

NORTH DAKOTA GEOLOGICAL SURVEY

Wilson M. Laird, State Geologist

· ADDITIONAL WELL LOGS FOR NORTH DAKOTA

Compiled by

Wilson M. Laird, Marjorie Ness, Clarence Klipfel

Report of Investigations Number 7

Grand Forks, North Dakota, 1952

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INTRODUCTION

The North Dakota Geological Survey has had numerous requests for well logs which have not been published. In the files of the Survey are numerous logs mostly of water wells which may be significant, but about which not too much is known as to their reliability or their source. Therefore these logs are being published without any guarantee as to their correctness in any form, but with the thought that some information is better than none.

For additional well logs already published see:

North Dakota Ground Water Studies Numbers 1-15

Selected Deep Well Records, North Dakota Geological Survey Bulletin No. 12.

Subsurface Stratigraphy of the Nesson Anticline,
North Dakota Geological Survey Bulletin 21, Part II

Stratigraphy of North Dakota with Reference to Oil
Possibilities, North Dakota Geological Survey
Report of Investigations No. 2

Gratitude is expressed to all drillers, particularly the water well drillers who submitted information on the wells they have drilled.

ADAMS COUNTY

Well-Log

Reeder, Adams County, North Dakota

Drilled May 1950

By Independent Drilling Company, Aberdeen, South Dakota

<u>FROM</u>	<u>TO</u>	<u>FORMATION</u>	<u>FROM</u>	<u>TO</u>	<u>FORMATION</u>
0	10	Gray clay	410	411	Rock
10	12	Yellow clay	411	444	Sandy shale
12	15	Gray clay	444	459	Shale
15	16	Gravel	459	460	Rock
16	17	Rock	460	480	Shale
17	40	Coal, some sand	480	481	Rock
40	62	Gray clay	481	520	Sand, shale
62	75	Shale	520	521	Rock
75	90	Fine sand	521	542	Shale
90	97	Coal	542	565	Hard and sandy
97	110	Sandy	565	578	Rock, shale streaks
110	118	Shale	578	590	Shale
118	119	Rock	590	615	Sand, coal streaks
119	126	Coal streaks	615	620	Shale
126	130	Shale	620	630	Sand
130	138	Gravel	630	666	Shale
138	140	Shale	666	671	Rock
140	254	Sandy shale	671	704	Shale
254	255	Rock	704	705	Rock
255	303	Shale	705	773	Sandy shale
303	305	Rock	773	773'6"	Rock
305	307	Sand, coarse	773'6"	805	Shale
307	322	Shale	805	832	Shale
322	323	Rock	832	850	Sand
323	350	Shale	850	851	Rock
350	361	Coal, shale streaks	851	902	Sandy shale
361	392	Sandy shale	902	918	Shale
392	393	Rock	918	930	Shale, hard shells
393	410	Shale	930	985	Sandy shale
			985	999	Shale
480 feet test pump			999	1035	Sandy shale
50 feet from ground level used Static head			1035	1040	Shale
pumped 50 G.P.M. for 40 hours; at this			1040	1140	Sandy shale
time water flowed			1140	1141	Rock
Down to 370 feet from ground level			1141	1178	Sandy shale
			1178	1179	Rock
			1179	1258	Sand
			1258	1296	Shale
			1296	1307	Sandy
			1307	1350	Shale

BARNES COUNTY

SE $\frac{1}{4}$ Sec. 13, Twp. 137N., R. 57W., Nome, Barnes County, North Dakota
Elevation 1342' (?)

<u>Depth in Feet</u>	<u>Formation</u>
0 to 40	Soil, sand and clay
40 to 60	Yellow clay
60 to 108	Bluish gravelly clay

Barnes County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>
108 to 270	Tough bluish clay
270 to 271	Iron Ore (?)
271 to 399	Blue clay with thin layers of iron ore at 356
399 to 404	Iron Ore (?) -- softer below
404 to 704	Blue clay with fine sand
704 to 714	Hard clay
714 to 756	Sand and clay mixed; first flow
756 to 756½	Hard iron layer
756½ to 784	Clay with thin hard layer at base
784 to 830	Clay and fine sand
830 to 865	Clay and sand alternating; thin layer of Iron Ore; second flow at top
865 to 887	Clay and sand; third flow at top
887 to 888	Sand with main flow

BENSON COUNTY

TOWN OF LEEDS ARTESIAN WELL, BENSON COUNTY

Elevation 1531' (?)

<u>Depth in Feet</u>	<u>Formation</u>
0 to 100	Glacial Drift
100 to 1737	Hard shale and streaks of limestone
1737 to 1792	Sandrock streaks in shale
1792 to 1822	Shale
1822 to 1832	Good sandstone
1832 to 1835	Shale
1835 to 1860	Sandstone
1860 to 1890	Soft sand and shale
1890 to 2110	Streaky sandstone

Geological Interpretation of Log

<u>Depth in Feet</u>	<u>Formation</u>
0 to 100	Pleistocene Drift
100 to 1737	Pierre, Niobrara and Benton Shales (Upper Cretaceous)
1737 to 2110	Dakota sandstone and other beds

BILLINGS COUNTY

Log of well at Sully Springs, Billings County, North Dakota

Elevation 2570' (?)

<u>Depth in Feet</u>	<u>Formation</u>
0 to 56	Shale
56 to 57	Coal
57 to 86	Shale

Billings County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>
86 to 98	Coal
98 to 246	Shale
246 to 249	Rock
249 to 313	Shale
313 to 322	Coal
322 to 421	Shale
421 to 556	Sand and Shale
556 to 580	Shale
580 to 586	Rock
586 to 631	Sand and Shale

SULLY SPRINGS, NORTH DAKOTA

10" well, total depth 535 ft., completed November 1905. Elevation of water was 260 ft. below surface. Test gave 3000 Gallons per hour.

Elevation

2570-2520	50' shale
2520-2490	2' coal
	28' shale
2490-2478	12' coal
2478-2320	158' shale
2320-2310	3' rock
	7' to water level
2310-2253	64' shale
2253-2244	9' coal
2244-1986	258 shale
1986-1935	6' rock
	45' shale

MEDORA, NORTH DAKOTA

WELL NO. 1

Total depth 941 ft., located opp. sta. 7885-61, 120' north of main track drilled in 1892. Casing for the first 500 ft is 4", balance 3". At a depth of 360 ft. elevation 1889, a flow of 22 gal. per minute was reached. At depth of 622 ft. elev. 1627 well gave flow of 33 gal. per min. Finished well gave flow of 39 gal. per min. with 15 lbs. pressure per square inch.

Elevation

2249-1889

soil and drift
 10" coal
 sand
 2' coal
 soapstone and sand
 23'6" coal
 soap and sandstone
 quicksand

Medora, North Dakota; well No. 1 (con't.)

Elevation

	soapstone
	2'6" coal
	soap and sandstone
1889	First flow
1889-1627	Hard sand rock
	Soap and sandstone
	7'6" coal
	sandstone and slate
	2' coal
	soap and sandstone
	hard sand rock
	soapstone
	3' coal
	soapstone
	2' coal
	soapstone
	2' coal
	soapstone
	hard sand rock
	soapstone and sandstone
	fossil shells
1627	quicksand
	Second flow
	soapstone
	2' coal
	soapstone
	5' coal
	soapstone
	quicksand
	soapstone
	5' coal
	soapstone
	coal
	soapstone
	sand and soapstone
1308	coarse sand and gravel
	Third flow

MEDORA, NORTH DAKOTA

WELL NO. 2

Total depth 500 Ft. located opp. station 7880-44.
 78 ft. north of track, drilled 1904. Casing consist
 of 33 ft. 6", 130 ft. 4½", and 270' 3½". Test when
 completed gave 3000 gal. per hour.
 First flow 272 ft. from surface (elev. 1881)
 Second flow 465'8" from surface (elev. 1787.3)

Elevation

2253-2226	27' clay, sand and gravel
2226-2206	2' coal
	18' clay shale
2206-2153	53' sandstone
2153-2123	30' clay shale
2123-2100	23' coal

Medora, North Dakota; Well No. 2 con't.

Elevation

2100-2033	67' clay shale
2033-2013	5' sandstone
	15' clay and sandstone
2013-1986	2' coal
	25' clay and shale
1986-1946	3' hard sandstone
	37' sand
1946-1928	5' hard sandstone
	19' sand
1928-1912	16' soft sandstone
1912-1854	58' clay and sandstone
1854-1843	11' hard sandstone
1843-1798	45' clay shale
1798-1787.3	2' slate
	8' hard sandstone
	8' cavity, 2nd flow
1787.3-1753	34'4" soft sandstone

Log of well at Medora, North Dakota

Tertiary		FROM	TO
Fort Union			
	Sand	0	30
	Coal	30	31
	Soapstone	31	75
	Coal	75	75½
	Soapstone and sand	75½	123
	Coal	123	146
	Soapstone and Sand	146	186
	Quicksand	186	271
	Soapstone	271	276
	Coal	276	278
	Soapstone and sandstone	278	364
	Coal	364	393
	Sandstone and shale	393	416
	Coal	416	418
	Soapstone and sandstone	418	436
	Hard sand rock	436	441
	Soapstone	441	465
	Coal	506	508
	Soapstone	508	520
	Coal	520	522
	Soapstone	522	536
	Hard sandrock	536	541
	Fossil shells, soapstone and sandstone	541	591
	Quicksand	591	626
	Coal	626	628
	Soapstone	628	631
	Coal	631	636
	Soapstone	636	691
	Soapstone with fossils	691	693
	Quicksand	693	711
	Soapstone	711	761
	Coal	761	766
	Soapstone	766	844
	Coal	844	847

Log of Well No. 2 at Medora, North Dakota (con't.)

	<u>FROM</u>	<u>TO</u>
Soapstone	847	882
Coal	882	883
Soapstone and sandstone	883	915
Coal	915	916
Coarse soft sand	916	931
Sand and gravel	931	941

C.C.C. Camp 2 miles NW. of Medora. Drilled Oct. 1936.

LOG:

0 - 15	Yellow clay
15 - 23	Sandy blue clay
23 - 28	Gray sandstone and soapstone
28 - 40	Blue sand
40 - 40½	Layer rock
40½ - 100	Sandstone
100 - 104	Blue clay, turning darker
104 - 108	Brown clay
108 - 109	Coal
109 - 121	Brown clay
121 - 128	Sandy blue clay
128 - 140	Sandstone
140 - 141	Hard rock
141 - 154	Gray shale
154 - 179	Coal
179 - 200	Gray shale
200 - 203	Brown shale
203 - 212	Sandy gray shale
212 - 215	Gray shale
215 - 219	Brown shale
219 - 236	Light gray shale
236 - 265	Blue shale, turning darker some coal slack.
265 - 265½	Hard shale rock.
265½ - 279	Blue Gray shale
279 - 281	Coal
281 - 298	Blue shale
298 - 306	Gray shale
306 - 323	Soapstone and coal slack water source
323 - 333	Sandstone, blue water source
333 - 349	Sandstone, gray, water source
349 - 354	Hard sandrock, water source
354 - 365	Sandstone, water source
365 - 366	Blue shale

BOWMAN COUNTY

MONTANA-DAKOTA UTILITIES COMPANY

STATEMENT AS TO DEEP TEST DRILLING IN BAKER FIELDS

by Cecil W. Smith, Vice President, Montana-Dakota Utilities Company

BAKER FIELD

In 1934 and 1935 the Baker field, located on the Cedar Creek Anticline in Wibaux and Fallon Counties, Montana and Bowman County, North Dakota, was unitized for the purpose

of producing oil and gas. The units formed were based upon geological information and the areas included in the units were based upon the productive areas in the Judith River Sand which produces gas from wells varying from 700' to 900' deep and upon the productive area in the Eagle Sand with respect to the Units 8-A and 8-B, which production comes from wells from 1200' to 1400' deep. Originally Units 8-A and 8-B were included in what was then designated as Unit 8 and which was formed for the purpose of unitizing lands prior to the drilling of deep test wells in that area. The territory included in Unit No. 8 was based upon geological maps prepared by the U. S. Geological Survey and the limits were determined partly by the location of Government lands in that area. All of these unit plans were approved at various times since 1934 by the Secretary of the Interior.

After Unit No. 8 had been formed and approved by the Secretary of the Interior, Fidelity Gas Company, the wholly owned subsidiary of the Montana-Dakota Utilities Co., arranged for the drilling of the original deep test well, the history of which follows:

Northern Pacific No. 1

This well was located in Sec. 17-4N-62E, Fallon County, Montana. Drilling was commenced on August 27, 1935 and was continued throughout the winter until February 8, when operations were shut down on account of winter weather. Drilling was resumed on April 3, 1936 and on April 18, oil was encountered at a depth of approximately 6740'. Drill stem tests were made and on April 21, a substantial amount of oil was recovered on such a test and it was decided to set casing and test the well for production. The production occurred in a dolomitic limestone. On May 11, casing was run and cemented. From May 16 until July 26, the well production was tested, formation was acidized and it was determined that oil and water were present at this horizon. It was then decided to drill the well deeper and drilling was resumed on July 26. Drilling continued from this horizon until August 21 when additional oil saturation was encountered at a depth of 8130'. This saturation continued to a depth of 8196' which was reached on August 29, 1936. This production was also from a dolomitic limestone. After a Schlumberger survey, it was decided to set casing and a string of 4 3/4" casing was set to a depth of 8124' on September 6. After running tubing, testing was started on September 18. The well flowed a small quantity of oil from this horizon. Swabbing was started and swabbing indicated the production of approximately 1 1/2 barrels per hour. The well was acidized twice but the formation was very tight and acidizing did not increase the production which remained at approximately 1 1/2 barrels per hour. When swabbing was discontinued, the well flowed naturally about one-half barrel per hour. There was no water present in this formation and there is a small amount of gas occurring with the oil. On October 10, work on this well was discontinued. This well was stopped probably 1000' above the granite. After the N. P. No. 1 Well was completed, it was then decided to drill two additional wells to determine the oil possibilities in the upper horizon encountered at 6740' in the first well.

Warren No. 1

The second well drilled was the Warren No. 1 Well, which was located in Unit No. 5 north of Baker in Sec. 23-8N-t9E of the Montana Principal Meridian, Fallon County, Montana, approximately 25 miles northwest of the first well. Drilling operations were started on this well October 23, 1936 and were continued until the first producing horizon was encountered at a depth of approximately 7265'. At this depth the same dolomitic limestone was encountered as was found in the No. 1 N.P. well. At this location this horizon was saturated with salty water but there was a considerable amount of heavy waxy petroleum residue contained in some of the porous portions of the core which was recovered. This formation was cored to a depth of 7630' and the entire section was found to be saturated with salt water with traces of oil.

Bowman County, North Dakota (con't.)

At that depth drilling in this well was discontinued and the well plugged. This well was not carried below the first producing horizon encountered in the No. 1 N. P. well and probably stopped at a point 2500' above granite.

