

**WELL HISTORY**  
**ENSIGN OPERATING COMPANY**  
**NO. 1-3 KOEHN**  
**C N/2 SW SEC. 3, T32S, R30W**  
**MEADE COUNTY, KANSAS**

**BY**  
**DUANE E. MOREDOCK**  
**CONSULTING GEOLOGIST**

## TABLE OF CONTENTS

<b>SYNOPSIS</b>	<b>1</b>
<b>GENERAL WELL INFORMATION</b>	<b>2</b>
<b>DAILY DRILLING REPORT</b>	<b>5</b>
<b>WIRE LINE GEOPHYSICAL LOG FORMATION TOPS</b>	<b>6</b>
<b>LITHOLOGIC SAMPLE DESCRIPTIONS</b>	<b>8</b>
<b>SUMMARY</b>	<b>35</b>
<b>STRIP LOG (WITH DRILL TIME, LITHOLOGY AND HOT WIRE MEASUREMENTS)</b>	<b>ATTACHED</b>

## SYNOPSIS

The Ensign Operating Co. No. 1-3 Koehn C N/2, SW Sec. 3, T32S, R33W, Meade County, Kansas was a 6150 foot well to evaluate the Jaguar Prospect. The main objective of the well was to evaluate the Pennsylvanian Morrow sandstones for commercial oil production. Secondary objectives were the evaluations of the Chester sandstones, and Mississippian Ste. Genevieve limestones for commercial oil production. Another objective was to evaluate any significant oil and gas shows encountered while drilling the well to total depth.

The expected sandstones in the Morrow that produce oil and gas in this area were not present. Shows in the Morrow and Chester were drill-stem tested. This test recovered drilling mud with low pressures. A log anomaly with a corresponding mud gas detector show in the Mississippian Ste. Genevieve was drill-stem tested after logging the well. This test also recovered drilling mud.

The uppermost 90 feet of the Mississippian Ste. Genevieve had brown asphaltic staining. The stained samples had a dull yellow fluorescence and a good cut. There was no visible porosity in the lithologic samples. It is not uncommon to have a few feet or a few pieces of asphaltic staining in the Ste. Genevieve limestones. The amount of limestone with staining and the thickness of the limestone with asphaltic staining is unusual. This may represent a truncation of an oil reservoir at the Mississippian-Pennsylvanian Unconformity. The asphaltic staining would represent the weathered residual oil saturation of the reservoir. This asphaltic staining interval was included in the second drill-stem test.

After an evaluation of the lithologic samples, drill-stem test data and bore hole geophysical logs, it was determined that the well was not capable of oil and gas production from the formations in the Pennsylvanian and Mississippian. The well was plugged and abandoned on February 17, 1995.

## GENERAL WELL INFORMATION

**Operator:** Ensign Operating Co.

**Well Name:** No. 1-3 Koehn      API No. 15-119-20 943

**Prospect:** Jaguar Prospect

**Location:** C N/2 SW Sec. 3, T32S, R30W, 1980' FSL, 1320' FWL

**County:** Meade

**State:** Kansas

**Elevation:** G.L. 2758' K.B. 2770'

**Spudded:** February 2, 1995 @ 9:45 A.M..

**Completed Drilling:** February 14, 1995 @ 7:10 P.M..

**Total Depth:** Driller 6150', Logger 6137'

**Status:** Plug and Abandon

**Drill-Stem Tests:** Drill-Stem Test No. 1 5562'-5703', Pennsylvanian Morrow. Open hole test.

30-60-60-120

I.O. Surface Blow, Steady throughout, no increase.  
F.O. Surface Blow, Steady throughout, no increase.

Recovery: 15' Mud.

Hydrostatic Pressures 2592-2524 psi, Calc. MW 9.1 ppg  
Flow Pressures 44-44:44-44 psi  
Shut-in Pressures 100-89 psi  
Bottom Hole Temperature NR

Trilobite Testing Co., L.L.C., Shane McBride, Tester

Drill-Stem Test No. 2 5886'-5994' (Driller) 5872'-5980' (Logger),  
Mississippian Ste. Genevieve. Straddle test after logging.

30-60-30-120

I.O. Surface Blow, Built to 1 1/4".

F.O. Bubbled when tool opened, no blow. Tool was plugging (bottom  
choke or shut-in tool) during F.O. .

Recovery: 92' Mud.

Sampler: 4000 Ml Mud @ <25 psi

Hydrostatic Pressures 2883-2756 psi, Calc MW 9.3 ppg

Flow Pressures 86-107:269-269 psi

Shut-in Pressures 1594-1721 psi

Bottom Hole Temperature 124° F

Trilobite Testing Co., L.L.C., Shane McBride, Tester

**Logging Program:**

Run One

AIS/SP/GR 0' - 3276'

CNS/PDS/GR/Cal 1590' - 3249'

MLS/GR/Cal 1590' - 3249'

Run Two

AIS/SP/GR 0' - 6136'

CNS/PDS/GR/Cal 0' - 6110'

MLS/GR/Cal 1590' - 6110'

BCA/GR/Cal 1595' - 6093'

BPB Logging Co., Inc., Tim Hayes, Engineer.

**Sample Program:**

Ten foot samples from 2500' - 6150'. Samples were examined and  
described at the well site. Samples were caught on depth intervals by rig  
crews. Samples were lagged by geologist. All depths reported herein are  
lagged depths.

**Mud Logging:**

Holmes Gas Detector Service, Unmanned Unit.

**Mud Program:**

Cimмерon Mud Co., Jim Reed, Engineer.

**Lost Circulation:**

None.

**Contractor:** Duke Drilling Co., Rig No. 6, Dusty Brinkley, Toolpusher.

<b><u>Bit Record:</u></b>	No.	Size	Make	Type	Depth Out	Feet	Hours
	1	12.25	STC	DTJR	1602'	1602'	28.75
	2	7.875	HTC	O5C	5703'	4101'	138.50
	3	7.875	Ver	S88F	6150'	447'	37.75

Total Rotating Hours 205, Average 30.0 Ft/Hr

**Deviation Record:**

1/2°	@ 663'
3/4°	@ 1602'
3/4°	@ 2157'
3/4°	@ 2622'
3/4°	@ 3300'
1 1/2°	@ 5145'
1 1/2°	@ 5703'
1°	@ 6150'

## DAILY DRILLING REPORT

Ensign Operating Co.  
No. 1-3 Koehn  
C N/2 SW Sec. 3, T32S, R30W  
Meade County, Kansas

### 7:00 A.M. Reports

1	Feb.	2	0' (0') Rig up rotary tools. Spud @ 9:45 A.M..
2	Fri	3	1000' (1000')
3	Sat	4	1602' (602') Set 8 5/8" @ 1599', Plug Down @ 2:45 A.M.
4	Sun	5	2330' (728') Drill Plug @ 3:45 P.M.
5	Mon	6	3125' (795')
6	Tue	7	3575' (450') Logged well @ 3300'.
7	Wed	8	4070' (495')
8	Thur	9	4590' (520')
9	Fri	10	5060' (470')
10	Sat	11	5410' (350')
11	Sun	12	5703' (293') DST No. 1 5562'-5703'.
12	Mon	13	5795' (92')
13	Tue	14	6025' (230')
14	Wed	15	6150' (125') Logging
15	Thur	16	6150' (0') DST No 2 5872'-5980' Log, 5886'-5994'; Drlr.
16	Fri	17	6150' (0') Plug and Abandon.

## FORMATION TOPS

Ensign Operating Co.  
No. 1-3 Koehn  
C N/2 SW Sec. 3, T32S, R30W  
Meade County, Kansas

G.L. 2758' K.B. 2770'	Comparison Well SWSW 28-31S-30W K.B. 2763'	Drill Time And Samples	Wire Line Logs
Tertiary	Surface +2755'	Surface +2758'	Surface +2758'
Cretaceous	514' +2249'	512' +2258'	504' +2266'
Permian			
Glaudalupian			
Taologa	583' +2180'	543' +2227'	530' +2240'
Day Creek	758' +2005'	755' +2015'	747' +2023'
Leonardian			
Nipewalla Gr.			
Blaine	988' +1775'	966' +1804'	962' +1808'
Cedar Hills	1128' +1635'	1153' +1617'	1156' +1614'
Sumner Gr.			
Stone Corral	1612' +1151'	1645' +1125'	1642' +1128'
Ninnescah	1700' +1063'	1728' +1042'	1744' +1026'
Wellington	1926' +837'	1985' +785'	1976' +794'
Hutchinson	2154' +609'	2215' +565'	2204' +566'
Wolfcampian			
Chase Gr.			
Herington	2624' +139'	2710' +60'	2700' +70'
Kridler	2646' +117'	2741' +29'	2729' +41'
Winfield	2732' +31'	2826' -56'	2812' -42'
Towanda	2770' -7'	2869' -99'	2858' -88'
Fort Riley	2842' -79'	2946' -176'	2934' -164'
Wreford	2942' -179'	3044' -274'	3034' -264'
Council Grove Gr.	3038' -275'	3146' -376'	3133' -363'
Neva	3189' -426'	3302' -532'	3291' -521'
Pennsylvanian			
Virgilian			
Wabaunsee Gr.	3538' -775'	3676' -906'	3661' -891'
Shawnee Gr.			
Topeka	3854' -1091'	3928' -1158'	3916' -1146'

