NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR N0. 31

Summary of the Zach Brooks Drilling Co. Edwin Berentson No. l
Bottineau County, North Dakota

By Morton Strassberg

December, 1953

Zach Brooks Drilling Company Edwin Berentson No. 1, Bottineau County, North Dakota, C SW SE Section 21, T. 163 N., R. 80W., (660 feet from S. line and 1980 feet from E. line) Elevation 1505 K.B., 1495 G.L.

The Zack Brooks Drilling Company Edwin Berentson No. l was spudded November 11, 1952 and 10 3/4" casing was set at 248 feet with 200 sacks cement. Drilling was completed November 29, 1952 and 5 1/2 inch casing was set to 3500 feet with 200 sacks cement.

Cores

Core #1 3268-3293
#2 3295-3345
#3 3347-3397
#4 3397-3438 1/2
#5 3438 1/2-3483
#6 3483-3527
#7 3527-3547
#8 3547-3560 1/2
#9 3560 1/2-3610
#10 3610-3633

Tests

DST #1 3233-3268

Tool open 45 minutes, open top and 1/2 inch bottom choke, good strong blow, recovered 1620 feet fluid; 30O feet very slightly oil and gas cut muddy brackish water and 1320 feet fairly and grading downward to estimated 50% oil and slightly gas cut muddy brackish water, initial flowing pressure 250#, final bottom hole flowing pressure 750#, bottom hole shut in for 15 minutes 1700#, hydrostatic pressure 1800#.

DST #2 3245-3255

Double packer, tool open 1 1/2 hours, open top and 1/2 inch bottom chokes, fair blow, recovered 360 feet fluid, estimated 300 feet of almost free 38 gravity oil and 60 feet very slightly brackish emulsion cut oil, bottom hole flowing pressure 0#, bottom hole shut in 15 minutes 1400#, hydrostatic pressure 1800#.

DST #3 3317-3345

Tool open 20 minutes, tool open top choke and ½ inch bottom choke, no blow, recovered 20 feet slightly oil and gas cut mud, bottom hole flowing pressure 0#, bottom hole shut in 15 minutes 0#, hydrostatic pressure 1800#.

DST #4 3353-3438 1/2

Tool open 12 minutes, open top and 1/2 inch bottom choke, very strong blow, recovered 180 feet slightly to fairly oil and gas cut mud, no water, bottom hole flowing pressure 0#, bottom hole shut in 15 minutes 450# and still climbing, hydrostatic pressure 2000#. (Note: short test due to very strong blow and approaching darkness).

DST #5 3434-3547

Tool open 1 3/4 hours, fairly strung blow decreasing toward end of test, open top and 1/2 inch bottom choke, recovered 210 feet fluid being very slightly oil and gas cut brackish muddy water, bottom hole flowing pressure 0#, bottom hole shut in 30 minutes 400#, hydrostatic pressure 2000#.

DST #6 3344-3388

Tool open 2 1/2 hours, open top and 1/2 inch bottom choke, good strong blow, recovered 240 feet fluid being estimated 70% oil and gas cut mud and water, no salt water, bottom hole flowing pressure 0#, bottom hole shut in 15 minutes 1100#, hydrostatic pressure 2000# (water analysis showed 38,000 PPM).

Perforated: 3352-3385

With 132 jet shots (McCullough 5/8 inch diameter hole), 500 gallons acid formation broken down at 1400#, broke back 1900# and took acid at rate of 1 bbl. per minute, broke back 2200#. Swabbed estimated 2 bbls. fluid per hour of estimated 75% oil for 48 hours.

Perforated: 3350-3365

With 61 gun shots (Lane-Wells 15/32 diameter holes)

Perforated: 3414 -3430

With 65; 3434-3450 with 65 gun shots (Lane Wells). Run and set Baker tool at 3390 feet, swabbed 12 hours and swabbed dry. 1000 gallons acid, built up 4000#, no take; reset packer at 3330, 1000 gallons acid, built up 2300#, no take; pulled packer and tubing and found tool was plugged with gravel.

Ran Lane-Wells log to 3467 feet zeroed at top rotary bushing instead of drive bushing.

Set Baker T and P tool at 3395 feet; backed off and picked up stinger and Otis choke with bottom zone blanked off; sealed stinger in packer.

1000 gallons acid in perforations 3350-3356; swabbed acid water and oil for 36 hours, swabbed at rate of 3 bbls. fluid per hour (70% oil), well continued to swab at approximate same rate with possible increase in oil for next 48 hours.