No. 1 Smith

The third well drilled by Fidelity Gas Co. was the No. 1 Smith well which was located in Sec. 8-4N-62E in Unit No. 8 approximately one-half mile north of the first well. Drilling in this well started on October 24, 1936 and continued until December 16 when the dolomitic limestone with oil saturation was encountered at a depth of 6751'. Drilling and coring continued to a depth of 6765'. At this point drilling operations stopped and the well was reamed for installation of 9 5/8" casing. The casing was set at 6739' on January 28, 1937. Testing was commenced on February 20 and continued until late in April at which time it was concluded that water and oil were present in this horizon in this well also. In April tubing was run and the well placed in condition for making a pumping test. These tests subsequently indicated a varying production of oil and water, the oil varying from 40 to 60 barrels per day of 32 gravity oil along with 250 to 300 barrels of brackish water. Pumping was continued for several months with results approximately as given above and then discontinued. This well tested only the upper horizon and was stopped probably about 2500' above the granite.

After drilling these three wells, the Fidelity Gas Co. discontinued further drilling. Subsequently in 1941, an operating agreement was made with the Carter Oil Co. whereby that company took over operations as to horizons below 2000' on Unit 8 and drilled an additional well as follows:

Carter Oil Co. No 1 Well

This well was located in Sec. 19-4N-62E on a separate high as determined by geophysical surveys, approximately two miles southwest of the first well. Drilling operations were commenced on May 12, 1941 and on July 6, 1941, 9 5/8" casing was set at 6549' and cemented. Drilling and coring continued and oil saturated dolomite was encountered from 6826' to 6837'. A drill stem test was run and 300' of oil with drilling water and mud entered 4 1/2" drill pipe in twenty minutes. Drilling then continued in this well and cores were taken continuously from a depth of 7943' to 8300' with only partial recovery through series of dolomitic limestone. Some oil saturation was observed in cuttings while drilling at 8316' and coring was resumed with only partial recovery to 8398'. Coring was resumed again at 8398' and continued to 8413' with only partial recovery. At that point a drill stem test was run and two stands of oil and mud were obtained in the drill pipe. Coring was continued to a depth of 8550' with partial recovery in limestone and dolomite formation. At 8653' an additional drill stem test was made. 123' of mud with a slight showing of oil was obtained. Drilling in this well continued to a depth of 9678' which was the final depth without making further drill stem tests. Granite was reached at approximately 658'. 7" casing was then run and landed at 8822'. A Schlumberger survey taken prior to the running of the casing indicated oil showings at the following points:

6725' to 6764'
8330' to 8359'
8400' to 8430'
8470' to 8510'

In testing these horizons the following perforations were made:

48 shots 9/16" 8485 to 8510

Bowman County, North Dakota (con't.)

28 shots	9/16"	8395 to 8410
17 shots	9/16"	8320 to 8330
18 shots	9/16"	8334 to 8350

In making a test with the packer set at 8311 and upon four hours and thirty minutes, fifty-two stands of fluid were recovered, thirty-four of which were oil, water cut and eighteen were water. Upon completion of this test the perforations were cemented.

The next test was on perforations from 6835' to 6821'. At this point fifteen 9/16" holes were shot and water came in when the casing was perforated. This indicated that the cement behind the casing had not shut off water and that this test would be valueless. A cement squeeze job was tried and the casing again re-perforated with ten holes from 6876' to 6881'. The holes started flowing hot sulphur water immediately upon perforation, indicating that the cement shut off was not satisfactory. A squeeze cement job was again perforated from 6829' to 6825' with ten holes and the well was acidized with 500 gallons of acid through these perforations. A drill stem test was made and after three hours and five minutes, one stand of oil and 67 stands of water with 5 to 10% oil was recovered. The cement was then all drilled out of the casing down to a depth of 8500' and an attempt made to bail the well dry but it was found that oil and water was shut off. After further testing it was decided to abandon the hole and casing was shut off and the well plugged on January 3, 1942.

The following seem to be the tentative determination of formation tops in this well:

Mississippian to	7680
Undetermined	7680 to 7840
Ordovician	7840 (Big Horn group)
White wood	8300 to 9340
Cambrian	9340

This well drilled through to the granite and has penetrated all horizons.

Following the completion of the Carter well in 1949, the Husky Refining Co. of Cody, Wyoming became interested in the possibilities in this area and an operating agreement was made with them covering the lands in Units 8-A and 8-B, which had been formed for shallow gas production from the oil Unit No. 8.

Husky Refining Co. - #1 Northern Pacific Well

The Husky Refining Co. began drilling their deep test well in Sec. 7-4N-62E on May 13, 1949. Coring started at a depth of 6781' on July 13 and top of the oil saturation was found at a depth of 6817' on July 15. A drill stem test was made from 810' to 6834' with the tool open 33 minutes. 19½ stands of clean oil and 5½ stands of oil cut mud were recovered. A Schlumberger survey was made and 7" O.D. casing was set at a depth of 6830' and cemented with 250 sacks of cement. After swabbing, test had been run the casing was perforated with 38 holes from 6817' to 6824'. Pumping tests subsequently completed showed that this well was producing oil and water from this horizon. These pumping tests indicated that oil production varies from 10 to 0 barrels per day along with quantities of water. Production from this well was subsequently stopped and the well shut in. The Husky Refining Co. resigned as operator and turned their operating rights back to Fidelity. This well tested only the upper horizon and was probably stopped at 2500' above the granite.

The five deep test wells which have been drilled in the Baker field have not found

Bowman County, North Dakota (con't.)

any oil or gas in commercial quantities below the Judith River and Eagle Sands, the reserves of gas in which are reported upon by Mr. Ralph E. Davis.

Sec. 4 T. 129N., R. 106, Elevation 2877, well No. 347

Gas well: 190,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	93	93	Top soil, gravel from 15' to 24' and shale
93	675	582	Gray shale
675	705	30	Dark gray sandy shale - top Judith 675'
705	1090	385	Gray shale
1090	1365	275	Dark gray sandy shale - top Eagle Sand 1090'
TOTAL DEPTH		1365	

Hole was cored from 1085' to 1104'. Full recovery. Shale with layers of fine sand from 1090' to 1104'.

Sec. 5 T. 129N., R. 106W., Elevation 2884, well No. 285

Gas well: 439,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL DEPTH</u>	<u>FORMATION</u>
0	70	70	Sand and sandy shale
70	120	50	Shale and gravel
120	680	560	Gray shale
680	714	34	Gray sandy shale Judith River Sand
714	1096	382	Gray shale
1096	1350	254	Gray sandy shale Eagle sand

TOTAL DEPTH 1350'

Sec. 5 T. 129N., R. 106W., Elevation 2845, well No. 323

Gas well: 480,000 cubic feet per 24 hours

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL DEPTH</u>	<u>FORMATION</u>
0	74	74	Top Soil and gravel and sand at 30 ft.
74	111	37	Dark shale
111	648	537	Gray shale, and bentonite
648	675	27	Dark gray sandy shale top Judith River Sand 648
675	1060	385	Gray shale and bentonite
1060	1300	240	Sandy shale

TOTAL DEPTH 1300'

Cored from 1055' to 1093 - From 1055 to 1074 Core No. 1 full recovery shale and sand good sand from 1065 to 1074.

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Core No. 2 from 1074 to 1093 full recovery shale and ~~layers of sand~~ throughout.

Sec. 6, T. 129N., R. 106W., Elevation 2917, Well No. 322.

Gas Well: 362,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	103	103	Top soil and gray shale.
103	720	617	Gray shale, shells and bentonite
720	765	45	Gray sandy shale. Top of Judith River Sand 720'.
765	1128	363	Gray shale.
1128	1371	243	Gray sandy shale. Top Eagle Sand - 1128'.

TOTAL DEPTH 1371'

Cored from 1120' to 1138'

Sec. 8, T. 129N., R. 106W. Elevation 2928, Well No. 325.

Gas Well: 210,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	108	108	Top soil and from 18' to 35' gravel and sand and from 35' to 108' gray shale.
108	624	516	Gray shale and shells
624	731	107	Gray shale and shells
731	767	36	Gray sandy shale top Judith River Sand 731'
767	1157	390	Gray shale and bentonite.
1157	1400	243	Gray sandy shale and some bentonite

TOTAL DEPTH 1400

Cored from 1130' to 1163'

Top Eagle Sand 1157'

Sec. 9 T. 129N., R. 106W., Elevation 2874, Well No. 326

Gas Well: 116,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	104	104	Shale and sand and gravel from 18' to 35'
104	677	573	Gray shale
677	719	42	Gray sandy shale and some fossil shell. Top Judith River Sand - 677' ?
719	1098	379	Dark shale and bentonite
1098	1375	277	Dark gray shale with thin streaks of sand and fossil shells.

TOTAL DEPTH - 1375'

Top of Eagle Sand - 1098'

Cored hole from 1080' to 1099'. Recovered 17' shale and 2' shale with thin streaks of sand.

Bowman County, North Dakota (con't.)

Cored hole from 1350' to 1368'. Recovered 6' shale with thin streaks of fine sand at top of core and balance gray shale.

Sec. 9, T. 129N., R. 106W., Elevation 2869', Well No. 327.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	108	108	Gray shale and sand from 15' to 25'.
108	508	400	Sand, gray shale and shells
508	688	180	Gray shale
688	738	50	Dark gray sandy shale and bentonite a little fine sand at 688
738	1098	360	Gray shale and bentonite
1098	1348	250	Dark gray shale sandy top Eagle Sand 1098'
1348	1500	152	Dark gray shale sandy

TOTAL DEPTH 1500'

Cored hole from 1075' to 1113'.

Core No. 1 Full recovery gray shale.

Core No. 2 Full recovery 15' gray shale and 5' gray shale with small layers of sand.

Hole was abandoned with 30 sacks of cement from 1178' up to 1078' and from 600' up to 550' with 15 sacks cement and a 4' marker post placed at surface with 5 sacks of cement.

Drill stem test No. 1 tested from 1075' to 1348' - no gas.

Drill stem test No. 2.0 Same as test No. 1 only a small showing of gas.

Drill stem test No. 3 - tested from 1348' to 1500' small showing of gas, no evidence of water.

Sec. 9, T. 129N., R. 106W., Elevation 2861, Well No. 328

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	102	102	Top soil 15' and sand from 15' to 27' - shale 27' to 75'
102	659	557	Gray shale
659	702	43	Dark gray shale, a little sandy shale, and bentonite.
702	1075	373	Dark shale and a little fine sand at 1104'.
1075	1354	279	Dark shale gray and bentonite.

TOTAL DEPTH 1354

Cored from 1075' to 1122': Dark gray shale and a little fine sand at 1104'.

Bowman County, North Dakota (con't.)

Hole was abandoned with 15 sacks of cement from 1300' up to 1100' and from 600' up to 550' with 15 sacks of cement. A 4' marker post placed at surface with 5 sacks of cement.

Drill stem test No. 1: Tested from 1075' to 1354' with a small showing of gas. Tested in a 4 3/4" hole.

Sec. 16, T. 129N., R. 106W., Elevation 2874', Well No. 390

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	20	20	Top soil
20	45	25	Sand and gravel
45	105	60	Gray shale hard rock at 52'
105	884	779	Gray shale shell at 772' to 775'
884	1018	134	Gray shale and bentonite shell at 949'
1018	1378	360	Dark gray shale and bentonite

TOTAL DEPTH 1378'

Hole was abandoned with 15 sacks of cement from 1050' to 1000' and from 600' up to 550' with 15 sacks of cement. A 4' marker post placed at surface with 5 sacks of cement.

Cored from 1050' to 1121' - dark gray shale
 Drill Stem Test No. 1 at 1125'
 Tester fell thru formation to 1140'. No test.

Drill stem test No. 2 at 1140':
 Mud fluid cut around formation seat. no test.

Drill stem test No. 3 at 1150':
 Formation seat would not hold. Tester fell down to 1171'. No test.

Sec. 31, T. 130N., R. 106W. Elevation 2906, Well No. 318

Gas Well: 281,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	690	690	Gray shale
690	745	55	Gray sandy shale, shell at 741'. Top Judith River Sand 1068.
745	1105	360	Gray shale and shells. Bentonite at 1068 to 1078'
1105	1350	245	Gray sand and shale. Sand fine. Top of Eagle Sand 1105'.

TOTAL DEPTH 1350'

Cored from 1068 to 1105.

Sec. 31, T. 130N., R. 106W. Elevation 2931, Well No. 321

Gas Well: 280,000 cubic feet per 24 hours.

LOG:

Bowman County, North Dakota (con't.)

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	98	98	Top soil and gray shale
98	318	220	Gray shale and shells
318	718	400	Gray shale and shells
718	760	42	Gray sandy shale - top of Judith River Sand 718'.
760	1142	382	Gray shale and shells bentonite.
1142	1380	238	Gray sandy shale - Top of the Eagle Sand 1142'.

TOTAL DEPTH 1380'

Cored from 1115' to 1151'

Sec. 2, T. 130N., R. 107W. Elevation 2952, Well No. 156

Gas Well: 280,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	107	107	Shale
107	227	120	Shale, small shells.
227	410	183	Shale and shells - coal vein (244'9" to 245'9")
410	589	179	Shale
589	740	151	Shale with shells at (638-639)(716-717) Sticky shale (710-740)
740	846	106	Shale and shells at (764-765'6")
846	982	136	Shale with shells (933 to 933'6")
982	1086	104	Shale with shells at (1001-1002')
1086	1162	76	Shale with shells at (1103'7" to 1104'3")
1162	1200	38	Shale and sandy shale - shell at (1198-1199) Presumably top of Eagle Sand 1200
1200	1217	17	Core No. 1-17' recovery sand and shale with gas
1217	1395	178	Sandy shale
1395	1450	55	Sandy shale

TOTAL DEPTH 1450'

Cored 1200 to 1217-----17' recovery.

Log of Gas Development Company well, Bowman County, North Dakota.

Sec. 3, T. 130N., R. 107W. Location: 540 ft. S. of N. Line, and

738 ft. E. of W. Line of Sec. 3. Elevation: 2966.8.

Commenced drilling May 20, 1929.

Finished drilling July 8, 1929.

<u>Depth in Feet</u>	<u>Formation</u>
0 to 555	Dark shale--shell 305 to 307
555 to 575	Sandy shale - some gas
575 to 620	Soft dark gray shale, shell 595 to 600
620 to 655	Sandy shale - some gas
655 to 685	Shale
685 to 697	Sandy shale - show gas
697 to 1180	Gray shale - little gas 1075
1180 to 1275	Gas - sand

Bowman County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>
1275 to 1330	Sandy shale
1330 to 1405	Gas sand - some shale
1405 to 1455	Sandy shale

Sec. 3, T. 130N., R. 107W., Elevation 2974, Well No. 304

Gas well: 196,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	101	101	Shale
101	643	542	Shale (shells at 176 and 203)
643	975	332	Shale and sand (shells at 680 and 705) Judith River sand no identified.
975	1100	125	Shale
1100	1119	19	Core #1 Full recovery sandy shale sand diminish- ing at top of core - Top of Eagle Sand 1100.
1119	1350	231	Sand and shale

TOTAL DEPTH 1350

1347.50' of 1½" tubing installed with vent nipples and with perforated nipple at bottom.

