

WELL REPORT

KANSAS-NEBRASKA NATURAL GAS COMPANY

SPRINGDALE STORAGE WELL NO. 5

SE $\frac{1}{2}$ NE $\frac{1}{2}$ of Section 16, T8N, R53W
Logan County, Colorado

A. L. BERGREN, JR.
Consulting Geologist

December 1, 1969

BIT RECORD:

<u>NO.</u>	<u>SIZE</u>	<u>MAKE</u>	<u>TYPE</u>	<u>IN</u>	<u>OUT</u>	<u>FOOTAGE</u>	<u>HOURS</u>
A	12 1/4"	Varel	V3S	0	520	520	8 3/4
1	7 7/8"	Varel	V3S-J	520	3598	3078	23 1/4
2	7 7/8"	Varel	V3S-J	3598	4496	898	19 3/4
3	7 7/8"	Varel	V3S-J	4496	4840	344	14 3/4
4	7 7/8"	Varel	V2	4840	4965	125	10 1/2

MUD RECORD:

<u>DATE</u>	<u>GEL</u>	<u>CAUSTIC</u>	<u>QUEBRACHO</u>	<u>SODA ASH</u>	<u>MAGCOPHOS</u>	<u>DRISCOS</u>
11/20/69	53 sx.	100 lbs.				
11/22/69					150 lbs.	
11/23/69	30 sx.	150 lbs.	12 sx.	150 lbs.		
11/25/69	20 sx.	50 lbs.				1 sack
<u>TOTAL</u>	<u>103 sx.</u>	<u>300 lbs.</u>	<u>12 sx.</u>	<u>150 lbs.</u>	<u>150 lbs.</u>	<u>1 sack</u>

FORMATION TOPS: (Adjusted to Schlumberger measurements)

Elevation: 4162' GR
4170' KB

Niobrara	3929	(+ 241)
Carlile	4304	(- 134)
Greenhorn	4510	(- 340)
Bentonite	4659	(- 489)
"D" Sand	4754	(- 584)
"J" Sand	4854	(- 684)

Total Depth 4965' Driller 4963' Schlumberger

II

WELL HISTORY

- 11/20/69 Moved in and spudded. Drilled 12 1/4" hole to 520'. Added 53 sx. gel and 100 lbs. caustic. Set 16 joints of 24 lb., plastic coated, 8 5/8" surface casing at 509' KB, cemented to surface with 325 sacks. The drift is 1/4° at 520'.
- 11/21/69 WOC. Drilled 7 7/8" hole to 1614'. The drift is 1/4° at 1021' and 1/2° at 1520'.
- 11/22/69 Drilled 7 7/8" hole to 3598'. Pulled Bit No. 1 at 3598'. Added 150 lbs. of Magcophos. The drift is 1/2° at 2021', 1° at 2524', 1/2° at 2931' and 1 3/4° at 3464'.
- 11/23/69 Drilled 7 7/8" hole to 4458'. The drift is 1 3/4° at 3997'. Added 30 sacks gel, 150 lbs. caustic, 12 sacks quebracho and 150 lbs. soda ash. The mud weight is 9.6, the funnel viscosity is 44, the water loss is 5.4 and the PH is 8.5.
- 11/24/69 Drilled 7 7/8" hole to 4840'. Pulled Bit No. 2 at 4496' and Bit No. 3 at 4840'. The drift is 1 3/4° at 4496' and at 4840'. The mud weight is 9.9, the funnel viscosity is 80, the water loss is 4.6 and the PH is 8.0. The top of the "D" was picked by drilling time and samples at 4750'. Examination of the samples revealed the sandstones are tight with some scattered shows.
- 11/25/69 Drilled 7 7/8" hole to TD of 4965'. Pulled Bit No. 5 at 4965'. Added 20 sacks gel, 50 lbs. caustic and one sack Driscos. The mud weight is 9.9, the funnel viscosity is 61, the water loss is 4.8 and the PH is 8.0. The "J" top was picked by drilling time and samples at 4851'. Examination of the samples revealed tight sand with some good shows at the top. A very few small fragments of extremely friable, porous sandstone with very faint fluorescence and a great amount of unconsolidated sand grains were noted as the bulk of the "J" was drilled.
- 11/26/69 Ran Schlumberger Induction and Combination Microlog - Formation Density logs. On basis of these logs, DST No. 1 was run. See Part I for details. The crew was preparing to run production string as the geologist left the well.

III

LITHOLOGY

Note: Samples neither lagged back nor adjusted to Schlumberger measurements.