G.L. 2758' K.B. 2770'	Comparison Well SWSW 28-31S-30W K.B. 2763'	Drill Time And Samples	Wire Line Logs
Douglas Gr.			
Heebner	4265' -1502'	4367' -1597'	4356' -1586'
Toronto	4286' -1523'	4388' -1618'	4376' -1606'
Missourian			
Lansing Gr.	4378' -1615'	4492' -1722'	4475' -1705'
Kansas City Gr.	4604' -1841'	4711' -1941'	4702' -1932'
Swope	4812' -2049'	4923' -2153'	4909' -2139'
Demoinesian			
Marmaton Gr.	4982' -2219'	5102' -2332'	5096' -2326'
Oswego	5095' -2332'	5219' -2449'	5208' -2438'
Cherokee Gr.	5145' -2382'	5278' -2508'	5264' -2494'
Atokaian	5270' -2507'	5416' -2646'	5392' -2622'
Morrowian	5426' -2663'	5572' -2802'	5566' -2796'
Chester	5470' -2707'	5594' -2824'	5586' -2816'
Terra Rossa	5618' -2855'	5778' -3008'	5766' -2996'
Mississippian			
Meramecian			
Ste. Genevieve	5674' -2911'	5856' -3086'	5847' -3077'
Total Depth	5970' -3207'	6150' -3380'	6137' -3367'

## LITHOLOGIC SAMPLE DESCRIPTIONS

Ensign Operating Co.  
No. 1-3 Koehn  
C N/2 SW Sec. 3, T32S, R30W  
Meade County, Kansas

Sample examination commenced at 2456 feet and continued to total depth at 6150 feet. Samples were caught by crews on depth intervals and lagged by geologist. All depths reported herein are lagged depths. A 10 foot sample interval was used from 2456 feet to 6150 feet.

- 2456 - 2468 Shale (50%), red, light green. Anhydrite (50%), white, fine crystalline.
- 2468 - 2485 Anhydrite (40%), white, fine crystalline. Dolomite (40%), light gray, fine crystalline. Shale (20%), red, light green. Salt by drill time.
- 2485 - 2500 Anhydrite (50%), white, fine crystalline. Dolomite (20%), light gray, fine crystalline. Shale (30%), red, light gray. Salt by drill time.
- 2500 - 2506 Anhydrite (65%), white, fine crystalline. Shale (25%), red, light green. Dolomite (10%), gray, fine crystalline.
- 2506 - 2515 Anhydrite (50%), white, fine crystalline. Shale (30%), red, light gray. Dolomite (20%), light gray, white, fine crystalline.
- 2515 - 2534 Anhydrite (70%), white, fine crystalline. Shale (10%), red, light gray. Dolomite (20%), light gray, white, fine crystalline. Salt by drill time.
- 2534 - 2542 Anhydrite (85%), white, fine crystalline. Shale (10%), red, light gray. Dolomite (5%), light gray, white, fine crystalline. Salt by drill time.
- 2542 - 2556 Anhydrite (90%), white, gray, fine crystalline. Shale (5%), red, light gray. Dolomite (5%), light gray, white, fine crystalline.
- 2556 - 2564 Anhydrite (90%), white, light gray, fine crystalline. Shale (5%), red, light gray. Dolomite (5%), light gray, white, fine crystalline.
- 2564 - 2572 Anhydrite (90%), white, light gray, fine crystalline. Shale (5%), red, light gray. Dolomite (5%), light gray, white, fine crystalline.
- 2572 - 2582 Anhydrite (85%), white, light gray, fine crystalline. Shale (5%), red, light gray. Dolomite (10%), light gray, white, fine crystalline.
- 2582 - 2597 Anhydrite (90%), white, light gray, fine crystalline. Shale (5%), red, light gray. Dolomite (5%), light gray, fine crystalline.

- 2597 - 2604 Anhydrite (95%), white, light gray, fine crystalline. Shale (trace), red, light gray. Dolomite (5%), light gray, fine crystalline.
- 2604 - 2612 Anhydrite (95%), white, light gray, fine crystalline. Shale (trace), red, light gray. Dolomite (5%), light gray, fine crystalline.
- 2612 - 2622 Anhydrite (95%), white, light gray, fine crystalline. Shale (trace), red, light green. Dolomite (5%), light gray, fine crystalline.
- 2622 - 2636 Anhydrite (95%), white, light gray, fine crystalline. Shale (trace), red, light gray. Dolomite (5%), light gray, fine crystalline.
- 2636 - 2644 Anhydrite (90%), white, light gray, fine crystalline. Shale (trace), red, light gray. Dolomite (10%), tan, light gray, fine crystalline.
- 2644 - 2654 Anhydrite (65%), white, light gray, fine crystalline. Shale (trace-5%), red, some gray. Dolomite (30%), light gray, with black inclusion ghosts, fine crystalline.
- 2654 - 2666 Anhydrite (85%), white, light gray, fine crystalline. Shale (5%), red, some gray. Dolomite (10%), light gray, fine crystalline, some with black inclusion ghosts.
- 2666 - 2678 Anhydrite (60%), white, light gray, fine crystalline. Shale (5%), red, light gray. Dolomite (35%), light gray, some with dark gray inclusion ghosts, fine crystalline.
- 2678 - 2687 Anhydrite (35%), white, light gray, fine crystalline. Shale (10%), red, light gray. Dolomite (35%), light gray, some with dark gray inclusion ghosts.
- 2687 - 2698 Anhydrite (45%), white, light gray, fine crystalline. Shale (10%), red, light gray. Dolomite (45%), light gray, tan, fine crystalline.
- 2698 - 2708 Dolomite (65%), light gray, buff, fine crystalline. Shale (10%), red, light gray. Anhydrite (25%), white, light gray, fine crystalline.

**Herington 2710' +60'**

- 2708 - 2718 Dolomite (65%), light gray, tan, fine crystalline. Shale (10%), red, light gray. Anhydrite (25%), white, light gray, fine crystalline.
- 2718 - 2728 Dolomite (55%), light gray, tan, fine crystalline. Shale (20%), red, light gray. Anhydrite (25%), white, light gray, fine crystalline.
- 2728 - 2738 Dolomite (65%), light gray, tan, fine crystalline. Shale (15%), light gray, greenish gray, red. Anhydrite (20%), white, light gray, fine crystalline.

**Krider 2741' +29'**

- 2738 - 2750 Dolomite (70%), light gray, tan, fine crystalline. Shale (5%), light gray, red. Anhydrite (25%), white, light gray, fine crystalline.
- 2750 - 2761 Dolomite (65%), light gray, tan, fine crystalline. Shale (10%), light gray, red. Anhydrite (25%), white, light gray, fine crystalline.
- 2761 - 2770 Dolomite (85%), light gray, fine crystalline. Shale (5%), light gray, red. Anhydrite (10%), white, light gray.
- 2770 - 2777 Dolomite (90%), light gray, fine crystalline. Shale (trace) light gray, red. Anhydrite (10%), white, light gray, fine crystalline.
- 2777 - 2783 Dolomite (95%), light gray, fine crystalline, trace vuggy porosity. Shale (5%), light gray, red. Anhydrite (trace), white, light gray, fine crystalline.
- 2783 - 2797 Dolomite (100%), light gray, grayish tan, good vuggy porosity, some dolomite has very dark gray ghosts inclusions. Shale (trace), gray.
- 2797 - 2807 Dolomite (100%), light gray, grayish tan, good vuggy porosity, some very dark gray ghosts inclusions. Shale (trace), gray.
- 2807 - 2815 Dolomite (100%), light gray, grayish tan, good vuggy porosity, some very dark gray ghosts inclusions. Anhydrite (trace), white, light gray, fine crystalline. Shale (trace), gray, red.
- 2815 - 2823 Dolomite (100%), light gray, grayish tan, good vuggy porosity, some very dark gray ghosts inclusions. Anhydrite (trace), white, light gray, fine crystalline. Shale (trace), gray, red.
- Winfield 2826' -56'**
- 2823 - 2830 Dolomite (100%), light gray, grayish tan, good vuggy porosity, some dark gray ghosts inclusions. Shale (trace), gray. Anhydrite (trace), light gray, white, fine crystalline.
- 2830 - 2837 Dolomite (100%), light gray, grayish tan, good vuggy porosity, some dark gray ghosts inclusions. Shale (trace), gray. Anhydrite (trace), light gray, white, fine crystalline.
- 2837 - 2856 Dolomite (100%), light gray, light grayish tan, good vuggy porosity, some dark gray ghost inclusions. Shale (trace), gray.
- 2856 - 2866 Dolomite (100%), light gray, light grayish tan, good vuggy porosity, some dark gray ghosts inclusions. Shale (trace), gray.
- 2866 - 2871 Dolomite (100%), light gray, light grayish tan, good vuggy porosity, some dark gray ghosts inclusions. Shale (trace), gray.