Sec. 10, T. 130N., R. 107W., Elevation 3058, Well No. 155

Gas well: 501,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	101	101	Shale
101	237	136	Shale
237	390	153	Shale with shell at (270-271) (304-305)
390	545	155	Shale with shells at (459-460) (520-522)
545	721	176	Shale with shells at (592-592'8")
721	865	144	Shale with shells at (770-771)
865	945	80	Hard shale
945	1044	99	Hard shale (shell 1010-1013)
1044	1200	156	Shale with shells (1177'6" to 1178'4")
1200	1215	15	Core #1 (2'6" rec.) Show gas - sand Top of Eagle Sand
1215	1364	149	Sandy shale with shell (1268-1268'9")
1364	1500	136	Hard sandy shale

TOTAL DEPTH 1500'
Cored from 1200 to 1215

Sec. 10, T. 130N., R. 107W., Elevation 3060, Well No. 333

Gas. Well: 180,000 cubic feet per 24 hours.

Bowman County, North Dakota (con't.)

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	111	111	Top soil and gray shale
111	1183	1072	Gray shale, shells, and bentonite
1183	1433	250	Gray sandy shale. Top of Eagle Sand 1183'.

TOTAL DEPTH 1433'

Hole was cored from 1170' to 1189'.
Core #1 from 1170' to 1183', gray shale; from 1183' to 1189', sand and shale.

Sec. 11, T. 130N., R. 107W., Elevation 3010, Well No. 305

Gas Well: 240,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	102	102	Shale
102	654	552	Shale
654	891	237	Shale and sand
			Judith River Sand not identified
891	1130	239	Shale
1130	1149	19	Core #1 full recovery. Shells 1142-1144, all of core contained sand but percentage of sand markedly increased at 1139. Top of Eagle sand.
1149	1403	254	Sand and shale

TOTAL DEPTH 1403'

536.15' of 1" tubing on bottom
862.70' of 1 1/2" tubing on top

Sec. 11, T. 130N., R. 107W., Elevation 3011', Well No. 334

Gas Well: 175,000

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	95	95	Top soil and gray shale
95	1137	1042	Gray shale hard shell from 740' to 742'
1137	1396	259	Dark gray sandy shale shell 1334' Top Eagle Sand 1137'.

TOTAL DEPTH 1396'

Hole was cored from 1125' to 1144'.
Core #1 full recovery shale from 1125' to 1137'.
From 1137' to 1144', sandy shale.

Sec. 13, T. 130N., R. 107W., Elevation 3008, Well No. 332

Gas Well: 295,000 cubic feet per 24 hours.

LOG:

Bowman County, North Dakota (con't.)

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	105	105	Gray shale
105	1168	1063	Gray shale and bentonite shell at 625' and 782' and 922'.
1168	1434	266	Gray sandy shale, top of Eagle Sand 1168'.
TOTAL DEPTH 1434'			Hole was cored from 1157' to 1185'. Core #1 from 1157' to 1166'. Recovery 5' dark gray shale. Core #2. Recovered 19' shale and sand from 1166' to 1185'.

Sec. 14, T. 130N., R. 107W., Elevation 3020, Well No. 306

Gas Well: 260,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	105	105	Shale
105	288	183	Shale
288	651	363	Shale (shell 622-624)
651	1083	432	Shale and sand
1083	1100	17	Judith River Sand not identified
1100	1118	18	Shale (shell at 1092')
1118	1137	19	Core No. 1 shale, full recovery
1137	1156	19	Core No. 2 shale, full recovery
1156	1400	253	Core No. 3 8' recovery-sand in bit and core-estimate top of Eagle Sand at 1147'. Sand and shale Eagle sand - gas
TOTAL DEPTH 1400'			538.50' of 1" tubing on bottom 860.20' of 1 1/2" tubing on top

Sec. 14, T. 130N., R. 107W., Elevation 2999, Well No. 307

Gas Well: 355,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	105	105	Shale
105	426	321	Shale
426	864	438	Shale and sand (shells at 454', 618', 785', 789', and 798'). Judith River Sand not identified.
864	1160	296	Shale-shells at 1020', 1038', 1118'.
1160	1179	19	Core #1 full recovery sand and shale, percentage sand decreased at top-estimate top of Eagle Sand at 1150'.
1179	1400	221	Sand and shale
TOTAL DEPTH 1400'			

1396.70' of 1 1/2" tubing

Bowman County, North Dakota (con't.)

Sec. 14, T. 130N., R. 107W., Elevation 3019, Well No. 354

Gas Well: 150 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	105	105	Shale
105	408	303	Sticky shale
408	526	118	Shale - Shell (411-411-6) (423-423-6)
526	715	189	Shale (Shell 610-612)
715	833	118	Hard gray shale (Shell 820-821)
833	1052	219	Shale
1052	1225	173	Hard shale (Shell 1199-1200)
1225	1230	5	Core #1 (Rec. 6 th) Sandy shale and shell. Top Eagle Sand 1225'.
1230	1248	18	Core #2 - sandy shale. (18' Rec.) Showing gas streaks of sand.
1248	1273	25	Sandy shale
1273	1349	76	Sandy shale (Shells 1273-6 to 1276 and 1302-6 to 1303-6 and 1319 to 1320)
1349	1430	81	Sandy shale - small shells
TOTAL DEPTH 1525'			• Cored from 1225 - 1230 1230 - 1248

Sec. 23, T. 130N., R. 107W., Elevation 2985, Well No. 391

Gas well: 214,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	110	110	Gray shale
110	1002	892	Gray shale
1002	1120	118	Gray shale and bentonite
1120	1135	15	Gray shale
1135	1140	5	Gray shale
1140	1388	248	Gray sandy shale, top of Eagle Sand 1140'
TOTAL DEPTH 1388'			Hole was cored from 1120' to 1154'. 1120 to 1135 Core No. 1 recovered 10' gray shale and bentonite. 1135 to 1154 Core No. 2 recovered 5' shale with streaks of sand.

Sec. 24, T. 130N., R. 107W., Elevation 2942, Well No. 308

Gas well: 295,000 cubic feet per 24 hours

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	812	812	Gray shale, small shell at 625'

Bowman County, North Dakota (con't.)

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
812	867	55	Gray shale with a little sand, Judith River Sand Shell at 1137' to 1139'.
867	1160	293	Gray shale
1160	1410	250	Gray shale with fine sand, Eagle sand.

TOTAL DEPTH 1410'

Sec. 25, T. 130N., R. 107W., Elevation 2921, well No. 309

Gas well: 162,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	720	720	Gray shale - hard shell at 395', 407' and 590'.
720	775	55	Gray shale with a little sand, Judith River Sand Hard shell at 756' to 758'.
775	1135	360	Gray shale
1135	1385	250	Gray shale with a little fine sand, Eagle Sand Hard shell 1197.50 to 1202' - 1304' to 1306'.

TOTAL DEPTH 1385'

Well No. 1, Sec. 36, T. 130N., R. 107W. NE₁ NE₁, Elevation 2949.6'. Bowman County

LOG:

<u>FROM</u>	<u>TO</u>	<u>FORMATION</u>
0	778	Blue shale
778	785	Gray, sandy shale. Gas.
785	791	Sand - gas. 6" shell at 785'.
791	1185	Dark gray shale. Shell at 885' 4" shell at 962'.
1185	1225	Dark gray sandy shale.
1225	1246	Sand, gas.
1246	1335	Sandy gray shale. Gas.
1335	1337	Sand. Gas.
1337	1365	Dark gray sandy shale. A little gas.
1365	1400	Dark sticky shale.
1400	1408	Hard fine sand. Gas.
1408	1420	Dark sticky shale.
1420	1480	Dark sandy shale. Gas.
1480	1485	Dark shale with rusty lime

VILLAGE WELL AT BOWMAN, BOWMAN COUNTY, NORTH DAKOTA

Sec. 11, T. 131N., R. 102W.

<u>Depth in Feet</u>	<u>Formation</u>
0 to 70	Surface sandy yellow clay
70 to 170	Layer of Lignite Coal and yellow clay
170 to 198	Sheets of coal 2' to 3' thick; also sandy clay.

Bowman County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>
198 to 241	Blue clay
241 to 245	Lignite coal
245 to 361	Blue clay
361 to 391	Lime shells and clay
391 to 393	Hard limestone
393 to 401	Sandy clay turning to light color
401 to 461	Sandy light clay to dark, scattered float coal
461 to 916	Sandy light clay and streaks of coal
916 to 930	Sand (18 gal.) test - set in 2½" pipe at 927'
930 to 947	Sandy shale - pumped no water
947 to 968	Sand pumped 18 gallons per minute
968 to 1002	Clay no sand - no water.
1002 to 1046	Sand pumped 60 gallons per minute by air.

Pumped with Pamona pump 96 gallons per minute, 88 gallons per minute for 10 hours into elevated tank. Clear soft water. Water static 235 feet from the top.

Sec. 34, T. 131N, R. 107W. Elevation 3019, well No. 336

Gas well: 170,000 cubic feet per 24 hours.

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	94	94	Top soil and gray shale
94	336	242	Gray shale and bentonite
336	1132	796	Gray shale and shells
1132	1178	46	Gray shale
1178	1440	262	Gray sandy shale, top Eagle Sand 1178'.

TOTAL DEPTH 1440'

Hole was cored from 1132' to 1166'
 Core No. 1 from 1132' to 1151' gray shale
 Core No. 2 from 1151' to 1166' recovered 7'
 gray shale small showing of fine sand at bottom of core.

Sec. 36, T. 131N., R. 107W., Elevation 3089, Well No. 158

Gas well: 125,000 cubic feet per 24 hours

LOG:

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
0	101	101	Shale and some surface gravel
101	178	77	Shale
178	380	202	Shale and shells
380	540	160	Shale
540	658	118	Hard Shale and shells from 579'-581', 619'-620'
658	771	113	Sticky shale with small shells. Shell 738-739'

Rowman County, North Dakota (con't.)

<u>FROM</u>	<u>TO</u>	<u>TOTAL FEET</u>	<u>FORMATION</u>
771	965	194	Shale and some thin shells
965	1109	144	Shells and shale
1109	1225	116	Shell 1005-1007 Shale and small shells, sandy shale. Shell 1177 and 1225'.
1225	1300	75	Shale and shell with sandy streaks - shell 1291
1300	1375	75	Dark shale with thin streaks of sand - some fossil shells.
1375	1391	16	Sandy shale - showing gas.
1391	1490	99	Sandy shale and shells.
1490	1600	110	Hard sandy shale and some small shells.

TOTAL DEPTH 1600'

Cored hole from 1300 to 1369

Cored hole from 1375 to 1391---to pick up Gas Sand

BOTTINEAU COUNTY

Westhope Gas Well, Bottineau County, North Dakota, South $\frac{1}{2}$ Sec. 10, T. 161N. R. 80W.

<u>Depth in Feet</u>	<u>Formation</u>
0 to 2	Soil
2 to 32	Yellow clay and gravel
32 to 154	Blue clay
154 to 170	Gravel with sand below, no flow of gas
170 to 205	White slate
205 to 208	Black sandstone
208 to 450	Shale, soft blue covering
450 to 500	Black slate
500 to 500 & 6 inches	Yellow rock, hard limestone
500 to 705	Shale, blue covering
705 to 850	Blue shale
850 to 860	Sandy shale
860 to 1370 & 6 inches	Blue shale

TOTAL DEPTH 1980

WILLOW CITY WELL, BOTTINEAU COUNTY, NORTH DAKOTA

<u>DEPTH IN FEET</u>	<u>FORMATION</u>
0 to 2	Surface soil
2 to 17	Yellow clay mixed with sand
17 to 51	Black joint clay
51 to 94	Hardpan
94 to 117	Fort Union Sandstone
117 to 177	Bluish gray clay -- no grit
177 to 326	Black sandy clay -- 8" layer of rock at 274'.
326 to 391	Hard material

REPORT OF WELL -- Drilled at CCC 766 Near Kramer, North Dakota
by C. A. Simpson, November 1938.

Bottineau County, North Dakota (con't.)

Log of Formations:

0- 1 Topsoil
1- 30 Yellow clay
30- 81 Blue clay
81- 92 Muddy gravel
92-102 Sandy blue clay
102-115 Gravelly blue clay
115-126 Blue clay
126-129½ Gravel, source of supply
129½-130 Gravelly clay

- REPORT OF WELL

OWNER: A. N. Kyle

LOCATION: 3½ miles east, 2 miles south of Bottineau, North Dakota

LOG:

0- 1 Loam
1- 3 Sandy yellow clay
3- 22 Very sandy yellow clay
22- 68 Sandy blue clay
68- 73 Muddy gray sand
73- 88 Blue shale
88- 92 Muddy sandstone
92-103 Sandy shale
103-114 Gray sandstone
114-121 Very hard rock
121-138 Gray sandstone
138-142 Gray shale

REPORT OF WELL

OWNER: Alfred Gray

LOCATION: 2 miles east, ½ mile south of Bottineau, North Dakota

LOG:

0- 1 Topsoil
1- 15 Yellow clay
15- 20 Sand, gravel, and rocks
20- 50 Gray clay
50- 55 Sand, no water
55- 77 Sandy gray clay
77- 80 Rocks, clay
80-108 Blue shale
108-122 Sandy shale, and sandstone

Water Level: 16 feet below ground

Capacity: Four to five gallons per minute

REPORT OF TEST WELLS

Jan, January 1941

Location: Approximately 130 feet SE of 1938 8" well
Kramer C.C.C. Camp, near Kramer, North Dakota

LOG:

0- 1 Topsoil
1- 23 Yellow clay

Bottineau County, North Dakota (con't.)

Log: 23- 75 Blue clay
 75- 88 Gravelly blue clay and rocks
 88- 90 Sand and gravel
 90-118 Sandy gray clay and rocks
~~118-122 Muddy gravel~~
 122-128 Coarse and fine gravel, rather dirty
 128-132 Gray shale
 132-134 Sandy green shale
 134-140 Gray shale

Remarks: There was a very small amount of water in the 88-90' gravel vein. This was not enough to be of use. There was more water in the 122-128' vein but stayed quite dirty. The water came up to within 50' of the surface when let rest during the noon hour. The vein furnished 4 G.P.M. at the 73' level. Drawdown was slow and recovery was slower. At the clearest that the water got during 3 hours bailing, it would still settle out an inch of very fine sand in the bottom of a five gallon pail of the water.

4 1/2" test hole.