- 4710-4740 Shale, gray to dark gray.
- "D" Sand
- 4740-4760 Sandstone, gray to dark gray, fine to medium grain, tightly cemented, no porosity, no show; sandstone, buff, fine to medium grain, hard and tight, clean, mostly without a show but some with poor to fair fluorescence, spotty light stain.
- 4760-4765 Siltstone, light gray to buff, hard to friable, no show; trace of sandstone, as above, with poor fluorescence.
- 4765-4770 Siltstone, as above; trace of sandstone, brown, fine to medium grain, very tight, fairly friable, very faint fluorescence, spotty stain.
- 4770-4775 Sandstone, gray, fine grain, tight, friable, no show; trace of sandstone, buff, fine grain, tight, very faint fluorescence, possible spotty stain.
- 4775-4780 Sandstone, light gray, fine to medium grain, tight, well cemented, quite hard, clean, no show; sandstone, gray to dark gray, fine grain, tight, slightly dirty, no show; trace of sandstone, light gray, fine grain, low porosity, clean, slightly glauconitic, excellent fluorescence, light stain; trace of sandstone, white to light gray, fine to medium grain, tight, clay-filled, fairly friable, excellent fluorescence, light stain.
- 4780-4790 Sandstone, gray, very fine grain, very hard and tight, no show; sandstone, light gray, fine to medium grain, tight, hard, clean, no show; trace of sandstone, light gray, fine grain, tight, well cemented, quite hard, clean, excellent fluorescence, light stain.
- 4790-4840 Shale, gray to dark gray; siltstone, light gray, shale laminae; trace of sandstones, as above.
- 4840-4850 Cavings following trip with siltstone, gray to dark gray, very hard.
- 4850-4860 Siltstone, as above; considerable pyrite.
- "J" Sand
- 4860-4865 Sandstone, white, fine grain, tight, clay-filled, no show; trace of sandstone, tan, fine grain, tight, hard, well cemented, excellent fluorescence, light even stain.

- 4865-4870 Sandstone, white, medium to coarse grain, some fair to good porosity, some clay-filled and tight, initially faint fluorescence which fades after short exposure; sandstone, clay-filled, as above.
- 4870-4875 Sandstone, white, faint fluorescence, as above, no stain; sandstone, gray, fine grain, tight, dirty, no show. (Very little sandstone in the sample)
- 4875-4880 Trace of sandstone, white, as above, no show; large amount of unconsolidated sand grains which suggest that the very friable pay zone is being ground up, no show. (Very little consolidated sandstone in the sample)
- 4880-4890 Trace of sandstone, white, as above, very faint fluorescence, no stain; unconsolidated sand grains, as above. (Very little consolidated sandstone in the sample)
- 4890-4895 Trace of sandstone, white, faint fluorescence, as above; trace of sandstone, light gray, fine grain, tight, clay-filled, no show. (Very little consolidated sandstone in the sample)
- 4895-4900 Large amount of unconsolidated sand grains; trace of sandstone, gray, fine grain, tight, dirty, hard, no show; trace of sandstone, light gray, fine grain, hard and tight, clean, no show. (Very little consolidated sandstone in the sample)
- 4900-4905 Trace of sandstone, gray, as above, no show; trace of sandstone, white, fine to medium grain, porous, very friable, clean, no show. (Very little consolidated sandstone in the sample)
- 4905-4920 Sandstone, light gray, fine to medium grain, poor to fair porosity, very friable, clean to slightly clay-filled, no show.
- 4920-4925 Trace of sandstone, as above, no show; trace of sandstone, fine to medium grain, low porosity, very friable, clean, no show. (Very little consolidated sandstone in the sample)
- 4925-4930 No consolidated sandstone in this sample.
- 4930-4935 Trace of sandstone, white, fine grain, tight, clay-filled, no show. (Very little consolidated sandstone in the sample)
- 4935-4940 No consolidated sandstone in this sample.
- 4940-4950 Sandstone, gray, fine to medium grain, tight, clay-filled, no show. (Limited amount of consolidated sandstone in the sample)
- 4950-4955 Sandstone, light gray to buff, fine grain, fair to good porosity, clean, spotty light stain; trace of sandstone, light gray, fine grain, moderately hard and tight, clean, no show. (Very little sandstone, in the sample)

4955-4960 Trace of sandstone with spotty stain, as above; trace of sandstone, light gray, fine grain, very hard and tight, no show. (Very little sandstone in the sample)

4960-4965 Trace of sandstone, gray, fine grain, tight, clay-filled, no show. (Very little sandstone in the sample)

4965 Circulated 1 Hour

20 Minute Circulated Sample

Trace of sandstone, as above, no show. (Very little sandstone in the sample)

40 Minute Circulated Sample

Shale, gray to dark gray; cavings of sandstones noted above.

60 Minute Circulated Sample

Shale, gray to dark gray; cavings of sandstones noted above.

IV

COMMENTS

Based on the log character, the results of the drill stem test and the almost complete lack of consolidated sandstone and the abundance of unconsolidated sand grains noted in the sample study, it is obvious that the "J" Sand at this spot is an excellent reservoir. The amount of gas which can be stored in these rocks will be limited only by the amount of structural closure present.

Ad. Dugan