### **Towanda 2869' -99'**

- 2871 - 2874 Dolomite (100%), light gray, light grayish tan, vuggy porosity, some dark gray ghosts inclusions. Shale (trace), gray.
- 2874 - 2890 Dolomite (85%), light grayish tan, light gray, good vuggy porosity, trace Dolomite with dark gray ghosts inclusions. Limestone (15%), light gray, white, medium grained oolitic packstone with oomoldic porosity. Shale (trace), gray.
- 2890 - 2897 Dolomite (80%), light grayish tan, light gray, good vuggy porosity, trace dolomite with dark gray ghost inclusions. Limestone (15%), light gray, white, medium grained oolitic packstone with oomoldic porosity. Shale (5%), gray.
- 2897 - 2908 Dolomite (90%), light grayish tan, light gray, good vuggy porosity, trace dolomite with dark gray ghosts inclusions. Limestone (5%), light gray, white, medium grained oolitic packstone with oomoldic porosity. Shale (5%), gray.
- 2908 - 2916 Dolomite (85%), light grayish tan, light, gray, good vuggy porosity, trace dolomite with dark gray inclusion ghosts. Limestone (10%), light gray, white, medium grained oolitic packstone with oomoldic porosity. Shale (5%), gray.
- 2916 - 2931 Dolomite (75%), light grayish tan, light gray, good vuggy porosity, trace dolomite with dark gray ghosts inclusions. Limestone (15%), light gray, white, packstone, vuggy porosity. Shale (10%), gray.
- 2931 - 2946 Dolomite (80%), light grayish tan, light gray, good vuggy porosity, trace dolomite with dark gray, ghosts inclusions. Limestone (10%), light gray, white, packstone. Shale (10%), gray.

### **Fort Riley 2946' -176'**

- 2946 - 2958 Dolomite (65%), light grayish tan, light gray, some vuggy porosity. Limestone (20%), white, light gray, packstone, some oolitic packstone with oomoldic porosity. Shale (15%), light gray, very light green.
- 2958 - 2968 Dolomite (80%), light gray, grayish tan, trace vuggy porosity. Limestone (5%), light gray, packstone. Shale (15%), light gray, very light green.
- 2968 - 2978 Dolomite (75%), light gray, grayish tan, fine crystalline. Limestone (15%), light gray, white, packstone. Shale (10%), light gray, very light green.
- 2978 - 2985 Dolomite (75%), light gray, grayish tan, fine crystalline. Limestone (15%), light gray, white, packstone. Shale (10%), light gray, very light green.
- 2985 - 2994 Dolomite (45%), light gray, grayish tan, fine crystalline. Limestone (45%), light gray, white, packstone. Shale (10%), light gray, light greenish gray.

- 2994 - 3004 Limestone (90%), white, light tan, packstone, wackestone. Shale (5%), light gray, greenish gray. Dolomite (5%), light gray, fine crystalline.
- 3004 - 3017 Limestone (90%), white, light grayish tan, packstone, wackestone. Shale (10%), light gray, light green. Dolomite (trace), light gray, fine crystalline.
- 3017 - 3026 Limestone (80%), white, light gray, grayish tan, packstone, wackestone. Shale (10%), light gray. Dolomite (10%), light gray, fine crystalline.
- 3026 - 3033 Limestone (75%), white, light grayish tan, packstone, wackestone. Shale (15%), light gray, light green. Dolomite (10%), light gray, fine crystalline.
- 3033 - 3040 Limestone (90%), light grayish tan, tan, wackestone, some packstone. Shale (10%), light gray, light green.

**Wreford 3044' -274'**

- 3040 - 3054 Limestone (95%), white, light grayish tan, tan, wackestone, some packstone. Shale (5%), light gray, light green.
- 3054 - 3066 Limestone (95%), white, light grayish tan, wackestone, some packstone. Shale (5%), light gray, light green. Chert (trace), white, light gray.
- 3066 - 3076 Limestone (90%), white, light grayish tan, wackestone, packstone. Shale (10%), light gray, light green. Chert (trace), white, light gray.
- 3076 - 3086 Limestone (85%), white, light grayish tan, wackestone, some packstone. Shale (15%), light gray, light green. Chert (trace), tan, light gray.
- 3086 - 3094 Limestone (95%), tan, light grayish tan, packstone, wackestone. Shale (5%), light gray, light green.
- 3094 - 3102 Limestone (95%), tan, light grayish tan, packstone, wackestone. Shale (5%), light gray, light green.
- 3102 - 3112 Limestone (90%), tan, light grayish tan, wackestone, packstone. Shale (10%), light gray, light green. Chert (trace), tan, light gray.
- 3112 - 3122 Limestone (90%), tan, light grayish tan, wackestone, packstone. Shale (10%), light gray, light green. PSQ.
- 3122 - 3134 Limestone (90%), tan, light grayish tan, wackestone, some packstone. Shale (10%), light gray, light green. PSQ.

**Council Grove 3146' -376'**

- 3134 - 3155 Limestone (90%), tan, light grayish tan, wackestone, some packstone. Shale (10%), light gray, light green. PSQ.
- 3155 - 3161 Limestone (95%), white, wackestone, packstone. Shale (5%), light gray, light green.
- 3161 - 3175 Limestone (95%), white, light tan, wackestone, packstone. Shale (5%), light gray, light green.
- 3175 - 3184 Limestone (95%), white, light tan, wackestone, packstone. Shale (5%), light gray, light green.
- 3184 - 3190 Limestone (100%), white, light tan, wackestone, packstone. Shale (trace), light gray, light green.
- 3190 - 3193 Limestone (100%), white, light tan, wackestone, packstone. Shale (trace), light gray.
- 3193 - 3207 Limestone (100%), white, light tan, wackestone, packstone. Shale (trace), light gray.
- 3207 - 3224 Limestone (100%), white, light tan, wackestone, packstone, some fine grained, oolitic packstone with oomoldic porosity. Shale (trace), light gray.
- 3224 - 3230 Limestone (100%), white, light tan, wackestone, packstone, some fine grained oolitic packstone with some oomoldic porosity. Shale (trace), light gray.
- 3230 - 3235 Limestone (95%), white, light tan, wackestone, packstone, some fine grained oolitic packstone with some oomoldic porosity. Shale (5%), light gray.
- 3235 - 3241 Limestone (95%), white, light tan, wackestone, packstone, some fine grained oolitic packstone with oomoldic porosity. Shale (5%), light gray.
- 3241 - 3253 Limestone (95%), white, light tan, wackestone, packstone. Shale (5%), light gray.
- 3253 - 3270 Limestone (85%), white, light tan, wackestone, packstone. Dolomite (10%), tan, fine crystalline. Shale (5%), light gray.
- 3270 - 3287 Limestone (85%), white, light tan, wackestone, packstone. Dolomite (10%), tan, fine crystalline, some with good vuggy porosity. Shale (5%), gray.
- 3287 - 3300 Limestone (95%), white, light tan, packstone, wackestone, trace packstone with red hematitic staining (unconformity surface?). Shale (5%), gray, greenish gray. Note: The well was logged at the depth of 3300 feet at the request of Murfin Drilling Co., Inc.. Driller's Depth 3300', Logger's Depth 3276'.

3300 - 3304 Limestone (90%), white, light tan, packstone, wackestone. Shale (10%), light gray. PSQ.

**Neva 3302' -532'**

3304 - 3309 Limestone (90%), white, light tan, packstone, wackestone. Shale (10%), light gray. PSQ.

3309 - 3319 Limestone (95%), white, light tan, wackestone, packstone. Shale (5%), light gray.

3319 - 3330 Limestone (95%), white, wackestone, mudstone. Shale (5%), light gray.

3330 - 3334 Limestone (95%), white, wackestone, mudstone. Shale (5%), light gray.

3334 - 3350 Limestone (90%), white, wackestone, mudstone. Shale (10%), light gray.

3350 - 3364 Limestone (95%), white, light gray, wackestone, mudstone. Shale (5%), light gray.

3364 - 3374 Limestone (95%), white, light gray, wackestone, mudstone, some packstone. Shale (5%), light gray.

3374 - 3382 Limestone (95%), tan, grayish tan, light gray, wackestone, mudstone, some packstone. Shale (5%), gray.

3382 - 3394 Limestone (60%), tan, white, wackestone, mudstone. Shale (40%), gray.

3394 - 3402 Limestone (80%), white, wackestone, packstone, some vuggy porosity. Shale (20%), gray.

3402 - 3412 Limestone (95%), white, wackestone, packstone, mudstone. Shale (5%), gray.

3412 - 3422 Limestone (95%), white, wackestone, packstone, mudstone. Shale (5%), gray.

3422 - 3430 Limestone (95%), light gray, wackestone, packstone. Shale (5%), gray.

3430 - 3438 Limestone (90%), tan, white, wackestone, packstone, some vuggy porosity. Shale (10%), gray.

3438 - 3444 Limestone (90%), tan, white, wackestone, packstone, some vuggy porosity. Shale (10%), gray.

3444 - 3454 Limestone (95%), white, tan, wackestone, packstone, some vuggy porosity. Shale (5%), gray, greenish gray.

3454 - 3458 Limestone (95%), white, packstone, wackestone, some oolitic packstone, some vuggy porosity. Shale (5%), gray, greenish gray.