REPORT OF WELL

OWNER: C. O. Svingen and Luke Svingen, Bottineau, North Dakota
 Location: Approximately 9 miles north of Bottineau
 Log:

0- 1	Topsoil	4 1/2" pipe
1- 27	Yellow clay	18- 0
27- 83	Gravel, <u>rocks</u> , <u>boulders</u>	17-10
83-123	Blue clay	17- 8
123-127	Muddy gravel	16- 7
127-263	Gravelly blue clay	17- 7
263-	Gravel, water	17-11
		18- 0
		17- 8
		17- 6
		17- 6
		18- 0
		17- 3
		16- 9
		17- 9
		18- 0
		<u>263-0</u>

Water level: 214' below ground
 Test: Bail 10 G. P. M. with 1' D.D.

Completed May, 1939

REPORT OF WELL

Owner: Oscar Roland
 Location: About 10 miles north of Bottineau, North Dakota on East Road.
 Log:

0- 1 Topsoil
 1- 42 Yellow clay
 42-209 Gray sandy clay
 209- Gravel

Water level 98 feet below ground
 Bailed 8 gallons per minute with 10 foot drawdown
 May 9, 1939

Bottineau County, North Dakota (con't.)

TURTLE MOUNTAIN OIL COMPANY

SE₄ 9-163-77

Elevation with altimeter 1552'. Drilled in 1906.

Gas at 1600' under 75 lbs. pressure. Hole filled with salt water at 2200'.

Total depth 2200'.

BURKE COUNTY

LOG OF BOWBELLS, NORTH DAKOTA WELL

Sec. 5(?) - T. 161, R. 89W.

<u>MATERIAL</u>	<u>THICKNESS</u>	<u>FROM</u>	<u>TO</u>
Red clay and blue clay with some gravel and sand.....	50	0	50
Boulders, soapstone, and fine sand.....	30	50	80
Hard coal (some water).....	3	80	83
showing of slack coal.....	25	100	125
Hard lignite with dark water.....	6	140	146
Real hardpan or lime rock.....	29	146	175
ough dark clay or soapstone.....	25	175	200
Ditto.....	50	200	250
Trace of sand gave water.....	50	250	300
Streamers of coal, gray soapstone.....	97	300	397
Real dark shale or paint stone (trace of oil).....	21	397	418
Dark shale.....	55	418	473
Hard lignite coal.....	2	493	495
Soft gray clay (some sand).....	55	495	550
Very hard shell.....	1	550	551
Flow of sand.....	6	551	557
Dark clay.....		under	570

Original well was drilled 574 ft., but was deepened to 701 ft. without finding any additional water. No official record of the last 127 ft. From memory at 660 to about 670 the driller encountered 11 feet of very hard lignite, and at 680 nine feet of solid rock.

LOG OF SOO LINE WELL, PORTAL, NORTH DAKOTA

Sec. 31, T. 164, R. 91

<u>MATERIAL</u>	<u>THICKNESS</u>	<u>FROM</u>	<u>TO</u>
Clay	8	0	8
Blue clay mixed with sand	172	8	180
Gray sand and hardpan	60	180	240
Raw clay	40	240	280
Coal	3	280	283
Raw clay	17	283	300
Sandy shale	60	300	360
Sandy shale	55	360	415
Shale	55	415	470
Sandy shale	30	470	500
Water bearing shale	18	500	518

Burke County, North Dakota (con't.)

<u>MATERIAL</u>	<u>THICKNESS</u>	<u>FROM</u>	<u>TO</u>
Brown draw clay	80	518	598
water-bearing fine sand and shale	110	598	708

BURLEIGH COUNTY

STERLING, NORTH DAKOTA

8" well, total depth 480' drilled May 1899. Located 25' south of main track, 150' west of depot. First water was struck 46' below ground (Elev. 1766), test of this gave 5 gallons per minute. Second water strata is 122' below ground (Elev. 1690). No water was found below this point. Well was tested to 74 gallons per minute, this was the limit of the pump, so well evidently can give a larger supply. Water level was 80' below ground. Well is 8" to a depth of 162', balance is 6".

Elevation

1812-1782	30' sand, clay, hardpan
1782-1766	16' clay and sand
1766-1761	5' black quicksand with small stone
1761-1754	7' hardpan
1754-1733	21' blue clay
1733-1729	1' very hardpan
	3' quicksand, little water
1729-1694	35' blue clay with a little sand
1694-1690	4' quicksand with small stones, little water
1690-1684	6' cemented coarse gravel
1684-1661	23' sand with some blue clay
1661-1332	329' very hard clay with some gravel that is almost a shale

DRISCOLL, NORTH DAKOTA

Drill Hole No. 1

Located opposite Sta. 8540 + 09. Drilled June 1904. Drilling went down to a depth of 160' through blue clay, struck gravel here and water came within 32' from surface, quantity of water was limited. Drilling was stopped on account of broken casing.

Elevation

1885-1823	Water level
1823-1695	160' blue clay
1695-Below	gravel and water

Drill Hole No. 2

Located opposite Sta. 8541 + 09. Total depth 525' completed Dec. 1904. No indication of water was found except small amount in upper water strata. Formation is light clay.

Elevation

1856-1331	525' light clay
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BURLEIGH COUNTY, NORTH DAKOTA (con't.)

St. Alexis Hospital Well, Burleigh County, Bismarck, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0 to 80	Yellow clay
80 to 110	Fine sand, water bearing
110 to 140	Blue clay
140 to 170	Sand, water bearing
170 to 190	Blue clay
190 to 230	Sand, water bearing
230 to 285	Blue clay
285 to 410	Fine sand, water bearing
410 to 535	Clay with layers of hard rock and thin layers of coal continued on to 590 feet which was the total depth.

CASS COUNTY

Location: NW 1/4 Sec. 19, T. 139N., R. 51W.

Drillers name: Dakota Artesian (1)

Well started: 10-23-37

Well completed: 11-1-37

Casing: Kind: Standard Black, Size 3". Length 229'9".

Screen: Length: 10', Diameter: 1 1/2", Size Opening: 40 Mesh Johnson

Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0 - 1	Top Soil
1 - 17	White Clay
17 - 23	Yellow clay
23 - 71	Blue Clay
71 - 83	Gravel
83 - 91	Sand
91 - 140	
140 - 163	Blue clay and rocks
163 - 180	
180 - 194	Gravel and sand
194 - 210	
210 - 227	Blue clay and rocks
227 - 233	Coarse sand
233 - 240	Fine sand

Flows 1 qt.
Pumps 6 gal.

Location: SW 1/4 Sec. 19, T. 139N., R. 51W.

Driller: Harry Matheson

Date Started: December 3, 1936.

Date Completed: December 24, 1936.

Casing: Kind: Standard Black, Size 3", Length: 189 1/2' - 6 feet above ground

Screen: Length: None

Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0 - 2	Top soil
2 - 19	Yellow clay

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of strata</u>	
19 - 45	Blue clay	
45 - 65	Blue clay	
65 - 70	Hardpan	
70 - 82	Blue clay	
82 - 84	Sand (with LS & Magnetite)	
84 - 92	Sand (hit a rock)	
92 - 95	Medium coarse sand	Water cleared up and well was finished without a screen.
95 - 109	Sand	Pumped 15 gallons per minute for 2 hours.
109 - 163	Blue clay, some sand	
163 - 164	Sand	
164 - 184	Blue clay and small stones	
184 - 190	Sand, medium coarse	Pumped with 2" cylinder and 20 feet of drop pipe.

Location: **SE₄ Sec. 19, T. 139N, R. 51W.**

Driller: Harry Matheson

Well started: 1-12-37

Well completed: 3-4-37

Water level below surface dry

Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 1	Top soil
1- 18	Yellow clay
18- 31	Blue clay
31- 36	Sand
36- 62	Blue clay
62- 64	Hard pan
64- 67	Blue clay
67- 90	Hardpan and small stones
90-110	Hardpan, blue clay and stones
110-120	Blue clay
120-138	Fine sand
138-150	Blue clay
150-170	Fine sand
170-173	Coarse sand
173-195	Fine sand
195-205	Fine sand
205-208-	Hardpan
208-218	Hardpan over coarse sand
218-222	Coarse sand
222-224	Blue clay
224-227	Fine white sand

Location: **SE₄ Sec. 19, T. 139N, R. 51W**

Driller: Harry Matheson

Date Started 3-6-37

Date Completed: 3-20-37

Dry well

Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 6	Top soil

<u>Total Depth</u>	<u>Kind of Strata</u>
6- 17	Yellow clay
17- 20	Fine sand
20- 60	Soft blue clay
60- 85	Hardpan and rocks
85- 90	Sand
90-105	Fine black sand and stoney
105-128	Blue clay and stones
128-145	Hardpan
145-156	Clay and small stones and sand
156-168	Blue clay
168-171	Coarse sand
171-200	Fine sand
200-206	Hardpan
206-223	White sand

Location: 4th. Sec. 11, T. 130N. R. 53W.
 Driller: Dakota Artesian (1)
 Well Started: 11-2-37
 Well Completed: 11-10-37
 Casing: Kind: Standard Black; Size-3"; Length 371'
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 3	White clay
3- 9	Yellow clay
9- 51	Gravel
51- 90	
90-118	Blue clay and rocks
118-141	Gravel
141-178	Blue clay and rocks
178-181	Rocks
181-241	Shale
241-276	Fine sand, insuff. water
276-350	
350-371	Shale
371-377	Sand

Flows 1 gallon per minute.

Well Completed: 1-22-38
 Water level below surface 9ft.
 Casing: Kind: Standard Black; Size 3"; Length 180'
 Screen: Length 10'; Diameter 1 1/2"; Size Opening 16 slot Johnson
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 21	Yellow clay
21- 50	
50- 57	Blue clay

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of strata</u>
57- 68	Gray clay
68- 69	Boulders
69- 77	Gray clay
77- 79	Boulders
79- 92	Gray clay
92- 95	Sand
95-110	Gray clay
110-112	Sand
112-118	Gray clay
118-130	Sand
130-131	Boulders
131-135	
135-163	Gray clay
163-164	Boulders
164-175	
175-180	Gray clay
180-192	Sand

Pumped 10 gallon per minute at 60' for 2 hours.

Location: SW $\frac{1}{4}$ Sec. 4, T. 141N., R. 50W.
 Driller: Independent Drilling Co. (2)
 Well started: 11-13-37
 Well Completed: 11-18-37
 Water level below surface 9 ft.
 Casing Kind: Standard Black; Size 3"; Length 138"
 Screen: Length 4', Diameter 1 $\frac{1}{2}$ ", Size Opening 18 slot Johnson
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 10	Yellow clay
10- 80	Blue clay
80- 82	Boulders
82- 90	Blue clay
90-105	
105-120	Slate
120-138	Gray clay
138-141	Sand

Pumps 8 gallons per minute

Location: NW $\frac{1}{4}$ Sec. 14, T. 141N, R. 50W.
 Driller: Guy Hildreth
 Well Started: April 21, 1937
 Well Completed: May 14, 1937
 Water level below surface 3 ft.
 Casing: Kind: Black; Size 3"; length 249"
 Screen: Length 6'; Diameter 1 $\frac{1}{2}$ ", Size Opening 60
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 5	Top soil

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
5- 76	Gray clay
76- 78	Gray clay
78- 90	Clay and stones
90-100	Clay, stone, and gravel
100-122	Shale
122-128	Clay and stone
128-133	Clay and stone
133-150	Clay and stone
150-157	Clay and stone
157-186	Clay
186-201	Shale
201-203	Clay and stones
203-213	Clay
213-221	Sand
221-255	Sand

Location: Sw $\frac{1}{4}$ Sec. 16, T. 141N., R. 50W.
 Driller: Gerhard Kaas
 Well Started: 6-23-37
 Well Completed: 6-28-37
 Water Level below surface 5 ft.
 Casing: Kind: Black; Size 3"; Length 140'
 Screen: Length 6'; Diameter 1 $\frac{1}{2}$ "; Size Opening 40 mesh
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
1- 21	Top soil
21- 42	Yellow clay
42- 92	Blue clay
92-124	Blue clay
124-146	Sand

Location: Sw $\frac{1}{4}$ Sec. 16, T. 141N., R. 50W.
 Driller: Gerhard Kaas
 Well Started: 6-2-37
 Well Completed: 6-21-37
 Dry well
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 8	Top soil
8- 20	Yellow clay
20- 60	Blue clay
60- 90	Blue clay
90-130	Blue clay
130-165	Blue clay
165-205	Blue clay and sand
205-240	Blue clay and sand
240-270	Blue clay and sand
270-300	Soap stone
300-320	Red, black, and green clay

Drilled into green clay which is decomposed granite.

Cass County, North Dakota (con't.)

Location: NW 1/4 Sec. 23 & E 1/2 of SE 1/4 of 22, T. 141N. R. 50W.
 Driller: Independent Drilling Co. (1)
 Well Started: 11-11-37
 Well Completed: 11-23-37
 Water level below surface 6 ft.
 Casing: Kind: Standard Black; Size 3"; Length 257'
 Screen: Length 13' Diameter 1 1/4"; Size Opening 10 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 21	Yellow clay
21- 70	Blue clay
70- 78	Slate
78- 88	Gray clay
88- 90	Gravel
90-110	Gray clay
110-120	Sand
120-130	
130-147	Gray clay
147-148	Boulders
148-159	Gray clay
159-160	Boulders
160-215	Gray clay
215-222	
222-230	Slate
230-251	Sand
251-256	Gray clay
256-269	Sand

Pumps 10 gallons per minute.

Location: SE 1/4 Sec. 9, T. 141N., R. 51W.
 Driller: Herberg
 Well Started: 6-11-37
 Well Completed: 6-27-37
 Water Level below surface 23 ft.
 Casing: Kind: Standard black; Size 3"; Length 251' plus 62' - 1 1/4" to Screen
 Screen: Length 10; Diameter 1 1/4"; Size Opening 18 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 6	Top soil
6- 20	Yellow clay
20- 85	Blue clay
85-109	Blue clay and rock
109-125	Blue clay and stone
125-165	Sand and mud
165-175	Blue clay and small stones
175-220	Blue clay
220-225	Blue clay
225-226	Hardpan
226-227	Sand
227-245	Sand
245-280	Sand and stones

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
280-310	Sand
310-312	Sand
312-314	Stone
314-315	Hardpan
315-322	Sand and water

Location: NE $\frac{1}{4}$ Sec. 9, T. 141N., R. 51W.
 Driller: Albert Herberg
 Well Started: May 6, 1937
 Well Completed: June 10, 1937
 Water level below surface 6 ft.
 Casing: Kind: Standard Black; Size 3", Length 133'
 Screen: Length 0, Diameter 0; Size Opening 0.
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 5	Top soil
5- 20	Yellow clay
20- 90	Blue clay
90-102	Blue clay and gravel
102-104	Hardpan
104-110	Sand
110-122	Sand
122-130	Blue clay
130-132	Sand
132-137	Sand
137-148	Blue clay
140-180	Blue clay
180-240	Blue clay and stone
240-335	Blue clay
335-340	Sand
340-355	Sand
355-370	Sand
370-385	Coarse sand
385-387	Brown clay
387-408	Green clay
408-412	Green clay

Well needs a 20 ft. cistern as it will not stand pumping.
 No screen was used as the sand is too fine.
 From 133' to 137' is water.
 Tested at 20 gallons per minute under pressure.