Pumping unit installed.

Production began January 1, 1953 after well had been cleaned the well pumped the following barrels of oil per day:

1 - 1	21 B.O.	1 - 31	8 B.O.
1 - 2	11	2 - 1	11
1 - 3	16	2 - 2	11
1 - 4	8	2 - 3	13
1 - 5	11	2 - 4	16
1 - 6	11	2 - 5	11
1 - 7	13	2 - 6	11
1 - 8	8	2 - 7	13
1 - 9	3	2 - 8	11
1 - 10	21	2 - 9	2
1 - 11	11	2 - 10	Shut in
1 - 12	5	2 - 11	33
1 - 13	Shut in	2 - 12	Shut in
1 - 14	Shut in	2 - 13	11
1 - 15	3	2 - 14	Shut in
1 - 16/22	Shut in and sand frac. w/3000 gallons	2 - 15	19
		2 - 16/18	Shut in
1 - 23	27	2 - 19	5
1 - 24	30	2 - 20	16
1 - 25	19	2 - 21/22	Shut in
1 - 26	16	2 - 23	30
1 - 27	16	2 - 24/27	Shut in
1 - 28	16	2 - 28	38
1 - 29	11		
1 - 30	8		

Total oil produced through July 1953, 1484 barrels.

Formation Tops

Formation tops were determined from samples, core chips, electric log, micro log and radioactivity log, not all formation tops called in the following list. Colors determined from rock color chart.

Cretaceous System	Depth
Niobrara Formation	1403
Greenhorn Formation	1720
Dakota	2190 (Electric log)
Jurassic System	
Morrison Formation	2400(Electric log)
Sundance Formation	2470(Electric log)
Piper Formation	2950
Triassic System	
Spearfish Formation	3168
Mississippian System	
Charles Formation	3337
Mission Canyon	3584

From	To	Formation
284	290	Limestone, light gray, argillaceous.
290	470	Shale, medium gray.
470	500	Shale, medium gray, white bentonite.
500	530	Shale, medium gray, micaceous.
530	590	Shale, medium light gray.
590	680	Shale, light to medium light gray.
680	710	Shale, medium light gray.
710	740	Shale, light to medium light gray.
800	860	Shale, light to medium light gray.
890	920	Shale, medium light to medium dark gray.
920	950	Shale, light to medium gray.
980	1010	Shale, light gray.
1010	1040	Shale, light to medium light gray.
1040	1070	Shale, light gray bentonitic and medium dark gray calcareous.
770	1130	Shale, medium light to light olive gray, bentonitic.
1160	1190	Shale, medium light gray.
1190	1210	Shale, medium to dark gray, bentonitic.
1300	1330	Shale, medium dark gray bentonitic.
Niobrara 1403		
1450	1480	Shale, medium dark to dark gray, calcareous.
1500	1520	Shale, medium dark gray. Few medium grains subrounded frosted quartz.
1520	1550	Shale, medium to medium dark gray.
1550	1560	Shale, medium to medium light gray.
1560	1580	Shale, medium to medium dark gray, calcareous, bentonitic.
1580	1590	Shale, medium dark to dark gray, calcareous.
1590	1600	Shale, medium to medium dark gray, calcareous.
1600	1610	Shale, medium dark and light olive gray, bentonitic.
1610	1650	Shale, medium dark and olive gray.
1650	1660	Shale, medium dark to dark gray, bentonitic.
1660	1670	Shale, medium dark to dark gray.
1680	1690	Shale, same as above.
1690	1710	Shale, medium dark to hark gray, bentonitic.
Greenhorn 1720		
1720	1730	Shale, medium to medium dark gray, calcareous.
1740	1750	Shale, medium dark gray, calcareous, white specks.
1770	1790	Shale, medium dark gray, calcareous, white specks.
1790	1820	Shale, medium dark gray, calcareous, white specks, bentonite.
1820	1840	Shale, medium dark gray, bentonitic.
1840	1850	Shale, medium dark gray, calcareous.
1850	1860	Shale, medium dark gray, white specks, calcareous.
1860	1880	Shale, medium dark gray, bentonitic.
1880	1890	Shale, medium dark gray, white, pyritic.
1890	1910	Shale, medium dark gray, bentonitic.
1920	1930	Shale, medium dark gray, bentonitic.
2000	2030	Shale, medium dark gray, light gray, bentonite.
2060	2080	Shale, same as above.