- 3458 - 3470 Limestone (95%), white, packstone, wackestone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3470 - 3482 Limestone (95%), white, buff, packstone, wackestone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3482 - 3496 Limestone (95%), white, buff, packstone, wackestone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3496 - 3508 Limestone (95%), white, buff, packstone, wackestone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3508 - 3516 Limestone (95%), white, buff, packstone, wackestone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3516 - 3520 Limestone (95%), white, light gray, packstone, wackestone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3520 - 3531 Limestone (95%), tan, light gray, packstone, wackestone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3531 - 3550 Limestone (90%), white, light gray, packstone, wackestone, some oolitic packstone with oomoldic porosity. Shale (10%), gray, greenish gray.
- 3550 - 3564 Limestone (90%), white, light gray, packstone, wackestone, mudstone. Shale (10%), gray, greenish gray.
- 3564 - 3573 Limestone (90%), white, light gray, packstone, wackestone, some mudstone. Shale (10%), gray, greenish gray.
- 3573 - 3582 Limestone (90%), light gray, white, wackestone, mudstone. Shale (10%), greenish gray, gray.
- 3582 - 3594 Limestone (95%), light gray, white, wackestone, mudstone. Shale (5%), gray, greenish gray.
- 3594 - 3602 Limestone (95%), light gray, tan, white, wackestone, mudstone, trace oolitic packstone. Shale (5%), gray, greenish gray.
- 3602 - 3605 Limestone (95%), light gray, tan, white, wackestone, mudstone. Shale (5%), gray, greenish gray.
- 3605 - 3618 Limestone (95%), white, packstone, wackestone. Shale (5%), gray, greenish gray.
- 3618 - 3625 Limestone (95%), white, packstone, wackestone. Shale (5%), gray, greenish gray.
- 3625 - 3644 Limestone (95%), white, packstone, wackestone. Shale (5%), gray, greenish gray.

- 3644 - 3655 Limestone (95%), white, buff, packstone, wackestone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3655 - 3663 Limestone (95%), white, buff, packstone, wackestone, some vuggy porosity, trace fine grained oolitic packstone with oomoldic porosity. Shale (5%), gray, greenish gray.
- 3663 - 3671 Limestone (95%), buff, white, tan, wackestone, packstone, fossils. Shale (5%), gray, greenish gray.

**Wabaunsee 3676' -906'**

- 3671 - 3681 Limestone (95%), light gray, buff, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3681 - 3685 Limestone (95%), light gray, buff, packstone, wackestone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3685 - 3690 Limestone (95%), light gray, buff, wackestone, packstone, trace medium grained oolitic packstone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3690 - 3704 Limestone (100%), light gray, buff, wackestone, packstone, some fine grained oolitic packstone with oomoldic porosity, some vuggy porosity. Shale (trace), gray, greenish gray.
- 3704 - 3722 Limestone (100%), light gray, buff, packstone, wackestone, some fine grained oolitic packstone with oomoldic porosity, some vuggy porosity. Shale (trace), gray, greenish gray.
- 3722 - 3732 Limestone (100%), buff, very light gray, packstone, wackestone, trace fine grained oolitic packstone with oomoldic porosity, some vuggy porosity. Shale (trace), gray, greenish gray.
- 3732 - 3736 Limestone (95%), buff, light grayish tan, wackestone, packstone, some vuggy porosity, trace fine grained oolitic packstone with oomoldic porosity. Shale (5%), gray, greenish gray.
- 3736 - 3749 Limestone (95%), buff, light grayish tan, wackestone, packstone, fossils, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3749 - 3756 Limestone (95%), buff, light grayish tan, light gray, wackestone, packstone, some mudstone, some vuggy porosity. Shale (5%), gray, greenish gray.
- 3756 - 3766 Limestone (95%), buff, light grayish tan, light gray, wackestone, packstone, some mudstone, some vuggy porosity. Shale (5%), gray, greenish gray.

- 3766 - 3778 Limestone (95%), buff, light grayish tan, light gray, wackestone, packstone, some mudstone, some vuggy porosity, fusulinids. Shale (5%), gray, greenish gray.
- 3778 - 3788 Limestone (95%), buff, light grayish tan, light gray, wackestone, packstone, vuggy porosity. Shale (5%), gray, greenish gray.
- 3788 - 3793 Limestone (95%), buff, white, light grayish tan, packstone, wackestone, vuggy porosity, trace tan fine grained oolitic packstone. Shale (5%), gray, greenish gray.
- 3793 - 3800 Limestone (95%), buff, white, light grayish tan, packstone, wackestone, vuggy porosity, trace white fine grained oolitic packstone. Shale (5%), gray, greenish gray.
- 3800 - 3803 Limestone (95%), buff, white, light grayish tan, packstone, wackestone, some white fine grained oolitic packstone, fusulinids. Shale (5%), gray, light greenish gray.
- 3803 - 3806 Limestone (100%), white, light grayish tan, packstone, wackestone, some vuggy porosity, fusulinids. Shale (trace), gray, greenish gray.
- 3806 - 3820 Limestone (100%), white, light grayish tan, packstone, wackestone, vuggy porosity, some white, fine grained oolitic packstone with oomoldic porosity. Shale (trace), gray, greenish gray.
- 3820 - 3858 Limestone (100%), white, light grayish tan, packstone, wackestone, vuggy porosity, some white fine grained oolitic packstone with oomoldic porosity. Shale (trace), gray, greenish gray.
- 3858 - 3866 Limestone (100%), tan, light grayish tan, white, packstone, wackestone, some white, fine grained oolitic packstone with oomoldic porosity. Shale (trace), gray, greenish gray.
- 3866 - 3871 Limestone (75%), tan, light grayish tan, packstone, wackestone, vuggy porosity. Dolomite (20%), gray, with dark gray ghosts inclusions, fine crystalline. Shale (5%), gray, greenish gray.
- 3871 - 3876 Limestone (80%), tan, light grayish tan, packstone, wackestone, some fine grained oolitic packstone with oomoldic porosity. Dolomite (20%), gray, with dark gray ghost inclusions, fine crystalline. Shale (trace), gray, greenish gray.
- 3876 - 3882 Limestone (100%), buff, tan, gray, packstone, wackestone, fine grained oolitic packstone with oomoldic porosity. Shale (trace), gray, greenish gray.
- 3882 - 3889 Limestone (95%), buff, gray, packstone, wackestone, fine grained oolitic packstone with oomoldic porosity, some gray wackestone with black pellets. Shale (5%), gray.

3889 - 3900 Limestone (100%), tan, buff, fine grained oolitic packstone with oomoldic porosity, packstone, wackestone, some gray wackestone with black pellets. Shale (trace), gray.

3900 - 3927 Limestone (100%), tan, buff, fine grained oolitic packstone with oomoldic porosity, packstone, wackestone, trace gray wackestone with black pellets. Shale (trace), gray.

**Topeka 3928' -1158'**

3927 - 3938 Limestone (95%), tan, buff, light gray, wackestone, packstone, fine grained oolitic packstone with oomoldic porosity, some gray wackestone with black pellets, fusulinids. Shale (5%), gray.

3938 - 3946 Limestone (90%), light gray, buff, tan, wackestone, mudstone, some packstone. Shale (10%), gray, greenish gray.

3946 - 3960 Limestone (90%), light gray, tan, buff, mudstone, wackestone, some packstone with vuggy porosity. Shale (10%), gray.

3960 - 3968 Limestone (50%), gray, tan, mudstone, wackestone, packstone with vuggy porosity. Shale (50%), gray, black.

3968 - 3979 Limestone (65%), gray, tan, buff, mudstone, wackestone, packstone with vuggy porosity, trace tan fine grained oolitic packstone with oomoldic porosity. Shale (35%), gray, black.

3979 - 3984 Limestone (80%), gray, tan, wackestone, packstone with vuggy porosity. Shale (20%), gray, black.

3984 - 4002 Limestone (70%), gray, mudstone, some wackestone. Shale (30%), gray, black. Chert (trace), gray, black. Note: Mud clabbered at this depth.

4002 - 4010 Limestone (70%), gray, mudstone, some wackestone. Shale (30%), gray, black. Chert (trace), gray.

4010 - 4021 Limestone (80%), gray, mudstone, argillaceous. Shale (20%), gray, black. Chert (trace), gray. Down 5 1/2 hours for rig repair.

4021 - 4025 Limestone (70%), gray, mudstone, argillaceous. Shale (30%), gray, black.

4025 - 4034 Limestone (60%), gray, mudstone, argillaceous. Shale (20%), gray, black. Limestone (20%), tan, grayish tan, mudstone, wackestone, trace fine grained oolitic packstone with oomoldic porosity.

4034 - 4044 Limestone (65%), gray, mudstone, argillaceous. Shale (35%), gray.