Location: NE $\frac{1}{4}$ Sec. 9, T. 141N., R. 51W.
 Driller: Independent Well Company
 Well Started: June 9, 1937
 Well Completed: June 21, 1937
 Water level above surface 1 $\frac{1}{2}$ feet
 Casing: Kind: Standard Black, Size 3", Length 322'
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 1	Top soil

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
1- 5	Sand yellow clay
5- 18	Yellow clay
18- 30	Blue clay
30- 64	Blue clay
64- 70	Blue clay and gravel
70- 72	Sand
72- 97	Clay
97-106	Hardpan
106-113	Sand
113-115	Gravel and boulders
115-118	Hardpan
118-128	Blue clay
128-134	Coarse sand and a gas pocket
134-149	Blue clay
149-160	Sandy blue clay
160-200	Blue clay
200-245	Blue clay
245-280	Blue clay
280-320	Blue clay
320-355	Sand and water.

The sand too fine to use a screen.
 water flows at 2 gallons per minute at 6 inches above the ground.

Location: **NE 1/4 Sec. 7, T. 141N, R. 52W.**
 Driller: **Guy H. Idreth**
 Well Started: **May 18, 1937**
 Well Completed: **June 8, 1937**
 Water level above surface **1 ft.**
 Casing: **Kind: Standard Black, Size 3"; Length 357'**
 Screen: **Length 78"; Diameter 1 1/2"; Size Opening 10 slot**
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 12	Sand and gravel
12- 18	Clay
18- 60	Hard clay
60- 78	Blue clay
78-100	Blue clay and stones
100-175	Clay, hardpan and small stones
175-235	Hard layer and clay
235-240	Stone and sand
240-254	Sand and rock
254-300	Blue clay
300-321	Blue clay
321-334	Blue clay
334-349	Clay (soft) and stone
349-353	Hardpan and sand
353-371	Hardpan
371-382	Hardpan and large stone
382-384	Hard rock

Cass County, North Dakota (con't.)

Location: SW $\frac{1}{4}$ Sec. 15, T. 141N., R. 52W.
 Driller: Independent Drilling Co.
 Well started: 5-26-37
 Well Completed: 5-29-37
 Water level below surface 12 ft.
 Casing: Kind: Black pipe, Size 3", Length 106'
 Screen: Length 78"; Diameter 1 $\frac{1}{4}$ ", Size Opening 10 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 1	Top soil
1- 15	Yellow clay
15- 16	Sand
16- 37	Blue clay
37- 38	Coarse sand
38- 60	Clay
60-108	Clay
108-117	Sand

Well finished at 117'
 Tested at 3 gallons per minute. Used Johnson 10 slot 60 mesh screen

Location: NW $\frac{1}{4}$ Sec. 15, T. 141N., R. 52W.
 Driller: Independent Drilling Co. (1)
 Well Started: 11-2-37
 Well completed: 11-10-37
 Water level below surface 5 ft.
 Casing: Kind: Standard Black; Size 3"; Length 122'
 Screen: Length 10"; Diameter 1 $\frac{1}{4}$ "; Size Opening 10 slot Johnson
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 18	Yellow clay
18- 39	Blue clay
39- 42	Gravel and boulders
42- 89	Gray clay
89- 96	Quicksand
96- 98	Gray clay
98-100	Sand
100-108	Gray clay
108-114	Sand
114-122	Gray clay
122-130	Sand

Pumps 6 gallons per minute.

Location: SE $\frac{1}{4}$ Sec. 15, T. 141N., R. 52W.
 Driller: Independent well Co.
 Well Started: 6-1-37
 Well Completed: 6-8-37
 Water level below surface 34 ft.
 Casing: Kind: Standard Black; Size 3"; Length 118'
 Screen: Length 78"; Diameter 1 $\frac{1}{4}$ "; Size Opening 18 slot

Cass County, North Dakota (con't.)

Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 1	Top soil
1- 18	Yellow clay
18- 43	Blue clay
43- 45	Gravel and boulder
45-100	Clay
100-102	Gravel and boulder
102-115	Clay
115-118	Fine sand
118-124	Sand and water

Well tested with 90 feet of drop pipe at 3 gallons per minute
Johnson 1 1/4" X 60" - 18 slot well point

Location: NE 1/4 Sec. 15, T. 141N., R. 52W.
Driller: Independent Drilling Co.
Well Started: October 27, 1937
Well Completed: November 2, 1937
Water level below surface 18 ft.
Casing: Kind: Standard Black; Size 3"; Length 102 1/2'
Screen: Length 6'; Diameter 1 1/4"; Size Opening 18 slot
Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 18	Yellow clay
18- 53	Blue clay
53- 96	Gray clay
96- 97 1/2	Boulder
97 1/2- 98	Boulder
98-103	Gray clay
103-108	Sand

Pumped 5 gallons per minute

Location: SW 1/4 Sec. 19, T. 141N, R. 52W.
Driller: Independent Drilling Co. (2)
Well Started: 10-27-37
Well Completed: 11-1-37
Casing: Kind: Standard Black; Size 3"; Length 243'
Screen: Length 6'; Diameter 1 1/4"; Size Opening 18 slot Johnson
Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 3	Gravel
3- 18	Yellow clay
18- 75	Blue clay
75-134	Gray clay
134-146	Sandy clay
146-194	

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
194-195	Boulders
195-242	Gray clay
242-245	Sand

Flows 2½ gallons per minute.

Location: ~~Sec.~~ Sec. 31, T. 141N, R. 52W.
 Driller: Independent Drilling Co.
 Well Started: 11-2-37
 Well Completed: 11-12-37
 Casing: Kind: Standard Black; Size 3"; Length 253'
 2" 166'
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 7	Yellow clay
7- 80	
80- 95	Blue clay
95-106	Sandy clay
106-143	Gray clay
143-164	Sandy clay
164-200	
200-256	Gray clay
256-261	Sand
261-320	Sandy clay
320-335	
335-342	Shale
342-342'6"	Limerock
342'6"-344	Sandy shale
344-345	Limerock
345-370	Sandy shale
370-380	
380-393	Sand

Flows 3½ gallons per minute.

Location: ~~Sec.~~ Sec. 22, T. 141N, R. None given
 Driller: Geheard Kaas
 Well Started: 5-17-37
 Well Completed: 6-1-37
 Water level below surface 5 ft.
 Casing: Kind: Black pipe; Size 3"; Length 236'
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 20	Yellow clay
20- 41	Blue clay
41- 80	Blue clay
80-100	Sand and rocks
100-135	Blue clay
135-139	Sand and large rock

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
139-160	Sand, dirt, and gravel
160-190	Sand, dirt, and gravel
190-225	Sand and gravel
225-242	Sand and gravel

Well finished at 242' in coarse gravel without a screen.
 Tested at 10 gallons per minute.

Location: SE $\frac{1}{4}$ Sec. 5, T. 142N, R. 50W.
 Driller: Geheard Kaas
 Well Started: 4-22-37
 Well Completed: 5-14-37
 Water level below surface 10 ft.
 Casing: Kind: Black pipe; Size 3"; Length 333'
 Screen: Length 78"; Diameter 1 $\frac{1}{2}$ "; Size Opening 18 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 35	Yellow clay
35- 38	Blue clay and large rock
38- 98	Blue clay
98-107	Blue clay and rocks
107-123	Blue clay and rocks
123-139	Blue clay and rocks
139-170	Blue clay and stones
170-187	Blue clay and stones
187-200	Sand
200-223	Sand
223-245	Sand and small stones
245-275	Sand
275-306	Sand
306-330	Sand
330-338	Sand and gravel

Well finished at 338' and tested at 10 gallons per minute with a drop pipe of 80'.
 Water stands at 10' below surface.

Location: SW $\frac{1}{4}$ Sec. 5, T. 142N, R. 50W.
 Driller: Sletvold
 Well Started: 4-23-37
 Well Completed: 5-11-37
 Water level below surface 12 ft.
 Casing: Kind: Black pipe; Size 3"; Length 364'
 Screen: Length 1-6' 1-4"; Diameter 1 $\frac{1}{2}$ "; Size Opening 40
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 5	Top soil
5- 6	Yellow clay
6- 33	Yellow clay
33- 66	Blue clay
66- 88	Blue clay

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
88-114	Blue clay and rocks
114-144	Blue clay and rocks
144-177	Blue clay and rocks
177-214	Blue clay and rocks
214-223	Sand, gravelly
223-257	Blue clay and rocks
257-275	Clay and rocks
275-305	Clay and rocks
305-342	Clay and rocks
342-374	Sand and rocks

Well developed at 374'

Location: Nrd $\frac{1}{2}$ Sec. 5, T. 142N, R. 50W.
 Driller: Nelson
 Well Started: May 12, 1937
 Well Completed: May 28, 1937
 Water level below surface 10 ft.
 Casing: Kind: Standard Black; Size 3"; Length 208'
 Screen: Length 78"; Diameter 1 $\frac{1}{2}$ "; Size Opening 18 slot.
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 3	Top soil
3- 40	Yellow clay
40- 60	Gray clay
60- 75	Gray clay
75- 87	Hardpan
87-104	Hardpan
104-112	Hardpan
112-114	Hardpan
114-115	Shale
115-140	Blue clay, sand, and boulders
140-150	Blue clay, sand, and boulders
150-160	Hardpan
160-175	Hardpan
175-177	Hardpan and rock
177-179	Hardpan and rock
179-182	Hardpan and rock
182-200	Hardpan
200-213	Sand and water

Tested at 4 gallons per minute.

Location: SE $\frac{1}{4}$ Sec. 9, T. 142N, R. 50W.
 Driller: Geheard Kaas
 Well Started: 10-4-37
 Well Completed: 10-14-37
 Water level below surface 5 ft.
 Casing: Kind: Standard Black; Size 3"; Length 251'
 Screen: Diameter 1 $\frac{1}{2}$ "; Size Opening 40 Mesh Johnson
 Log:

Cass County, North Dakota (con't.)

<u>Total Depth:</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 17	Yellow clay
17- 60	
60- 90	Blue clay
90- 91	
91- 93	Rocks
93-165	
165-180	Blue clay
180-182	Rocks
182-200	
200-245	
245-256	Sand

Pumped as fast as 3" casing would carry it.

Location: SE $\frac{1}{4}$ 9, T. 142N, R. 50W.
Driller: Geheard Kaas
Well Started: September 10, 1937
Well Completed: September 17, 1937
Water level below surface 8 ft.
Casing: Kind: Standard Black; Size 3"; Length 306'
Screen: Length 6'; Diameter 1 $\frac{1}{2}$ "; Size Opening 40 mesh
Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 20	Yellow clay
20- 50	
50-100	
100-160	
160-210	
210-260	
260-294	Blue clay
294-300	Gravel
300-312	Gravel

Pumped 50 gallons per minute.

Location: NW $\frac{1}{4}$ Sec. 9, T. 142N, R. 50W.
Driller: Geheard Kaas
Well Started: Sept. 20, 1937
Well Completed: Oct. 2, 1937
Water level below surface 15 ft.
Casing: Kind: Standard Black; Size 3"; Length 332ft.
Screen: Length 6 ft.; Diameter 1 $\frac{1}{2}$ "; Size Opening 40 mesh
Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 15	Yellow clay
15- 55	
55- 90	Sand
90-100	
100-160	

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
160-210	
210-235	
235-275	
275-305	
305-320	Blue clay
320-338	Gravel

Pumps 30 gallongs per minute.

Location: SW $\frac{1}{4}$ and S $\frac{1}{2}$ of SE $\frac{1}{4}$ Sec. 15, T. 142N. - R. 50W.

Driller: Albert Herberg

Well Started: 10-8-37

Well Completed: 10-15-37

Water Level below surface 2 ft.

Casing: Kind: Standard Black; Size 3"; Length 208'

Screen: Length 5'; Diameter 1 $\frac{1}{4}$ "; Size Opening 60 mesh Johnson

Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 20	Yellow clay
20- 75	Blue clay
75- 76	Stone
76- 86	Blue clay
86- 90	Sand
90-118	Blue clay
118-119	Stone
119-160	
160-200	
200-213	Blue clay

Pumped at 25' - all pitcher pump could carry.

Location: NW $\frac{1}{4}$ Sec. 15, T. 142N. - R. 50W.

Driller: Albert Herberg

Well Started: October 5, 1937

Well Completed: October 7, 1937

Water level below surface 2 ft.

Casing: Kind: Standard Black; Size 3"; Length 97'.

Screen: Length 5' each; Diameter 1 $\frac{1}{4}$ "; Size Opening 60 mesh.

Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 6	Top soil
6- 20	Yellow clay
20- 70	
70- 87	Blue clay
87- 90	
90-103	Sand

At 7' pumped 25 gallons per minute.

Cass County, North Dakota (con't.)

Location: NE $\frac{1}{4}$ Sec. 16, T. 142N, R. 50W.
 Driller: Geheard Kaas
 Well Started: 10-25-37
 Well Completed: 11-6-37
 Water level below surface 4 ft.
 Casing: Kind: Standard Black; Size 3"; Length 248'
 Screen: Diameter 1 $\frac{1}{2}$ "; Size Opening 40 mesh Johnson
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 15	Yellow clay
15- 40	Blue clay
40- 90	
90-115	
115-160	
160-185	
185-230	
230-252	Sand

Pumped as fast as 3" casing will carry.

Location: SW $\frac{1}{4}$ Sec. 18, T. 142N, R. 50W.
 Driller: Albert Herberg
 Well Started: 11-2-37
 Well Completed: 11-12-37
 Water level below surface 14 ft.
 Casing: Kind: Standard Black; Size 3"; Length 137'
 Screen: Length 5' each; Diameter 1 $\frac{1}{2}$ "; Size Opening 60 mesh Johnson
 1 $\frac{1}{2}$ " pipe at lower end of screen, 8'
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 20	Yellow clay
20- 60	
60- 95	Blue clay
95- 96	Stone
96-120	
120-137	Sandy clay
137-150	Sand

7 gallons per minute at 90'

Location: NE $\frac{1}{4}$ Sec. 22, T. 142N, R. 50W.
 Driller: Albert Herberg
 Well Started: 10-27-37
 Well Completed: 10-30-37
 Water level below surface 6 ft.
 Casing: Kind: Standard Black; Size 3"; Length 157'
 Screen: Diameter 1 $\frac{1}{2}$ "; Size Opening 40 mesh Johnson
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
165-180	Sand
180-203	Fine sand

Tested at 30 gallons per minute.

