb slty slpyr, incr abnt pyr & tr cht.

MISSISSIPPIAN ST. GENEVEIEVE 5220'(-1288').

5220-5260 LS tan-gy-occ brn litho-incr microxl firm-mfri vfos & occ ool
text w/chk mtrx occ calc infill w/intbd dolo strgs ø-p-occ fr
nsfoc w/intbd SH strgs aa, incr abnt pyr & tr cht.

5260-5290 LS aa incr vchky & vfos w/occ intbd dolo strgs LS ø-p-tt nsfoc
w/intbd SH strgs bk-gybrn-occ tan firm-sft plty-blky arg carb
slcalc, abnt pyr tr cht.

5290-5330 LS mot brn & tan microxl incr mhd dns-firm mfos w/calc infill
pyr & occ carb w/DOL strgs w/LS and SH bk-gybrn-tan firm-sft
vvcarb slty slcalc, tr cht & pyr.

5330-5380 LS aa incr vfos w/vchky mtrx slpyr & intbd DOL & SH strgs abnt
pyr tr cht.

5380-5406 LS tan-mgy-brn microxl-xfxl firm mfos w/calc infill & vf
dissem pyr w/intbd sh & dolo strgs aa, abnt pyr & cht.

SPERGEN 5406'(-1474').

5406-5420 DOL mot brn-mgy-occ tan/gy pred gran & xfxl fri-mfirm varg &
lmy w/intbd LS strgs tan-ltcrm xfxl m-vfos vchky slpyr occ
dolo ø-p-tt nsfoc; occ sh strgs intbd; tr cht & pyr.

5420-5450 DOL bf-lttan & gy pred gran-xfxl fri-firm suc text w/LS aa
intbd fri-firm fos vchky w/SH strgs bk-dkgybrn sft carb;
LS/DOL ø-p-vtt nsfoc; abnt pyr tr cht.

TOTAL DEPTH 5450'(-1518').