- 4044 - 4053 Limestone (75%), gray, mudstone, argillaceous. Shale (25%), gray.
- 4053 - 4063 Limestone (50%), gray, mudstone, argillaceous. Shale (50%), gray.
- 4063 - 4074 Limestone (60%), gray, mudstone, argillaceous. Shale (40%), gray.
- 4074 - 4084 Limestone (65%), gray, mudstone, argillaceous. Shale (35%), gray.
- 4084 - 4093 Limestone (55%), gray, mudstone, argillaceous. Shale (45%), gray.
- 4093 - 4104 Limestone (50%), gray, mudstone, argillaceous. Shale (50%), gray.
- 4104 - 4113 Limestone (65%), gray, mudstone, argillaceous. Shale (35%), gray.
- 4113 - 4123 Limestone (70%), gray, mudstone, argillaceous. Shale (30%), gray, light green, greenish gray.
- 4123 - 4132 Limestone (50%), gray, mudstone, argillaceous. Shale (50%), gray, light green, greenish gray.
- 4132 - 4139 Limestone (75%), gray, mudstone, argillaceous. Shale (25%), gray, light green, greenish gray.
- 4139 - 4145 Limestone (25%), gray, mudstone, argillaceous. Limestone (50%), tan, grayish tan, mudstone, wackestone. Shale (25%), gray, light green, greenish gray.
- 4145 - 4158 Limestone (85%), gray, mudstone, argillaceous. Shale (15%), gray.
- 4158 - 4172 Limestone (85%), gray, mudstone, argillaceous. Shale (15%), gray.
- 4172 - 4184 Limestone (90%), gray, mudstone, argillaceous. Shale (10%), gray.
- 4184 - 4194 Limestone (90%), gray, mudstone, argillaceous, some limestone with chlorite inclusions. Shale (10%), gray.
- 4194 - 4200 Limestone (60%), gray, mudstone, argillaceous, some limestone with chlorite inclusions. Shale (40%), gray.
- 4200 - 4208 Limestone (65%), gray, mudstone, argillaceous, some limestone with chlorite inclusions. Shale (35%), gray.
- 4208 - 4221 Limestone (65%), gray, mudstone, argillaceous. Shale (35%), gray.
- 4221 - 4230 Limestone (70%), gray, mudstone, argillaceous. Shale (30%), gray.
- 4230 - 4238 Limestone (70%), gray, mudstone, argillaceous. Shale (30%), gray.

- 4238 - 4248 Limestone (100%), buff, white, packstone, good vuggy porosity. Shale (trace), gray.
- 4248 - 4256 Limestone (100%), buff, white, packstone, good vuggy porosity, trace chlorite. Shale (trace), gray, black.
- 4256 - 4259 Limestone (100%), buff, white, packstone, good vuggy porosity. Shale (trace), gray, black.
- 4259 - 4284 Limestone (100%), buff, light tan, packstone, wackestone, vuggy porosity. Shale (trace), gray, black.
- 4284 - 4296 Limestone (90%), buff, light tan, packstone, wackestone, some vuggy porosity. Shale (10%), black, gray.
- 4296 - 4301 Limestone (80%), tan, grayish tan, gray, wackestone, packstone. Shale (20%), black, gray.
- 4301 - 4311 Limestone (75%), tan, grayish tan, gray, wackestone, packstone. Shale (25%), gray, black.
- 4311 - 4323 Limestone (70%), tan, grayish tan, gray, wackestone, packstone. Shale (30%), gray, black.
- 4323 - 4338 Limestone (75%), buff, tan, packstone, wackestone. Shale (25%), gray, black, greenish gray.
- 4338 - 4344 Limestone (50%), buff, tan, light gray, wackestone, packstone. Shale (50%), black, gray.
- 4344 - 4358 Shale (60%), black, gray. Limestone (40%), buff, tan, light gray, wackestone, packstone, mudstone.

**Heebner 4368' -1597'**

- 4358 - 4370 Limestone (65%), grayish tan, wackestone, packstone, fossiliferous. Shale (35%), black, gray.
- 4370 - 4381 Shale (70%), black, gray. Limestone (30%), grayish tan, wackestone, packstone, fossiliferous.
- 4381 - 4387 Limestone (60%), grayish tan, wackestone, some packstone, fossiliferous. Shale (40%), black, gray.

**Toronto 4388' -1618'**

- 4387 - 4394 Limestone (100%), white, wackestone, packstone. Shale (trace), black, gray.

- 4394 - 4405 Limestone (95%), white, wackestone, packstone, some vuggy porosity. Shale (5%), black, gray.
- 4405 - 4418 Limestone (85%), white, tan, grayish tan, wackestone, packstone, some mudstone. Shale (15%), gray, black, greenish gray.
- 4418 - 4423 Limestone (95%), white, wackestone, some packstone. Shale (5%), gray, black, greenish gray.
- 4423 - 4431 Limestone (80%), white, wackestone, some packstone. Shale (20%), gray, black, green, greenish gray.
- 4431 - 4442 Limestone (85%), light grayish tan, buff, wackestone, some packstone, mudstone. Shale (15%), gray, black, green, greenish gray.
- 4442 - 4454 Limestone (90%), grayish tan, tan, wackestone, mudstone, some packstone, fossiliferous. Shale (10%), gray, black, greenish gray.
- 4454 - 4456 Limestone (90%), grayish tan, tan, wackestone, mudstone, some tan fine grained oolitic packstone. Shale (10%), gray, greenish gray.
- 4456 - 4466 Limestone (90%), grayish tan, tan, wackestone, mudstone, some tan fine grained oolitic packstone. Shale (10%), gray, greenish gray. Chert (trace), tan, white, gray.
- 4466 - 4476 Limestone (90%), buff, grayish tan, wackestone, mudstone. Shale (10%), gray, greenish gray. Chert (trace), tan, white, gray.
- 4476 - 4483 Limestone (90%), grayish tan, buff, wackestone, mudstone. Shale (10%), gray, greenish gray. Chert (trace), tan, white, gray.

**Lansing 4492' -1722'**

- 4483 - 4494 Limestone (95%), buff, grayish tan, wackestone, mudstone. Shale (5%), gray, greenish gray. Chert (trace), tan, white, gray.
- 4494 - 4500 Limestone (95%), buff, grayish tan, wackestone, mudstone. Shale (5%), gray, greenish gray. Chert (trace), tan, white, gray, brown.
- 4500 - 4515 Limestone (95%), buff, light grayish tan, wackestone, packstone, some mudstone. Shale (5%), gray, greenish gray. Chert (trace), tan, white, light gray.
- 4515 - 4526 Limestone (100%), buff, light grayish tan, wackestone, packstone, some mudstone. Shale (trace-5%), gray, greenish gray. Chert (trace), tan, white, light gray.

- 4526 - 4534 Limestone (95%), buff, light grayish tan, wackestone, packstone, some coarse grained oolitic packstone with dark gray oolites, fossiliferous. Shale (5%), gray, greenish gray. Chert (trace), tan, white, light gray.
- 4534 - 4540 Limestone (95%), buff, tan, packstone, wackestone, trace coarse grained oolitic packstone with dark gray oolites. Shale (5%), gray, greenish gray. Chert (trace), tan, gray, brown, white.
- 4540 - 4550 Limestone (90%), buff, tan, packstone, wackestone, some oolitic packstone. Shale (10%), gray, greenish gray, green black. Chert (trace), tan, gray, brown, white.
- 4550 - 4555 Limestone (85%), buff, tan, packstone, oolitic packstone, wackestone. Shale (15%), gray, greenish gray, green, black. Chert (trace), white, gray, tan.
- 4555 - 4570 Limestone (95%), tan, buff, packstone, some wackestone. Shale (5%), gray, greenish gray, green, black. Chert (trace), white, tan, gray.
- 4570 - 4587 Limestone (95%), tan, buff, packstone, some wackestone. Shale (5%), gray, greenish gray, green. Chert (trace), white, tan, gray.
- 4587 - 4592 Limestone (95%), tan, buff, packstone, some wackestone. Shale (5%), gray, greenish gray. Chert (trace), tan, gray, white.
- 4592 - 4597 Limestone (90%), tan, buff, packstone, some wackestone. Shale (10%), gray, greenish gray, Chert (trace), tan, gray, white.
- 4597 - 4602 Limestone (95%), tan, buff, packstone, trace oolitic packstone, some wackestone. Shale (5%), gray, greenish gray, black. Chert (trace), tan, gray, white.
- 4602 - 4610 Limestone (100%), tan, buff, packstone, some wackestone. Shale (trace), gray, greenish gray, black. Chert (trace), tan, gray, white.
- 4610 - 4630 Limestone (100%), tan, buff, packstone, some wackestone. Shale (trace), gray, greenish gray, black. Chert (trace), tan, gray, white.
- 4630 - 4639 Limestone (100%), tan, buff, packstone, some wackestone, tan medium grained oolitic packstone. Shale (trace), gray, greenish gray. Chert (trace), white, tan, gray.
- 4639 - 4644 Limestone (90%), tan, buff, packstone, some wackestone. Shale (10%), gray, greenish gray, black. Chert (trace), tan, white, gray.
- 4644 - 4649 Limestone (80%), tan, buff, packstone, some wackestone. Shale (20%), gray, greenish gray. Chert (trace), tan, gray, white.

- 4649 - 4652 Limestone (100%), tan, fine grained oolitic packstone with oomoldic porosity, packstone, wackestone. Shale (trace), gray, greenish gray.
- 4652 - 4656 Limestone (100%), tan, fine grained oolitic packstone with oomoldic porosity, packstone, wackestone. Shale (trace), gray, greenish gray.
- 4656 - 4666 Limestone (100%), tan, packstone, oolitic packstone with oomoldic porosity, wackestone. Shale (trace), gray, greenish gray.
- 4666 - 4693 Limestone (100%), tan, packstone, fine grained oolitic packstone with oomoldic porosity, wackestone. Shale (trace), gray, greenish gray. Chert(trace), tan, white.