From	To	Formation
2100	2110	Shale, medium dark gray.
2110	2120	Shale, medium to medium dark gray, calcareous, bentonitic.
2120	2140	Shale, medium to medium dark gray.
2140	2150	Shale, medium to medium dark gray, bentonitic.
2170	2180	Shale, medium to medium dark gray, bentonitic.
Dakota 2190		
2210	2220	Shale, medium to medium dark gray, bentonitic.
2250	2260	Sandstone, medium to coarse grained, subrounded to subangular, frosted, slightly pyritic.
2260	2270	Shale, medium dark gray, bentonitic. Medium subrounded to subangular quartz.
2290	2300	Sandstone, medium to coarse grained, subangular to subrounded, frosted.
2300	2310	Shale, medium gray, bentonitic. Quartz subrounded to subangular, medium grained, frosted.
Morrison 2400		
Sundance 2470		
2700	2710	Shale, median dark gray, calcareous.
2710	2720	Shale, medium to medium dark gray and little pale red shale. Little fine to medium grains quartz.
2720	2730	Shale, medium to medium dark gray. Pale red and greenish gray calcareous shale.
2730	2740	Shale, pale red and greenish gray, calcareous.
2740	2750	Shale, pale red and greenish gray, calcareous and medium to medium dark gray.
2750	2760	Shale, greenish gray to pale red, calcareous and medium gray to medium dark gray.
2760	2770	Shale, as above, pyritic.
2770	2780	Shale, pale red, calcareous and medium gray.
2780	2800	Shale, light to medium gray and pale red calcareous.
2800	2830	Shale, medium to medium dark gray and little pale calcareous. Free fine grained frosted quartz.
2830	2850	Shale, light to medium dark grey and little pale red shale. Very light gray finely granular limestone.
2850	2860	Shale, light to medium dark gray. Little very fine grain calcareous sandstone.
2860	2870	Shale, light to medium gray and pale red calcareous.
2870	2880	Shale as above, little very fine grained calcareous sandstone.
2880	2890	Shale as above, more sandstone.
2890	2900	Shale, medium light to medium dark gray, and little pale red. Very fine grained calcareous sandstone. Fine to medium grained free quartz.
2900	2910	Limestone, very light to yellowish gray, dolomitic, pinpoint porosity.
2910	2920	Limestone as above, medium to medium dark grayshale.
2920	2930	Limestone, yellowish gray, dolomitic, earthy.

From	To	Formation
2930	2940	Limestone, pale yellowish brown, finely granular. Medium to medium dark gray shale.
2940	2950	Limestone, pale yellowish brown to yellowish gray, fine grained earthy to finely granular.
Piper 2950		
2950	2980	Limestone, white to very light gray, chalky.
2980	3030	Limestone, white to very light gray, earthy, medium gray shale.
3030	3040	Limestone, very light gray, fine grained, chalky to earthy, medium to medium dark gray shale.
3040	3050	Limestone, very light to yellowish gray, fine grained, dense. Medium to medium dark gray shale. White, finely sucrosic anhydrite.
3050	3060	Anhydrite, white, finely sucrosic. Medium to medium dark gray shale. Little very light gray limestone.
3060	3070	Limestone, yellow to medium light gray dolomitic. Medium to medium dark gray shale. White anhydrite.
3070	3090	Anhydrite, white, finely sucrosic. Medium to medium dark gray shale.
3090	3100	Anhydrite, white, finely sucrosic. Moderate red and medium to medium dark gray shale. Little yellow gray limestone
3110	3120	Shale, medium to medium light gray.
3120	3160	Shale, dark, light brownish, and olive gray. Little white anhydrite.
3160	3170	Shale, moderate red and medium to medium dark gray. Considerable white anhydrite.
Spearfish 3168		
3170	3200	Shale as above, considerable fine to medium grained free quartz.
3200	3210	Sandstone, frosted to slightly iron stained, very fine to fine grained. Pale red and medium dark gray shale.
3210	3220	Sandstone, fine to very fine grained, subrounded, frosted to slightly iron stained. Grayish orange pink siltstone.
3230	3240	Siltstone, grayish orange pink, arenaceous, argillaceous.
3240	3250	Sandstone, very fine grained, argillaceous, iron stained.
3250	3268	Sandstone, very fine to fine grained, calcareous, medium dark gray shale.
3268	3270	Sandstone, silty pale yellowish brown.
3270	3275	Sandstone, light brown and white, silty, fair oil and gas odor.
3275	3293	Siltstone, light brown, anhydrite inclusions and streaks, some streaked porosity and permeability. No shows.
3295	3299	Siltstone, light brown, white streaks, no shows.