Location: Sec. NE $\frac{1}{4}$ 29, T. 142N, R. 50W.
Driller: Kaas
Well Started: 6-29-37
Well Completed: 7-9-37
Water level below surface dry
Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 24	Yellow clay
24- 30	Blue clay and rocks
30- 60	Blue clay and rocks
60- 85	Blue clay and rocks
85- 95	Blue clay and rocks
95-115	Blue clay and rocks
115-130	Blue clay and rocks
130-150	Blue clay and rocks
150-160	Blue clay and rocks
160-163	Blue clay and large rock

Moved about 20 ft. south and started new hole

Location: NE $\frac{1}{4}$ Sec. 29, T. 142N, R. 50W.
Driller: Kaas
Well Started: 7-17-37
Well Completed: 7-31-37
Water level below surface 6 ft.
Casing: Kind: Standard Black, Size 3"; Length 39 $\frac{1}{4}$ '
Screen: Length 6'; Diameter 1 $\frac{1}{2}$ "; Size Opening #18 slot
Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 24	Yellow clay
24- 40	Blue clay and rocks
40-100	Blue clay and rocks
100-160	Blue clay and rocks
160-220	Blue clay and rocks
220-280	Blue clay and rocks
280-330	Blue clay and rocks
330-340	Blue clay and rocks
340-355	Blue clay and rocks
355-375	Blue clay and rocks
375-390	Sand and gravel
390-398	Sand and water

Tested at 8 gallons per minute.

Cass County, North Dakota (con't.)

Location: SE $\frac{1}{4}$ Sec. 9, T. 142N, R. 51W.
Driller: Independent Drilling Co. Rig #1
Well Started: 10-13-37
Well Completed: 10-20-37
Water level below surface 18 ft. 1 $\frac{1}{2}$ " 6'
Casing: Kind: Standard Black; Size 3"; Length 150'
Screen: Length 12'; Diameter 1 $\frac{1}{2}$ "; Size Opening 60 mesh
Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 1 $\frac{1}{2}$	Top soil
1 $\frac{1}{2}$ - 31	Yellow clay
31- 50	
50- 65	Blue clay
65- 67	Hardpan
67- 94	Gray clay
94- 94 $\frac{1}{2}$	
94 $\frac{1}{2}$ - 96	Boulders
96-104	Gray clay
104-105	Boulders
105-120	
120-126	Gray clay
126-137	Sand

Pumped 5 gallons per minute

Location: NW $\frac{1}{4}$ Sec. 9, T. 142N, R. 51W.
Driller: Independent Drilling Co.
Well Started: 9-17-37
Well Completed: 10-5-37
Casing: Kind: Standard Black; Size 3"; Length 352'
Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 18	Yellow clay
18- 50	
50- 70	Blue clay
70- 90	Sandy clay
90-100	Gravel and clay
100-102	Boulders
102-110	
110-115	Hardpan
115-116	Boulders
116-120	
120-127	Hardpan
127-140	Gray clay
140-141	
141-142	Boulders
142-180	
180-218	Gray clay
218-220	Boulders
220-270	Gray clay
270-280	
280-300	Sandy clay

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
300-302	Lime rock
302-320	
320-334	Sandy clay
334-345	
345-355	Hardpan
355-368	Sand

Flowing 2 gallons per minute.

Location: W $\frac{1}{2}$ Sec. 9, T. 142N, R. 51W.
 Driller: Erick Nelson
 Well Started: 6-2-37
 Well Completed: 8-7-37
 Flowing well
 Casing: Kind: Black Standard; Size 3"; Length 328'
 Screen: Length 10'; Diameter 1 $\frac{1}{4}$ "; Size Opening #18 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 1	Top soil
1- 60	Yellow clay
60- 78	Gray clay and rocks
78- 97	Hardpan
97-105	Hardpan
105-112	Hardpan
112-121	Hardpan
121-129	Hardpan
129-138	Hardpan
138-145	Hardpan
145-151	Hardpan
151-157	Hardpan and boulders
157-164	Hardpan and boulders
164-176	Clay, gravel, and rocks
176-190	Blue clay and stones
190-232	Blue clay and stones
232-265	Blue clay and stones
265-273	Hardpan
278-279	Piece of granite
279-280	Piece of granite
280-291	Hardpan
291-297	Hardpan
297-308	Hardpan
308-318	Hardpan
318-321	Hardpan
321-327	Hardpan
327-332	Hardpan
332-334	Sand
334-334 $\frac{1}{2}$	Shale
334 $\frac{1}{2}$ -335	Shale
335-340	Clay and shale
340-342	Hardpan
342-346	Hardpan
346-349	Hardpan
349-353	Sand

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
353-355	Sand
355-357	Sand
357-370	Sand
370-377	Sand
377-390	Sand
390-400	Sand
400-415	Sand

Flows $1\frac{1}{2}$ gallons per minute at 3' above ground.

Location: SW $\frac{1}{4}$ Sec. 13, T. 142N, R. 51W.
 Driller:
 Well Started: November 24, 1936
 Well Completed: December 2, 1936
 Water level below surface 19 ft.
 Casing: Kind: Standard Black; Size 3"; Length 147' 10" Casing 10" above surface,
 Screen: Length 4 $\frac{1}{2}$ "; Diameter 1 $\frac{1}{4}$ "; Size Opening #18 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 6	Top soil
6- 20	Yellow clay
20- 76	Blue clay
76- 78	Blue clay
78- 81	Sand, white-med., fine, little water
81-102	Blue clay, some gravel
102-130	Blue clay, some gravel
130-138	Blue clay, some gravel
138-143	Black sandy clay (hard drilling)
143-147	Coarse sand
147-148 $\frac{1}{2}$	

Screen driven $1\frac{1}{2}$ ft. below casing. Pumped well with compressed air. Rate of flow averaged $7\frac{1}{2}$ gal. per min. for two hours. Screen set with rubber packer. Bottom plugged with lead. 2" fittings on top of screen.

Location: NW $\frac{1}{4}$ Sec. 13, T. 142N, R. 51W.
 Driller: Albert Herberg
 Well Started: December 4, 1936
 Well Completed: December 12, 1936
 Water level below surface 24 ft.
 Casing: Kind: Standard Black; Size 3"; Length 137'. Pipe 65' above ground.
 Screen: None
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 5	Black sandy top soil
5- 20	Yellow clay
20- 50	Blue clay
50- 70	Blue clay
70- 89	Blue clay

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
89- 90	Small stones
90- 99	Blue clay
99-112	Blue clay with sand
112-127	Coarse sand and small stones
127-135	Coarse sand
135-137	Coarse sand

Well finished without a screen. Very coarse sand. Water cleared up and pumped very little fine sand. Pumped 10 gallons per minute for 2 hours. 70' of pipe and air lift.

Location: NE $\frac{1}{4}$ Sec. 13, T. 142N, R. 51W.
 Driller:
 Well Started: December 17, 1936
 Well Finished: December 23, 1936
 Water level below surface 13 ft.
 Casing: Kind: Standard Black; Size 3"; Length 105 $\frac{1}{2}$ '
 Screen: Length 11'8"; Diameter 1 $\frac{1}{2}$ "; Size Opening Johnson #18 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 5	Top soil
5- 20	Yellow clay
20- 22	Blue clay
22- 78	Blue clay, hit rock and dynamited
78- 82	Blue clay and small stones
82- 86	Coarse sand
86-105	Medium sand
105-115	Medium sand

Pumped 30 gallons per minute for 2 hours. Use 70' of drop pipe and air lift.

The screen is set 102'4" below ground level. Screen Assembly: 6' Screen, 5' of 1 $\frac{1}{2}$ " Galv. Pipe, 2" to 1 $\frac{1}{2}$ " bushing, 2" coupling, 3" rubber packer on 2" nipple, 2" coupling with $\frac{1}{2}$ " slots, lead plug in bottom of screen.

Location: SE $\frac{1}{4}$ Sec. 13, T. 142N, R. 51W.
 Driller: Albert Herberg
 Well Started: 7-10-37
 Well Completed: 7-20-37
 Water level below surface 17 $\frac{1}{2}$ ft.
 Casing: Kind: Standard Black; Size 3"; Length 216'
 Screen: Length 48" each (2); Diameter 1 $\frac{1}{2}$ "; Size Opening #18 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 5	Top soil
5- 20	Yellow clay
20- 80	Blue clay, rock at 80'
80- 85	Sand
85- 95	Sand
95-135	Blue clay and gravel
135-180	Blue clay

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
180-206	Blue clay and gravel
206-220	Sand and stone
220-225	Sand and water

Tested at 20 gallons per minute

Location: NW $\frac{1}{4}$ Sec. 16, T. 142N, R. 51W.
 - Driller: Independent Drilling Co.
 Well Started: 10-6-37
 Well Completed: 10-25-37
 - Casing: Kind: Standard Black; Size 3"; Length 341'
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 22	Yellow clay
22- 80	Blue clay
80-80'6"	Boulders
80'6"-95	Blue clay
95- 96	Boulder
96-100	Blue clay
100-104	Sand
104-115	Gravel and sand
115-140	
140-146	Sandy clay
146-150	Sand
150-151	Boulder
151-220	
220-230	Gray clay
230-268	Sandy clay
268-280	
280-308	Gray clay
308-310	Sandy clay
310-311	
311-312	Boulders
312-340	Sand, clay
340-360	Sand
360-370	Sandy clay

Flowing $\frac{1}{2}$ gallon per minute

Location: NE $\frac{1}{4}$ Sec. 16, T. 142N, R. 51W.
 Driller: Albert Herberg
 Well Started: 12-30-36
 Well Completed: 2-10-37
 Water level above surface 3"
 Casing: Kind: Standard Black; Size 3"; Length 400'
 Screen: Length 10'; Diameter 1 $\frac{1}{2}$ "; Size Opening #18 slot Youngstown
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
1- 5	Black top soil

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
5- 20	Yellow clay
20- 65	Blue clay
65- 75	Blue clay, gravel and stones
75- 80	Blue clay and gravel
80-100	Blue clay and sand
100-122	Blue clay and small stones
122-148	Sandy blue clay
148-180	Blue clay and small stones
180-208	Blue clay and stones
208-260	Blue clay and small stones
260-328	Blue clay
328-336	Blue clay
336-340	Sand
340-342	Hardpan
342-343	White sand
343-355	Fine sand
355-382	Fine sand
382-401	Fine sand
401-410	White sand

15 gallons per minute

Set 2 5' #18 slot, 1½ Youngstown screens with 6' extension of 1½" black pipe, 1½ to 2 inch reducer, 3" rubber packer, 2" coupling with ½ inch slots on top. Lead plug in bottom.

Location: Sec. 17, T. 142N, R. 51W.
 Driller: Hildreth
 Well Started: 6-9-37
 Well Completed: 6-30-37
 Water level: Flowing
 Casing: Kind: Standard Black; Diameter 1½"; Size Opening #10 slot
 Screen: Length 5'; Diameter 1½"; Size Opening #10 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 1	Top soil
1- 64	Gray clay
64- 78	Shale and hardpan
78-102	Gravel
102-105	Large boulder
105-142	Hardpan
142-150	Clay
150-165	Hardpan
165-168	Small stones
168-193	Blue clay
193-200	Hardpan
200-230	Blue clay
230-286	Blue clay
286-306	Shale
306-314	Blue clay and stones
314-316	Hardpan
316-321	Hardpan
321-328	Blue clay
328-332	Hardpan

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
332-344	Shale, hardpan and a big stone
344-350	Large stone
350-362	Hard shale
362-374	Sand
374-378	Hardpan
378-385	Hardpan
385-391	Hardpan
391-393	Hardpan

Tested at 16 gallons per minute.

Location: NE 1/4 Sec. 28, T. 143N, R. 50W.
 Well Started: March 12, 1937
 Well Completed: March 26, 1937
 Water level below surface 4 ft.
 Casing: Kind: Standard Black pipe; Size 3"; Length 265'.
 Screen: Length 5'; Diameter 1 1/2"; Size Opening 18 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Black top soil
4- 20	Yellow clay
20- 70	Blue clay
70- 75	Blue clay
75- 90	Blue clay mixed with small stones and sand
90-105	Blue clay and gravel and small stones
105-144	Blue clay and gravel
144-175	Blue clay and sand
175-242	Blue clay and gravel
242-245	Blue clay and sand
245-266	Sand
266-270	Coarse sand

Screen down to 270' Youngstown #18. Tested at 10 gallons per minute for 9 hours water rises to within 4 feet of surface.

Location: SW 1/4 Sec. 32, T. 143N, R. 50W.
 Driller: Dakota Artesian Well Co.
 Well Started: May 12, 1937
 Well Completed: May 28, 1937
 Water level below surface 5 ft.
 Casing: Kind: Standard Black; Size 3"; Length 315'
 Screen: Length 78"; Diameter 1 1/2"; Size Opening 18 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 6	Clay
6- 20	Yellow clay
20- 80	Blue clay
80-110	Blue clay and rocks
110-117	Gravel and boulders
117-140	Clay and boulders

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
140-150	Blue clay and boulders
150-180	Shale
180-185	Sand and boulders
185-195	Shale
195-230	Shale
230-290	Shale and boulder
290-293	Shale
293-315	Blue clay
315-326	Sand, gravel and water

Location: SE $\frac{1}{4}$ Sec. 33, T. 143N, R. 50W.
 Well Started: 4-16-37
 Well Completed: 5-11-37
 Water level below surface 2 ft.
 Casing: Kind: Black pipe; Size 3"; Length 351'
 Screen: Length 6'; Diameter 1 $\frac{1}{4}$ "; Size Opening 40 mesh
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 6	Top soil
6- 31	Yellow clay
31- 50	Yellow clay
50- 58	Blue clay
58- 60	Blue clay
60- 70	Blue clay
70- 79	Gray rocks and clay
79- 83	Hardpan
83- 90	Blue clay and rocks
90-120	Blue clay and rocks
120-141	Hardpan
141-166	Gray clay and rocks
166-170	Clay and sand
170-180	Shale
180-188	Clay and gray rocks
188-204	Clay and gray rocks
204-210	Clay and gray rocks
210-221	Clay and gray rocks
221-224	Shale
224-230	Clay and sand
230-234	Clay and gray rocks
234-261	Gray rocks and clay
261-294	Clay and gray rocks
294-295	Hardpan
295-297	Hardpan
297-342	Clay
342-357	Sand

Location: NE $\frac{1}{4}$ Sec. 33, T. 143N, R. 50W.
 Driller: Geheard Kaas
 Well Started: 3-17-37
 Well Completed: 4-7-37
 water level below surface 1 $\frac{1}{2}$ '
 Casing: Kind: Standard Black; Size 3"; Length 325'
 Log:

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 15	Yellow clay
15- 38	Blue clay
38-100	Blue clay
100-146	Blue clay
146-161	Blue clay and small boulders
161-173	Blue clay
173-200	Blue clay
- 200-202	Gray Hardpan and boulders
202-205	Gray hardpan and boulders
205-247	Gray soapstone
- 247-265	Sandy clay
265-315	Sandy clay
315-321	Blue sand
321-331	Sand

Well finished at 331 ft. screen set at 325'

Location: Sec. 33, T. 143N, R. 50W.
 Well Started: 4-17-37
 Well Completed: 5-2-37
 Water level above surface 3 ft.
 Casing: Kind: Standard Black pipe; Size 3"; Length 227'
 Screen: Length 10 ft; Diameter 1 1/4"; Size Opening 18 slot
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 48	Top soil and yellow clay
48- 70	Blue clay, some rock
70- 80	Hardpan, gray, very hard
80- 90	Blue clay, rocks, and sand
90-122	Blue clay, rocks, and sand
122-155	Blue clay, rocks, and sand
155-180	Sand and gravel
180-190	Blue clay
190-209	Blue clay
209-241	Sand

Finished with 2 screens. Tests at 40 gallons per minute.