**Kansas City 4711' -1941'**

- 4693 - 4715 Limestone (100%), tan, packstone, some fine grained oolitic packstone with oomoldic porosity, wackestone. Shale (trace), gray, greenish gray. Chert (trace), white, tan, gray.
- 4715 - 4725 Limestone (100%), tan, packstone, some fine grained oolitic packstone with oomoldic porosity, wackestone. Shale (trace), gray, greenish gray. Chert (trace), tan, gray.
- 4725 - 4735 Shale (70%), black, gray, greenish gray. Limestone (30%), tan, brown, grayish tan, mudstone, wackestone. Chert (trace), tan, white.
- 4735 - 4738 Limestone (60%), grayish tan, tan, wackestone, mudstone. Shale (40%), gray, black, greenish gray.
- 4738 - 4754 Limestone (95%), buff, tan, fine-medium grained oolitic packstone with oomoldic porosity, packstone, wackestone. Shale (5%), gray, black.
- 4754 - 4761 Limestone (95%), buff, tan, medium grained oolitic packstone with oomoldic porosity, packstone, wackestone. Shale (5%), gray, black.
- 4761 - 4772 Limestone (95%), buff, tan, medium grained oolitic packstone with oomoldic porosity, packstone, wackestone. Shale (5%), gray. Chert (trace), gray, white.
- 4772 - 4782 Limestone (100%), buff, tan, packstone, wackestone. Shale (trace), gray, greenish gray.
- 4782 - 4786 Limestone (90%), buff, tan, packstone, wackestone, some tan medium grained oolitic packstone with oomoldic porosity. Shale (10%), gray, black.
- 4786 - 4806 Limestone (95%), buff, tan, packstone, wackestone, mudstone. Shale (5%), gray, black.

- 4806 - 4817 Limestone (90%), tan, light grayish tan, wackestone, packstone. Shale (10%), gray, greenish gray.
- 4817 - 4828 Limestone (90%), tan, light grayish tan, packstone, wackestone. Shale (10%), gray. Chert (trace), gray.
- 4828 - 4837 Limestone (100%), light gray, tan, packstone, wackestone, mudstone. Shale (trace), gray. Chert (trace), gray, brown, tan.
- 4837 - 4844 Limestone (100%), light gray, tan, wackestone, packstone, mudstone. Shale (trace), gray.
- 4844 - 4852 Limestone (100%), light gray, tan, wackestone, packstone, mudstone. Shale (trace), gray.
- 4852 - 4863 Limestone (100%), light gray, tan, packstone, wackestone, some vuggy porosity. Shale (trace), gray.
- 4863 - 4880 Limestone (100%), light gray, packstone, wackestone, some vuggy porosity. Shale (trace), gray, black.
- 4880 - 4891 Limestone (100%), tan, mudstone, some light gray, packstone. Chert (trace), gray. Shale (trace), gray, black.
- 4891 - 4900 Limestone (100%), tan, mudstone, wackestone. Shale (trace), gray.
- 4900 - 4908 Limestone (100%), tan, grayish tan, mudstone, wackestone. Shale (trace), gray. Chert (trace), gray.
- 4908 - 4913 Limestone (100%), grayish tan, grayish brown, mudstone, some wackestone. Shale (trace), gray.
- 4913 - 4918 Limestone (90%), grayish tan, grayish brown, mudstone, some wackestone, trace brown medium grained oolitic packstone with oomoldic porosity. Shale (10%), black, gray.

**Swope 4923' -2153'**

- 4918 - 4926 Limestone (30%), grayish tan, grayish brown, mudstone. Limestone (50%), tan, light brown, medium grained oolitic packstone with oomoldic porosity. Shale (20%), black, gray.
- 4926 - 4940 Limestone (100%), buff, tan, packstone, oolitic packstone with oomoldic porosity, wackestone. Shale (trace), gray.
- 4940 - 4954 Limestone (100%), grayish tan, tan, mudstone, wackestone, some packstone. Shale (trace), gray.

- 4954 - 4962 Limestone (100%), grayish tan, tan, grayish brown, wackestone, mudstone, trace packstone. Shale (trace), black.
- 4962 - 4970 Limestone (40%), grayish tan, grayish brown, mudstone, wackestone. Limestone (50%), dark grayish brown, mudstone. Shale (10%), black, gray, green.
- 4970 - 4978 Limestone (100%), dark grayish brown, mudstone, some wackestone. Shale (trace), gray, black. Chert (trace), gray.
- 4978 - 4986 Shale (80%), black, gray. Limestone (20%), dark grayish brown, mudstone. Chert (trace), dark brown.
- 4986 - 4990 Shale (90%), black, gray. Limestone (10%), dark grayish brown, brown, mudstone.
- 4990 - 4993 Limestone (90%), light brown medium grained oolitic packstone with oolmoldic porosity. Shale (10%), black, gray. Note: This sample caught late or lag is off.
- 4993 - 4997 Limestone (90%), light brown medium grained oolitic packstone with oomoldic porosity. Shale (10%), black, gray. Note: This sample caught late or lag is off.
- 4997 - 5028 Limestone (90%), light brown medium grained oolitic packstone with oomoldic porosity. Shale (10%), black, gray.
- 5028 - 5038 Limestone (30%), light brown medium grained oolitic packstone with oomoldic porosity. Limestone (65%), tan, grayish tan, mudstone, wackestone. Shale (5%), black, gray.
- 5038 - 5048 Limestone (75%), grayish tan, tan, wackestone, mudstone, some packstone. Limestone (15%), brown, tan, medium grained oolitic packstone with oomoldic porosity. Shale (10%), black, gray.
- 5048 - 5058 Limestone (65%), grayish tan, wackestone, mudstone. Limestone (25%), dark gray, mudstone, argillaceous. Shale (10%), black, gray.
- 5058 - 5068 Limestone (85%), grayish tan, tan, grayish brown, wackestone, mudstone. Shale (15%), gray, greenish gray, black.
- 5068 - 5076 Limestone (80%), grayish tan, grayish brown, wackestone, mudstone. Shale (20%), gray, greenish gray, black.
- 5076 - 5086 Limestone (60%), grayish tan, grayish brown, mudstone, some wackestone. Shale (40%), gray, greenish gray, black.
- 5086 - 5094 Limestone (50%), grayish tan, grayish brown, mudstone, some wackestone. Shale (50%), black, gray.

5094 - 5102 Limestone (45%), grayish tan, grayish brown, mudstone, some wackestone. Limestone (10%), tan, medium grained oolitic packstone with oomoldic porosity. No show of oil or gas. Shale (45%), gray, black.

**Marmaton 5102' -2332'**

5102 - 5110 Limestone (90%), buff, tan, wackestone, some packstone, mudstone, trace tan, medium grained oolitic packstone with oomoldic porosity. Shale (10%), gray, black.

5110 - 5116 Limestone (100%), buff, tan, wackestone, some packstone, mudstone. Shale (10%), gray, black.

5116 - 5124 Limestone (90%), buff, tan, wackestone, some packstone, mudstone. Shale (10%), gray, black.

5124 - 5130 Limestone (80%), buff, tan, wackestone, some packstone, mudstone. Shale (20%), gray, greenish gray.

5130 - 5146 Limestone (90%), buff, tan, wackestone, some packstone, mudstone. Shale (10%), gray, greenish gray.

5146 - 5155 Limestone (75%), grayish tan, tan, wackestone, mudstone. Shale (25%), black, gray, greenish gray.

5155 - 5167 Limestone (85%), grayish tan, tan, brown, wackestone, mudstone. Shale (15%), gray, black, greenish gray.

5167 - 5180 Limestone (90%), grayish tan, tan, brown, wackestone, mudstone. Shale (10%), gray, greenish gray. Chert (trace), tan.

5180 - 5186 Limestone (100%), tan, light grayish tan, mudstone, wackestone. Shale (trace), gray, greenish gray.

5186 - 5202 Limestone (100%), tan, buff, light grayish tan, wackestone, mudstone. Shale (trace), gray.

5202 - 5208 Limestone (100%), tan, buff, light grayish tan, packstone, wackestone, mudstone, trace fine grained oolitic packstone with oomoldic porosity. Shale (trace), gray.

**Oswego 5219' -2449'**

5208 - 5221 Limestone (60%), tan, grayish tan, wackestone, packstone. Shale (40%), gray, black, greenish gray, green.

5221 - 5228 Limestone (70%), grayish tan, wackestone, packstone, mudstone. Shale (30%), gray, black, greenish gray.

- 5228 - 5233 Limestone (100%), tan, buff, packstone, wackestone, fusulinids. Shale (trace), gray, black.
- 5233 - 5249 Limestone (100%), tan, buff, packstone, wackestone, fusulinids. Shale (trace), gray, black.
- 5249 - 5260 Limestone (100%), tan, grayish tan, mudstone, wackestone. Shale (trace), black, gray.
- 5260 - 5270 Limestone (70%), tan, grayish tan, mudstone, wackestone, some packstone. Shale (30%), black, gray.