From	To	Formation
3299	3301	Siltstone, yellow gray, faint oil and gas odor and taste, salty taste.
3301	3302	Sandstone, light brown, fine grained, silty.
3302	3303	Siltstone, light brown, salty.
3303	3310	Siltstone, light brown, arenaceous.
3310	3312	Sandstone, light gray, argillaceous, siltstone streaks, slightly oil odor, salty taste.
3312	3319	Sandstone, light brown, argillaceous.
3319	3322	Sandstone, greenish gray, very fine grained, light brown siltstone streaks, streaked porosity, and permeability, fair oil and gas odor, bleeding oil.
3322	3331	Siltstone, grayish red, arenaceous.
3331	3335	Siltstone, pale brown and yellowish gray with pale brown streaks, bleeding oil in top three feet.
Charles 3337		
3335	3339 1/2	Siltstone, grayish red, arenaceous, dolomitic, interbedded anhydrite.
3339 1/2	3340 1/2	Limestone, pale brown, dense, interbedded with anhydrite.
3340 1/2	3343	Limestone, yellow gray, lithographic.
3347	3352	Limestone, pale yellowish brown, finely sucrosic to lithographic, slightly anhydritic.
3352	3358	Limestone, pale yellowish brown, finely sucrosic, pinpoint to vugular porosity, fractures, thin seams and small inclusions anhydrite.
3358	3361	Limestone, pale brownish yellow to yellow gray, dense, anhydrite inclusions.
3362	3366	Anhydrite, grayish red and pale red, dolomite inclusions and streaks.
3366	3368 1/2	Anhydrite, pale red to gray red, small limestone inclusions.
3368 1/2	3370	Anhydrite, white to medium gray.
3370	3370 1/2	Dolomite, light brownish gray, dense.
3370 1/2	3375	Anhydrite, light brownish gray to dusky red, included dolomite.
3375	3378	Limestone, medium brown, broken with anhydrite.
3378	3381	Dolomite, yellowish gray, fine grained, dense. Moderate brown anhydrite inclusions.
3381	3385	Dolomite, pale red dolomitic.
3385	3389	Limestone, white to pinkish gray, lithographic, tight, broken with anhydrite.
3389	3397	Anhydrite, pale red.
3397	3413	Anhydrite, grayish pink, pale red and light gray inclusion and thin seams limestone.
3413	3419	Anhydrite, pale red to light gray, seams and inclusions of limestone.
3419	3424	Limestone, pale yellow, fine grained to sublithographic, broken with seams and inclusions of anhydrite, fair oil stain and odor.

From	To	Formation
3424	3426	Limestone, yellowish gray, fine grained to micro sucrosic, stylotic, vugular porosity, fractured, slight to fair oil show.
3426	3428	Limestone, yellow gray, micro sucrosic, anhydrite inclusions, tight, slight show oil.
3428	3434	Limestone, yellowish gray, microsic, some pinpoint porosity, slightly anhydritic.
3434	3436	Limestone, yellowish gray, micro sucrosic, pinpoint porosity, slightly anhydrite, slight oil show.
3436	3437	Limestone as above, no shows.
3437	3438 1/2	Anhydrite, white, broken with inclusions of light olive gray limestone.
3438 1/2	3450	Limestone, very light gray, sublithographic, fractured, streaked porosity and permeability. Some streaked anhydritic limestone, fair show oil in porous zones.
3450	3470	Broken anhydrite, limestone and dolomite, light brownish gray to pale red, and yellow gray.
3470	3476	Limestone, yellowish gray, sublithographic, some oil odor and stain at base and top interval.
3476	3479	Limestone, grayish orange pink to light brownish gray, finely granular to micro sucrosic, anhydritic, slight stain in fractures in bottom.
3479	3483	Anhydrite, grayish red.
3483	3560 1/2	Broken red and white anhydrite with some streaks and inclusions of lithographic lime and sucrosic dolomite.
3560 1/2	3570 1/2	Broken red and white anhydrite with inclusions of lithographic limestone and sucrosic dolomite.
3570 1/2	3610	Limestone, light brown, fine to medium grain, streaked vugular porosity, slight to fairly porous and permeable, some thin anhydrite seams, salty taste.
Mission Canyon 3584		
3610	3633	Limestone, light brown, fine to medium grain, fossiliferous, vugular, fair porosity and permeability, salty taste.
Total Depth		