Location: Sec. (not given), T. 143N, R. 50W.
 Driller: Geheard Kaas
 Well Started: April 13, 1937
 Well Completed: April 21, 1937
 Water level below surface 6 ft.
 Casing: Kind: Black pipe; Size 3"; Length 111'.
 Screen: Length 6'; Diameter 1 1/4"; Size Opening 60 mesh
 Log:

<u>Total Depth</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 10	Gray clay
10- 25	Yellow clay

Cass County, North Dakota (con't.)

<u>Total Depth</u>	<u>Kind of Strata</u>
25- 40	Yellow clay
40- 47	Yellow clay
47- 67	Blue clay and rocks
67- 94	Blue clay and rocks
94-109	Blue clay and rocks
109-117	Gravel, quite coarse

Well developed at 117'
Screen set on granite boulder

Log of Test well #1
Drilled on Gardine Property, Fargo, North Dakota

<u>Total Depth</u>	<u>Kind of Strata</u>
50- 62	Clear Quartzsand with particles of clay
62- 90	Blue clay
90-125	Blue clayey sand, sand quite fine
125-135	Coarse sand with blue clay in it.
135-140	Gravel with coarse sand and blue clay. Also pebbles.
140-150	Sandy clay
150-158	Grayish sandy clay
158-160	Coarse sand
160-190	Clear medium grained quartz sand
190-195	Coarse sand
195- ?	Blue sandy clay

N. P. Well No. 2, Fargo, Cass County, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0- 93	Soil and clay
93-150	Sand and gravel
150-240	Soft sand and gravel, some water
240-259	Hard granite
259-327	Soft granite
327-360	Hard granite

<u>Geologic Formations</u>	<u>Depth of Formations</u>
Lake Agassiz Silt	0- 93
Glacial drift	93-150
Cretaceous	150-240
Archean Granite	240-

N. P. well No. 3

<u>Depth in Feet</u>	<u>Formation</u>
0- 89	Soil and clay
89-136	Sand and boulders
136-156	Gravel and sand
156-167	Sand and soapstone, some water
167-180	Soft sandstone
180-250	Sand
250-252	Granite

Cass County, North Dakota (con't.)

<u>Geologic Formations</u>	<u>Depth of Formations</u>
Lake Agassiz Silt	0- 89
Glacial Drift	89-167
Cretaceous sand and shale	167-250
Archean Granite	250

Blue Island Cry. Well, Cass County, Fargo, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0-105	Soil, yellow clay, blue clay
105-160	Sand
160-180	Sand and gravel, water bearing
180-280	Clay and sand
280-393	Green sandstone (?)
393-400	Red sandstone (?)
400-403	Gray sandstone (?)

<u>Geologic Formations</u>	<u>Depth in Feet</u>
Lake Agassiz Silt	0-105
Glacial Drift	105-160
Cretaceous sand and shale	160-280
Archean Granite (?)	280

Fairmount Cry. Well, Fargo, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0- 20	Yellow clay
20-125	Blue clay
125-190	Gray clay
190-227	Blue clay
227-246	Sand and gravel
246-250	Clay

Log of Test Well #3, Fargo, North Dakota

<u>Depth in Feet</u>	<u>Lithology and Remarks</u>
20- 55	Calcareous shale clay, yellow
55- 60	Fine light colored sand, calcareous
60- 65	Calcareous clay, blue
65-105	Calcareous shale clay, blue
105-115	Calcareous clay (dark) quite large pebbles
115-145	Calcareous clay, yellow
145-151	Calcareous clay, light colored sand and gravel
151-189	Calcareous clay, light colored sand, coarse and gravel
189-199	Calcareous clay, blue clay and sand
199-201	white soapy clay, also contains sand grains, not calcareous

G.N.R.R. Well, Casselton, Cass County, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0- 4	Filling

Cass County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>
4- 5	Black soil
5- 15	Yellow soil
15- 90	Blue clay
90-105	Sandy clay
105-243	Blue clay
243-246	Boulders and clay
246-324	Blue clay
324-350	Gray shale
350-351	White sand
351-370	White shale
370-410	Red shale
410-414	Granite formation
414-455	Green shale
455-531	Granite formation

Cass County Well, Tower City, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0- 50	Soil
50-425	Clay
425-450	Soft sandstone
450-535	Very soft clay
535-635	Mud
635-716	Hardpan, gravel and rock

CAVALIER COUNTY

REPORT OF WELL June 15, 1946

Owner: St. Mary's Rectory, Catholic Parish House, Munich, N. Dak.
 Location: On South side of Catholic Parish house in Munich, N. Dak.
 Driller: C. A. Simpson, Bisbee, N. Dak.

Log:

0- 1	Topsoil
1- 22	Yellow clay
22- 33	Sandy gray clay
33- 42	Hard gravelly gray clay with rocks.
42-102	Blue shale (a little water at 70')
102-104	Shale, gravel
104-109	Shale
109-110	Shale sand and gravel
110-113	Shale
113-114	Curvy shale and little water
114-114	Shale

Remarks: Most of water comes from 133-136
 Water level: About 20' below surface
 Yield: 4 gallons per minute at 60'
 4 1/3 gallons per minute at 70'
 Casing: 17' of 4" pipe
 22'9" of 3" perforated pipe.

Cavalier County, North Dakota (con't.)

REPORT OF WELL July 6, 1946

Owner: C.C. Martz, Calvin, North Dakota
Location: 3/4 miles east of Mt. Pleasant School of 4N. 8 3/4 E. of Rock Lake, N.D.
Driller: C. A. Simpson, Bisbee, North Dakota (Pasture Well)

Log:

0- 1	Topsoil
1- 21	Yellow clay
21- 65	Blue clay and rocks
65- 80	Yellow clay, gravelly, rocks
80- 82	Muddy yellow gravel
82-99	Sand and gravel

Casing: 94' of 4" black pipe
Screen: "Johnson" Armco iron, welded type screen, 4" X 6' slot #24
Water level: 15' below surface
Yield: 5'/min. (3 2/3 gpm) at 26'
7'/min. at 38'.

REPORT OF WELL June 13, 1946

Owner: Mrs. Julie Schuler, Munich, North Dakota
Location: In NW part of Munich, North Dakota
Driller: C. A. Simpson, Bisbee, North Dakota
Log:

0- 1	Topsoil
1- 20	Yellow clay
20- 30	Gravelly gray clay, muddy sand, rocks
30- 50	Gray hardpan, rocks
50-145	Blue shale

Casing: 124' of 4" black pipe
25' of 3" perforated pipe
Water level: 18'
Yield: 4 gallons per minute at 44'
6 gallons per minute at 60'
First water was at 86, next 130

REPORT OF WELL July 11, 1946

Owner: Wes Shortridge, Hannah, North Dakota
Location: 2 1/2 N. 6E. of Calvin, North Dakota
Driller: C. A. Simpson, Bisbee, North Dakota
Log:

0- 1	Top soil
1- 29	Yellow and blue clay w/rocks
29- 50	Hard blue shale
50- 97	Blue shale
97-	

Casing: 49' of 4" pipe
51' of 3" perforated pipe. (44' to top of 3")
Water level:
Yield: 3 1/2' / min at 38'
5' / min (3 1/3 gpm)

Cavalier County, North Dakota (con't.)

Pump: 2 1/2" cyl.
60' of 1 1/4" above cyl., 3' below

4" pipe	3" pipe
19-8	19-11
19-5	21
	11

REPORT OF WELL July 18, 1946

Owner: Wilfred H. Simon, Calio, North Dakota
Location: 4N. 1 1/2W. of Calio, North Dakota
Contractor: C.A. Simpson, Bisbee, North Dakota

A. Work on old well. Was said to be 196'. There was more pipe in it than could be fished out. Drilled to 183'. Gravelly shale was coming into well along with a very little water.

B. New Well. NE of house.

Log:

0- 1	Topsoil
1- 28	Yellow clay
28- 41	Gray clay, rocks
41-110	Shale or clay
110-216	Shale

Casing: 191' of 4" pipe
29' of 3" perforated pipe
Water level: 29'
Yield: 5' / min. at 72'
8' / min. at 105' (5 2/3 gpm)
Quality: Slightly salty and moderately soft.

REPORT OF WELL June 10, 1946

Owner: Peter Zimmer, Munich, North Dakota
Location: 1N, 2 1/2W of Munich. Well at SW corner of barn
Driller: C. A. Simpson, Bisbee, North Dakota

Log:

0- 1	Topsoil
1- 10	Yellow clay
10- 26	Gravelly yellow clay
26- 65	Gravelly gray clay
65- 80	Muddy sand
80- 98	Sandy shale (?)
98-118	Shale, sand and gravel w/water
118-129	Hard shale or slate
129-130	Shale, gravel and sand
130-134	Shale
134-138	Shale, sand, and gravel
138-143	Shale, sand
143-149	Sandy shale
149-152	Shale, sand, and gravel, mushy
152-156	Sandy shale (bit clean)
156-162	Shale, sand, and gravel
162-170	Sandy shale

Cavalier County, North Dakota (con't.)

170-171	Shale, sand, and gravel
171-180	Sandy shale
180-183	Shale, sand, and gravel

Casing: 183' of 4" pipe
 Yield: 5 gallons per minute at 40'
 Static level: 19'
 Pump: 2½" cyl., 42' of 1½" above cyl. and 8' below
 Remarks: There was water in all of the layers of shale, sand, and gravel but the sand was inclined to come with the water.

WELL LOG:

Munich, Cavalier County, North Dakota, 220' North of depot. Drilled December, 1919 by Ry. Co.

0 to 10	Soft yellow clay
10 to 20	Hard yellow clay and stones
20 to 31	Hard blue clay
31 to 34	Clay, sand, gravel, and boulders containing a little water
34 to 165	Hard blue shale

6" casing set at 126½ feet. Water stands at 19', and lowers to 130' when pumping 18 gallons per minute. Well used for locomotive supply.

Partial analysis of water from this well is given below in G.P.G.

Total Hardness	4.7
Sodium Carbonate	25.2
Alkali salts	125.1
Total Dissolved Solids	129.8

(From letter to Mr. Simpson from B. W. DeGeer of the Great Northern Railway Co., May 2, 1936.)

Geiske Bros. well, 1 mile west of Loma, Cavalier County, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0 to 30	Yellow and blue clay
30 to 45	Boulder clay
45 to 170	Clay with gravel and sand
170 to 175	Hard shale
175 to 179	Soft shale
179 to 181	Limestone
181 to 218	Hard shale
218 to 220	Soft shale
220 to 250	Hard shale
250 to 390	Shale, hard and soft layers
390 to 400	Shale, with small gravel
400 to 500	Shale, soft, with hard layers 1 to 2 feet thick

Langdon Test Well No. 1, Cavalier County, North Dakota
 Log:

<u>Formation</u>	<u>Depth in Feet</u>
Calcareous shale clay-blue	0 to 205
Calcareous shale, great percentage of granular limestone, gray	205 to 215

Cavalier County, North Dakota (con't.)

Formation

Depth in Feet

Calcareous shale-blue	215 to 245
Calcareous shale-dark gray	245 to 255
Calcareous shale-gray	255 to 265
Calcareous shale-blue	265 to 330
Calcareous shale-dark gray,	330 to 340
Calcareous shale, very dark gray	340 to 350
Calcareous shale-black-only slightly calcareous	350 to 360
Calcareous shale-black	360 to 370
Calcareous shale-dark gray	370 to 380
Calcareous shale-very dark gray	380 to 390
Calcareous shale-dark gray	390 to 420
Calcareous shale-gray	420 to 450
Calcareous shale-very dark gray	450 to 505
Calcareous shale-black	505 to 530
Calcareous shale-blue	530 to 620
Calcareous shale-gray	620 to 650
Calcareous shale clay-bluish gray	650 to 660
Calcareous shale clay-very dark gray	660 to 690
Calcareous shale clay-bluish gray	690 to 720
Calcareous shale clay-bluish gray-	720 to 730
Calcareous shale clay-gray	730 to 760
Calcareous shale clay-grayish	760 to 770
Calcareous shale clay- gray	770 to 790
Calcareous shale clay-bluish	790 to 820
Calcareous shale clay-light blue	820 to 875
Calcareous shale clay-light blue-very fine and powdery	875 to 890
Calcareous shale clay-blue-coarse	890 to 905
Calcareous shale clay-blue	905 to 995

REPORT OF TEST HOLES

Drilled for: Geological Survey
 Drilled by: C. A. Simpson, Bisbee, North Dakota

TEST HOLE #1

Location: 3 miles west of Concrete, North Dakota
 1/4 mile S. of N.Dak. Highway #5

Log:

0- 1 1/2	Topsoil
1 1/2- 3	Gray clay
3- 17	Yellow clay
17-140	Gray shale
140-180	Light gray shale
180-186	Dark gray shale

TEST HOLE # 2

Location: 2 1/2 miles W. of Concrete on #5

Log:

0- 1 1/2	Top soil
1 1/2- 10	Yellow clay
10- 65	Dark gray shale
65-100	Gray shale, rather light

Cavalier County, North Dakota (con't.)

TEST HOLE #2 (con't.)

100-141	Dark gray shale. Stopped hole.
141-158	Dark gray shale.
158-162	Gray shale
162-224	Medium dark gray shale
224-235	Gray with tinge of tan
235-317	Gray shale, varying a little in darkness

TEST HOLE # 3

Location: 3½ miles W., 1 mile S. of Concrete

Log:

0- 1	Top soil
1- 19	Yellow clay
19- 88	Gray shale
88- 89	Shale, gravel, water
89-180	Gray shale
180-195	Gray shale, lighter, with green tinge.
195-221	Light gray shale
221-245	Dark gray shale
245-311	Gray and medium light gray shale

TEST HOLE # 4

Location: 2½ W., 1 S. of Concrete

Log:

0- 1	Top soil
1- 17	Yellow clay
17-152	Gray shale
152-162	Light gray shale w/green
162-183	Light gray shale
183-193	Gray shale

TEST HOLE # 5

Location: 2 miles W., 1½ miles S. of Concrete, in road ditch.

Log:

0- 9	Yellow
9-136	Gray shale
136-162	Light gray shale
162-180	Dark gray shale
180-190	Gray shale
190-224	Dark gray shale
224-280	Light and medium light gray shale
280-300	Medium light gray shale, with tinge of tan
300-322	Very light gray shale
322-333	Darker gray shale
333-335	Becoming lighter. Still reacts to HCl

September 17, 1947 NE¼ S¼ Sec. 7, T. 161N, R. 54W.