**Cherokee 5278' -2508'**

- 5270 - 5282 Limestone (90%), gray, grayish tan, mudstone wackestone, dolomitic. Shale (10%), black, gray.
- 5282 - 5291 Limestone (70%), grayish tan, tan, wackestone, mudstone, some packstone, some gray dolomitic mudstone. Shale (30%), black, gray.
- 5291 - 5301 Limestone (70%), grayish tan, tan, wackestone, mudstone, some packstone. Shale (30%), black, gray.
- 5301 - 5310 Limestone (70%), gray, mudstone, dolomitic. Limestone (25%), grayish tan, mudstone, wackestone. Shale (5%), black, gray.
- 5310 - 5319 Limestone (50%), gray, mudstone, dolomitic. Limestone (15%), grayish tan, tan, wackestone, mudstone. Shale (35%), black, gray.
- 5319 - 5328 Limestone (80%), tan, light grayish tan, wackestone, packstone. Shale (20%), black, gray.
- 5328 - 5338 Limestone (85%), grayish tan, brown, wackestone, packstone. Shale (15%), black, gray.
- 5338 - 5349 Limestone (55%), grayish tan, grayish brown, wackestone, mudstone. Limestone (30%), dark gray, dark brown, mudstone. Shale (15%), black, gray. Chert (trace), dark brown.
- 5349 - 5355 Limestone (70%), grayish tan, grayish brown, dark gray, dark brown, wackestone, mudstone, some packstone. Shale (30%), dark gray, black.
- 5355 - 5368 Limestone (65%), grayish tan, grayish brown, dark gray, dark brown, wackestone, mudstone, some packstone. Shale (35%), dark gray, black.
- 5368 - 5376 Limestone (85%), light grayish tan, gray, tan, wackestone, mudstone. Shale (15%), black, gray.

5376 - 5386 Limestone (90%), light grayish tan, tan, gray, wackestone, mudstone. Shale (10%), black, gray.

5386 - 5396 Limestone (50%), tan, grayish tan, wackestone, mudstone, fossiliferous. Shale (50%), black, gray.

5396 - 5404 Limestone (80%), tan, grayish tan, wackestone, packstone, mudstone, fossiliferous. Shale (20%), black, gray. Chert (trace), white, tan.

**Atoka 5416' -2646'**

5404 - 5421 Limestone (90%), tan, grayish tan, packstone, wackestone, mudstone, packstone has good vuggy porosity, light tan oil stain, yellow fluorescence, good cut, good residual ring. Mud Gas 35 Units, 5405'-5410'. Shale (10%), black, gray.

5421 - 5426 Limestone (70%), tan, grayish tan, wackestone, some packstone, dark gray mudstone. Shale (30%), black, gray.

5426 - 5437 Limestone (90%), tan, grayish tan, packstone, wackestone. Shale (10%), black, gray.

5437 - 5442 Limestone (85%), tan, grayish tan, grayish brown, brown, wackestone, packstone, fusulinids. Shale (15%), black, gray. Chert (trace), dark brown.

5442 - 5453 Limestone (70%), tan, grayish brown, brown, wackestone, packstone, fusulinids. Shale (30%), black, gray. Chert (trace), dark brown.

5453 - 5466 Limestone (100%), tan, packstone, wackestone, some packstone has good vuggy porosity, light tan oil stain, yellow fluorescence, good cut, good residual ring. Mud Gas 30 Units, 5456'-5460'. Shale (trace), black.

5466 - 5476 Limestone (100%), tan, grayish tan, mudstone, wackestone, some packstone. Shale (trace), black, gray. Chert (trace), tan, brown.

5476 - 5484 Limestone (95%), grayish tan, tan, gray, mudstone, wackestone. Shale (5%), black, gray. Chert (trace), tan, brown.

5484 - 5496 Shale (60%), black. Limestone (40%), brown, dark brown, wackestone, mudstone. Chert (trace), gray.

5496 - 5504 Shale (50%), calcareous gray, black. Limestone (50%), brown, dark brown, gray, mudstone.

5504 - 5514 Shale (70%), calcareous gray, black. Limestone (30%), brown, dark brown, gray, mudstone. Lag off or late sample.

- 5514 - 5522 Shale (40%), black, calcareous gray. Limestone (60%), brown, dark brown, gray, mudstone.
- 5522 - 5533 Limestone (65%), brown, dark brown, grayish brown, mudstone, some wackestone. Shale (35%), black, gray.
- 5533 - 5548 Limestone (85%), gray, dark grayish brown, dark brown, mudstone, some wackestone. Shale (15%), black, gray.
- 5548 - 5561 Limestone (85%), dark brown, dark grayish brown, mudstone, wackestone, packstone. Shale (15%), black, gray. Chert (trace), brown.
- 5561 - 5568 Limestone (90%), dark brown, dark grayish brown, mudstone, some wackestone, packstone. Shale (10%), black, gray.

**Morrow 5572' -2802'**

- 5568 - 5578 Limestone (90%), dark brown, dark grayish brown, mudstone, some wackestone, packstone. Shale (10%), black, gray. Chert (trace), dark brown.
- 5578 - 5586 Limestone (50%), dark brown, dark grayish brown, light gray, mudstone, some wackestone. Shale (30%), black, gray. Sandstone (20%), light gray, white, fine grained, clay filled. No show of oil.

**Chester 5594' -2824'**

- 5586 - 5596 Shale (70%), black, gray, pyritic. Limestone (25%), dark brown, dark grayish brown, gray, mudstone, some wackestone, packstone. Sandstone (5%), light gray, white, fine grained, clay filled. Coal (trace), black.
- 5596 - 5610 Limestone (90%), tan, grayish tan, coarse grained fossiliferous packstone, few pieces of limestone with light tan oil stain, yellow fluorescence, slow bleeding cut, delayed residual ring. Shale (10%), black, gray, pyritic. Circulated sample.
- 5610 - 5614 Limestone (90%), tan, grayish tan, coarse grained fossiliferous packstone, few pieces of limestone with light tan oil stain, yellow fluorescence, slow bleeding cut, delayed residual ring. Shale (10%), black, gray, pyritic.
- 5614 - 5623 Limestone (90%), tan, grayish tan, coarse grained fossiliferous packstone, few pieces of limestone with light tan oil stain, yellow fluorescence, slow bleeding cut, delayed residual ring. Shale (10%), black, gray, pyritic.
- 5623 - 5636 Limestone (85%), tan, grayish tan, coarse grained fossiliferous packstone, few pieces of limestone with light tan oil stain, yellow fluorescence, slow bleeding cut, delayed residual ring. Shale (15%), black, gray, pyritic, fossiliferous, bryozoans.

- 5636 - 5648 Limestone (100%), buff, tan, coarse grained fossiliferous packstone. Shale (trace), gray, black.
- 5648 - 5658 Limestone (85%), buff, tan, coarse grained fossiliferous packstone. Shale (15%), gray, black.
- 5658 - 5669 Limestone (90%), buff, tan, grayish tan, coarse grained fossiliferous packstone. Shale (10%), gray, black.
- 5669 - 5674 Limestone (90%), tan, buff, gray, grayish tan, coarse grained fossiliferous packstone, trace packstone with brown oil stain, yellow fluorescence, bleeding cut, delayed residual ring. Shale (10%), black, gray.
- 5674 - 5676 Limestone (85%), tan, grayish tan, tan, gray, coarse grained fossiliferous packstone. Shale (15%), black, gray.
- 5676 - 5688 Shale (90%), gray, some black fossiliferous shale. Limestone (10%), tan, grayish tan, brown, fossiliferous packstone.
- 5688 - 5703 Shale (90%), gray, some black, fossiliferous. Limestone (10%), tan, grayish brown, coarse grained fossiliferous packstone.

Drill-Stem Test No. 1 5562'-5703', Pennsylvanian Morrow. Open hole test.

30-60-60-120

I.O. Surface Blow, Steady throughout, no increase.

F.O. Surface Blow, Steady throughout, no increase.

Recovery: 15' Mud.

Hydrostatic Pressures 2592-2524 psi Calc. MW 9.1 ppg

Flow Pressures 44-44:44-44 psi

Shut-in Pressures 100-89 psi

Bottom Hole Temperature NR

Trilobite Testing Co., L.L.C., Shane McBride, Tester

- 5703 - 5711 Shale (85%), gray, greenish gray, fossiliferous. Limestone (15%), tan, grayish tan, packstone, wackestone.
- 5711 - 5719 Shale (95%), gray, greenish gray, some black, fossiliferous, pyritic. Limestone (5%), tan, grayish tan, wackestone, mudstone. Sandstone (trace), light gray, fine grained.

- 5719 - 5731 Shale (95%), gray, greenish gray, some black, fossiliferous, pyritic. Limestone (5%), grayish tan, brown, tan, wackestone, packstone, mudstone. Sandstone (trace), white, fine grained.
- 5731 - 5741 Shale (85%), gray, greenish gray, some black, fossiliferous, pyritic. Limestone (15%), brown, grayish tan, gray, mudstone, wackestone, some packstone.
- 5741 - 5748 Limestone (85%), gray, dark grayish tan, grayish brown, packstone, wackestone. Shale (15%), gray, greenish gray, black.
- 5748 - 5759 Limestone (55%), gray, grayish tan, buff, packstone, wackestone, fossiliferous. Shale (45%), gray, greenish gray, black.
- 5759 - 5770 Limestone (95%), buff, white, tan, coarse grained packstone. Shale (5%), gray, light green, black.
- 5770 - 5778 Limestone (90%), buff, white, tan, coarse grained fossiliferous packstone, some coarse grained oolitic packstone. Shale (10%), gray, greenish gray, pyritic

**Terra Rossa 5778' -3008'**

- 5778 - 5790 Limestone (90%), buff, white, tan, coarse grained fossiliferous packstone, some coarse grained oolitic packstone. Shale (10%), gray, greenish gray, trace purple, light green shale.
- 5790 - 5799 Shale (80%), gray, greenish gray, ochre, purple, dark red, red-green mottled, light green. Limestone (20%), buff, white, tan, grayish tan, packstone, wackestone.
- 5799 - 5811 Shale (50%), gray, greenish gray, ochre, purple, dark red, red-gray mottled. Limestone (50%), buff, grayish tan, some limestone with red hematitic staining, packstone, wackestone.
- 5811 - 5822 Limestone (60%), buff, gray, tan, pink, red, wackestone, packstone, mudstone. Shale (40%), gray, greenish gray, light green, red, ochre, purple.
- 5822 - 5830 Shale (80%), gray, greenish gray, light green, red, ochre, purple. Limestone (20%), light gray, buff, red, mudstone, wackestone, packstone.
- 5830 - 5840 Shale (50%), gray, greenish gray, light green, red, ochre, purple. Limestone (50%), light gray, mudstone, dolomitic, trace buff packstone.
- 5840 - 5850 Shale (65%), gray, greenish gray, green, ochre, purple, dark red. Limestone (35%), light gray, grayish tan, mudstone, wackestone.

**Ste. Genevieve 5856' -3086'**

- 5850 - 5859 Shale (50%), gray, greenish gray, ochre, purple, dark red, green. Limestone (10%), light gray, grayish tan, mudstone, wackstone. Limestone (40%), white, fine grained silty packstone.
- 5859 - 5869 Limestone (85%), white, fine grained silty packstone, some limestone has brown asphaltic stain, yellow fluorescence, bleeding cut, good residual ring, no visible porosity. Shale (10%), gray, greenish gray, ochre, purple, dark red, green, black. Limestone (5%), light gray, tan, mudstone, wackstone.
- 5869 - 5878 Limestone (85%), white, fine grained silty packstone, some limestone has brown asphaltic stain, yellow fluorescence, bleeding cut, good residual ring, no visible porosity. Shale (10%), gray, greenish gray, ochre, purple, dark red, green, black. Limestone (5%), light gray, tan, mudstone, wackstone.
- 5878 - 5893 Limestone (90%), white, fine grained silty packstone, some limestone has brown asphaltic stain, yellow fluorescence, bleeding cut, good residual ring, no visible porosity. Shale (10%), gray, greenish gray, ochre, purple, dark red, green, black.
- 5893 - 5903 Limestone (100%), white, fine grained silty packstone, some limestone has brown asphaltic stain, yellow fluorescence, bleeding cut, good residual ring, no visible porosity.
- 5903 - 5913 Limestone (100%), white, fine grained silty packstone, some limestone has brown asphaltic stain, yellow fluorescence, bleeding cut, good residual ring, no visible porosity.
- 5913 - 5922 Limestone (100%), white, fine grained silty packstone, some medium grained packstone, some limestone has brown asphaltic stain, yellow fluorescence, bleeding cut, good residual ring, no visible porosity.
- 5922 - 5933 Limestone (100%), white, fine-medium grained packstone, some limestone has brown asphaltic stain, yellow fluorescence, bleeding cut, good residual ring, no visible porosity.
- 5933 - 5941 Limestone (100%), white, fine-medium grained packstone, some limestone has brown asphaltic stain, yellow fluorescence, bleeding cut, good residual ring, no visible porosity. Chert (trace), orange, dark gray.
- 5941 - 5949 Limestone (100%), white, fine-medium grained packstone, some limestone has brown asphaltic stain, yellow fluorescence, bleeding cut, good residual ring, no visible porosity. Chert (trace), dark brown, dark gray.
- 5949 - 5954 Limestone (100%), buff, white, fine grained packstone, wackstone. Chert (trace), white, tan, light orange. Note: Shut down pump at 5943' to replace pump liner gasket. Sample quality went to s--t. This sample is 40% Terra Rossa shales, following samples are worse.

- 5954 - 5970 Limestone (100%), buff, white, fine grained packstone, wackestone, coarse grained oolitic packstone, trace oomoldic porosity, no show of oil. Chert (trace), white, tan, orange. Mud Gas 21<8>20 Units, 5958'-5969'. Sample is 50% Terra Rossa shales.
- 5970 - 5981 Limestone (100%), buff, white, packstone, wackestone, some coarse grained oolitic packstone, fine grained packstone. Chert (trace), white, orange. Sample is 40% Terra Rossa shales.
- 5981 - 5992 Limestone (100%), buff, white, tan, packstone, wackestone, coarse-medium grained oolitic packstone, some chlorite. Sample is 50% Terra Rossa shales.
- 5992 - 6001 Limestone (100%), buff, tan, packstone, coarse grained oolitic packstone, wackestone. Sample is 10% Terra Rossa shales.
- 6001 - 6009 Limestone (100%), buff, tan, packstone, oolitic packstone, wackestone, fossiliferous. Chert (trace), white, tan, light gray. Sample is 15% Terra Rossa shales.
- 6009 - 6022 Limestone (100%), buff, tan, packstone, oolitic packstone, wackestone. Shale (trace), green. Sample is 15% Terra Rossa shales.
- 6022 - 6031 Limestone (100%), buff, tan, packstone, oolitic packstone, wackestone. Shale (trace), green. Sample is 40% Terra Rossa shales.
- 6031 - 6041 Limestone (100%), buff, tan, packstone, oolitic packstone, wackestone. Shale (trace), green. Chert (trace), tan, white. Sample is 60% Terra Rossa shales.
- 6041 - 6049 Limestone (100%), buff, tan, packstone, oolitic packstone, wackestone. Shale (trace), green. Sample is 75% Terra Rossa shales.
- 6049 - 6060 Limestone (100%), buff, tan, packstone, oolitic packstone, wackestone. Shale (trace), green. Sample is 85% Terra Rossa shales.
- 6060 - 6068 Limestone (100%), buff, tan, packstone, oolitic packstone, wackestone. Shale (trace), green. Sample is 75% Terra Rossa shales.
- 6068 - 6080 Limestone (100%), buff, tan, packstone, some oolitic packstone, wackestone. Shale (trace), green. Sample is 60% Terra Rossa shales.
- 6080-6090 Limestone (100%), buff, tan, packstone, wackestone. Shale (trace), green. Sample is 65% Terra Rossa shales.
- 6090 - 6100 Limestone (100%), buff, tan, packstone, wackestone. Shale (trace), green. Chert (trace), white. Sample is 65% Terra Rossa shales.

- 6100 - 6110 Limestone (100%), buff, tan, packstone, wackestone. Shale (trace), light green. Chert (trace), white, tan, light gray. Sample is 45% Terra Rossa shales.
- 6110 - 6119 Limestone (100%), buff, tan, packstone, wackestone. Shale (trace), light green, light gray. Chert (trace), white, tan. Sample is 30% Terra Rossa shales.
- 6119 - 6132 Limestone (100%), buff, tan, packstone, wackestone. Shale (trace), light green, light gray. Chert (trace), white, light gray. Sample is 15% Terra Rossa shales. Samples are cleaning up.
- 6132 - 6141 Limestone (100%), buff, light tan, packstone, wackestone. Chert (trace), white.
- 6141 - 6147 Limestone (100%), buff, tan, packstone, wackestone, some mudstone. Chert (trace), white.
- 6147 - 6150 Limestone (100%), tan, wackestone, mudstone, some packstone. Shale (trace), light green. Chert (trace), white.

**Total Depth Driller 6150' -3380'**

**Total Depth Logger 6137' -3367'**

Drill-Stem Test No. 2 5886'-5994' (Driller) 5872'-5980' (Logger),  
Mississippian Ste. Genevieve. Straddle test after logging.

30-60-30-120

I.O. Surface Blow, Built to 1 1/4".

F.O. Bubbled when tool opened, no blow. Tool was plugging (bottom  
choke or shut-in tool) during F.O. .

Recovery: 92' Mud.

Sampler: 4000 MI Mud @ <25 psi

Hydrostatic Pressures 2883-2756 psi Calc. MW 9.3 ppg

Flow Pressures 86-107:269-269 psi

Shut-in Pressures 1594-1721 psi

Bottom Hole Temperature 124° F

Trilobite Testing Co., L.L.C., Shane McBride, Tester

## SUMMARY

The Ensign Operating Co. No. 1-3 Koehn C N/2, SW Sec. 3, T32S, R33W, Meade County, Kansas was a 6150 foot well to evaluate the Jaguar Prospect. The main objective of the well was to evaluate the Pennsylvanian Morrow sandstones for commercial oil production. Secondary objectives were the evaluations of the Chester sandstones, and Mississippian Ste. Genevieve limestones for commercial oil production. Another objective was to evaluate any significant oil and gas shows encountered while drilling the well to total depth.

The expected sandstones in the Morrow that produce oil and gas in this area were not present. Shows in the Morrow and Chester were drill-stem tested. This test recovered drilling mud with low pressures. A log anomaly with a corresponding mud gas detector show in the Mississippian Ste. Genevieve was drill-stem tested after logging the well. This test also recovered drilling mud.

After an evaluation of the lithologic samples, drill-stem test data and bore hole geophysical logs, it was determined that the well was not capable of oil and gas production from the formations in the Pennsylvanian and Mississippian. The well was plugged and abandoned on February 17, 1995.