Test hole: M-1, M & W Drilling Company

2 miles S. from Highway #5 Pigtail Hills, Elevation 920

Start in dune sand

Fine grained sand, gray	0- 4
Fine grained sand, gray and brown with some iron stained sand. Lost some water at 9.0'. Waterable probably	4-10

Cavalier County, North Dakota (con't.)

Clay, silty, brown with iron cemented sandy leaves. Snail shells. Brown twigs.	10-14
Clay, silty, gray, snail shells	14-16
Clay, silty with less silt	16-19
Clay, silty with few pebbles	19-24
Clay, gray and interbedded sand. Less 3 ft. drilled base.	24-29
Clay, gray, little sand	29-64

Total Depth 64'

After standing about 1½ hours water stood at 9.7'.

Cavalier, September 17, 1947, NW¼ NW¼ Sec. 13, T. 161N., R. 54W.

Test hole: M-2, M&W Drilling Co.

Start in Sand

Sand and top soil	0-4
Clay, silty, some pebbles, gray, green, and yellow color	4-14
Clay, silty, pebbles, coal fragments, vegetation, fragments of limestone (?), Cretaceous Pierre shale. Yellow in this sample, washed thru trench.	14-24
Clay, silty gray, pebbles, some coal fragments, sandier than above	24-29
Sand, clayey, wood fragment, more sand than clay. Very fine grained	29-42
Sand, clayey with few small pebbles. Interbedded sand and clay by way it drills, gravel pebbles up to ½" diameter. Least in lower part - Lost water.	42-45
Gravel (?) mainly Benton Shale fragments, also Cretaceous Pierre fragments. Some sand. Clay interbedded, gravel probably in thin strips	45-52
Clay, gray, little silt	52-57
Clay, gray, no sand in silt	

Total depth 64'

Water level 6.8'

September 17, 1947

1 hour after drilling

Water level 9.5' September 18, 1947

Water level 9.4' September 19, 1947

September 18, 1947, NE¼ NE¼ Sec. 15, T. 161N., R. 55W.

Test hole: M-3 M & W Drilling Company, Elevation 971

Start in brown sand

Brown fine grained sand and coarse sand	0-4
Gravel and mainly Cretaceous Pierre shale and granite and limestone, and fine brown sand and some silty clay, probably in layers.	4-14
Clay and sand some pebbles mainly sand. Some coaly fragments	14-18
Sand, clayey and silty, yellow, iron stained	18-21
Sand, clayey, silty, gray	21-24
Clay, silty, gray, possibly some sand, probably more sand than clay. Fine grained brown, coaly fragments, definitely grayer than above	24-34
Sand, gray, silty with gray silty clay, willow fragment, takes water	34-54
Sand, fine grained, silty, gray	54-66
Clay, some sand, finer grains, silty gray	66-74

Cavalier County, North Dakota (con't.)

Clay, gray, silty, and little sand	74-84
Sand and clay, gray fine grained	84-99
Clay, gray, sticky	99-104

Total Depth 104'
 Water level 44' from surface September 19, 1947

September 18, 1947, SW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 15, T. 161N., R. 55W.
 Test hole: M-4, M & W Drilling Company, Elevation 1005'
 About middle of ridge in E W direction

Fine gravel and sand, Cretaceous Pierre pebbles, granite and limestone	0- 25
Sand, brown fine grained with some pebbles. Pebbles drop out 10' below top	25- 64
Sand, gray somewhat coarser	64- 70
Sand and gravel	70- 71
Clay, gray, and gravel	71- 74
Clay, dark gray to black, limestone pebbles and dark material looking like peat. Drilled harder 81-82. Silty, some shale pebbles	74- 88
Clay, dark greenish gray, some black stuff	88- 89
Clay, dark gray, some pebbles	89-124

Total Depth 124'
 Water level 35' from surface September 19, 1947

DICKEY COUNTY

Oakes Well (not N.E.R.R.) drilled 1890, Total Depth 977'

Elevation

1319-1239	80' soil, sand and gravel
1239-1174	65' blue clay
1174- 469	705' shale streaked with lime and sand
469- 444	25' hard sand rock
444- 439	5' lime and iron pyrite
439- 377	62' white sand rock with streaks of shale and lime
377- 342	35' white sand and sand rock

Drilled well at Ellendale, Dickey County, North Dakota

Depth in Feet

Formation

0- 10	Soil and clay
10- 20	Boulders
20- 50	Gravel and sand
50- 68	Soft blue clay
68- 220	Dark sticky clay; thin layer of hard shale at 220'
220- 235	Dark nearly black shale
235- 350	Firm dark shale
350- 550	Hard shale
550- 700	Soft dark shale
700- 720	Hard grayish shale

Dickey County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>
720- 745	Limestone
745- 820	Hard dark shale
820- 900	Tough sticky shale
900-1030	Shale with traces of sand; thin hard shale at 1030
1030-1052	Soft gray shale
1052-1080	Sandstone
1080-1083	Gray shale
1083-1135	Following log of 3" test hole--Gray shale, hard shell 7" thick at 1135
1135-1190	Soft gray shale
1190-1193	Sand
1193-1197	Gray shale
1197-1199	Sand
1199-1260	Gray shale; shading lighter

Ellendale Well No. 1, Dickey County, North Dakota Surface Elevation 1449 (?)

<u>Depth in Feet</u>	<u>Formation</u>
0- 25	Yellow clay
25- 110	Blue clay
110-1035	Shales
1035-1040	Hard sandstone
1040-1087	Soft sandstone

Oakes Well Elevation 1313 (?)

<u>Depth in Feet</u>	<u>Formation</u>
0- 65	Soil, sand and gravel
65- 80	Boulder clay
80-145	Blue clay
145-855	Shale streaked with lime and sand
855-875	Hard sandstone
875-880	Limestone with breaks of Pyrite
880-942	White sandrock with limestone; pyrite and shale
942-952	White sand
952-977	Limestone and sand

DIVIDE COUNTY.

MONTANA-DAKOTA UTILITIES COMPANY
Minneapolis, Minnesota

Log of Askin's Well #2
Kincaid Plant

September 1 to September 20, 1948

50' to 62'	12' of coal
101' to 106'	5' of coal
108' to 111'	3' of rock
123' to 127'	4' of coal
150' to 157'	7' of sand
157' to 162'	5' of coal

Divide County, North Dakota (con't.)

179' to 205'	Sand and sandy gumbo
205' to 210'	5' of coal
239' to 242'	3' of coal
248' to 250'	2' of rock
252' to 255'	5' of sandy shale
255' to 265'	10' of rock
265' to 314'	49' of sand
323' to 326'	3' of coal
330' to 338'	8' of coal
361' to 362'	1' of rock
405' to 407'	2' of rock
445' to 447'	2' of coal
484' to 487'	3' of coal
512' to 517'	5' of rock
526' to 528'	2' of coal
577' to 585'	8' of coal
635' to 710'	75' of sand
736' to 741'	5' of soft rock
765' to 769'	4' of rock
792' to 793½'	1½' of rock
817' to 842'	25' of hard gumbo and soft rock
894' to 897'	3' of soft rock
922' to 937'	15' of soft gumbo
946' to 947'	1' of rock
985' to 1009'	Easy going - soft stuff
1038' to 1040'	2' of rock
1109' to 1110'	1' of rock
1110' to 1112'	Sand rock
1145' to 1145' 8"	8" of hard rock
1172' to 1207'	Sandy shale
1207' to 1209'	2' of hard rock
1234' to 1241'	7' of coal
1345' to 1347'	2' of rock
1378' to 1378' 4"	4" of rock
1423' to 1423' 6 "	6" of rock

Test Well #3

Crosby, North Dakota, April 10 to 17, 1941

1 3/4 miles East of Crosby on Great Northern right of way. Elevation approx. 1980'

Log:

Total Depth	Kind of Strata
0- 22'	Yellow clay
22- 23'	Sandy
23- 34'	Yellow clay
34-	Boulders
34- 54'	Yellow clay showing of gravel
54- 55'	Cored one foot of rock
55- 57'	Yellow clay
57-	Boulder
57- 99'	Dark yellow clay showing of sand
99-	Boulder
99-113'	Blue clay showing gravel
113-114'	Hard pan
114-148'	Hard blue clay

Divide County, North Dakota (con't.)

148-180'	Hard shale and clay
180-225'	Softer blue clay showing boulders
225-227'	Rock core
227-248'	Softer blue clay showing boulders
248-278'	Hard blue clay showing boulders and lignite
278-280'	Hard blue clay showing boulders, sand, gravel
280-296'	Fine loose sand
296-	Hard blue clay

Hit flowing well at 280' measured twelve gallons per minute flow through 3/4" opening in drill bit attached to 2" pipe, well was let flow for twenty-four hours before plugging.

Northwest Oil Company
No. 1

NE 27 - 163N., 95W.
Divide County, North Dakota

0-45	Yellow clay
45-60	Blue shale
60-65	Water
65-85	Blue shale

Fort Union

85- 90	Green shale	425-433	Coal
90-100	Blue shale	433-450	Gray clay (shale)
100-110	Lime shells	450-460	Blue clay (shale)
110-125	Water sand	460-470	Black shale
125-133	Yellow shale	470-475	Blue shale
133-145	Blue shale	475-540	Gray shale
145-165	Gray shale	540-560	Gray sandy shale
165-170	Lime shells	560-570	Gray shale
170-200	Brown shale	570-590	Gray sandy shale
200-220	Limestone	590-610	Gray shale
220-280	Gray shale	610-615	Dark sandy shale
280-305	Brown shale	615-680	Gray sandy shale
305-315	Coal	680-695	Dark shale
315-320	Gray shale	695-715	Water sand; show oil & gas
320-340	Gray sandy shale	715-750	Sandy shale
340-370	Gray sand, shale	750-780	Brown shale
370-380	Water sand and sandy shale	780-795	Mud
380-400	Black shale	795-845	Gray shale
400-420	Gray shale	845-905	Sticky shale
420-425	Green conglomerate		

LANCE

905- 970	Brown shale
970- 995	Brownish gray shale
995-1010	Green shale
1010-1020	Sea Mud; show gas
1020-1035	Sticky sand
1035-1040	Coal or black peat or black shale
1040-1120	Gray shale
1120-1135	Gray sandy shale
1135-1150	Black and blue shale

FOX HILLS

1150-1205 Sand; gas and water

PIERRE

1205-1300	Blue shale
1300-1330	Black rotten shale
1330-1452	Blue shale

Divide County, North Dakota

12½" casing set at 1452

Log from here on possibly less reliable

1452-1700	Blue shale
1700-1765	Dark blue shale
1765-1766	Lime shells
1766-1930	Dark gray shale
1930-1963	Black shale
1963-1964	Hard shell
1964-2035	Dark shale
2035-2036	Lime shell
2036-2111	Dark shale
2111-2112	Lime shell
2112-2228	Dark shale
2228-2230	Lime shell
2230-2235	Dark shale

Report goes to April 25, 1928.

DUNN COUNTY

Drilled February 6, 1942

<u>Depth</u>	<u>Thickness</u>	<u>Lake Ilo Well</u> (on south side of cabin)
	22'	Top, sand and some gravel
22'	2'	Coal slack (dry)
24'	9'	Clay, blue
33'	9'	Coal, (seep of water)
42'	3'	Clay, blue
45'	3'	Sand and small gravel (real poor water)
48'	2'	Clay, green
50'	15'	Clay, sandy gray
65'	30'	Sandy clay (real soft) (dry)
95'	6"	Rock (white sand)
95½'	4'	Clay, blue
99½'	1½"	Coal (dry)
101'	1'	Sand (water 44' from top) No good, alkali
102'	1'	Shale or hardpan (fool's gold)
103'	2'	Coal (dry)
105'	16'	Clay, white
121'	4'	Clay, black
125'	22½'	Clay, blue
147½'	1½'	Coal (dry)
149'	1'	Space (lots of water) (40' from top) (soft and little red)
150'	11'	Coal (dry)
161'	2'	Clay, blue
163'	Bottom	Bottom

Cased with 4" Standard Galv. Pipe down 148'
Drove in so all water above is shut off.

Drilled June 23, 1943

About 9 miles S. of Halliday, N. Dak.

On a School Section for: R. Cole Smith

Lincoln County, North Dakota (con't.)

<u>Depth</u>	<u>Thickness</u>	
	42'	Top clay and little sandy
42'	3'	Rock (sand)
45'	23'	Clay (blue)
68'	3'	Coal (dry)
71'	2'	Clay (blue)
73'	2'	Coal (dry)
75'	15'	Clay (blue)
90'	26'	Clay (sandy)
116'	4'	Clay (blue)
120'	23'	Clay (black, green and some blue)
143'	8'	Coal (water)
		Dry bottom

Cased with 2" Standard Pipe Galv. down to coal at 143'.

Drilled July 17, 1945

M. Phippen (in Halliday, North Dakota)

<u>Depth</u>	<u>Thickness</u>	
	33'	Top, sand and gravel streaks (little water)
33'	18'	Clay, blue
51'	1½'	Coal, dry
52½'	4½'	Clay, blue
57'	2'	Rock, slate
59'	11'	Clay and coal streaks
70'	5'	Coal, water 5' from top
75'	2'	Clay, blue
	Bottom	

2" Standard Galv. Pipe down and into coal at 70'

Drilled in October, 1925

Tom McMahn, 5 miles N. of Werner

<u>Depth</u>	<u>Thickness</u>	
	60'	Top and sandy clay
60'	6'	Coal, dry
66'	39'	Clay
105'	1'	Coal, dry
106'	1'	Clay
107'	10'	Coal, dry
117'	11'	Clay
128'	2'	Rock
130'	8'	Clay
138'	2'	Coal, seep of water
140'	35'	Clay
175'	21'	Sand, white, little water
196'	3'	Rock, sand
199'	34'	Sandy
243'	13'	Sand, blue, water, 200' from top
256'	4'	Clay
260'	Bottom	
		5" well

Lunn County, North Dakota (con't.)

Drilled September 12, 1940
Goldie Rousau, in Werner, North Dakota

<u>Depth</u>	<u>Thickness</u>	
	21'	Top and sandy
21'	1'	Gravel, little water
22'	2'	Coal
24'	3'	Clay, blue
27'	47'	Sandy clay
74'	16'	Sandy, harder
90'	1'	Coal----(Water)
91'	9'	Sand
100'	7'	Coal. Water (comes up 8' above ground)
107'	3'	Clay, blue
110'	Bottom	

2" pipe down to coal at 100'. This well flows about 28 gallons per minute with pipe about 2' above ground.

Drilled October 19, 1936
K. J. Thompson, in Dunn Center, North Dakota

<u>Depth</u>	<u>Thickness</u>	
	12'	Top, and red sand
12'	1'	Rock, sand
13'	10'	Sand, dry
23'	4'	Clay, black and soft
27'	18'	Coal, water, no good
45'	31'	Clay
76'	2'	Coal, dry
78'	2'	Clay
80'	6'	Coal, (water) 31' from top, (not so good)
86'	12'	Clay, sandy
98'	10'	Clay, blue
108'	2'	Coal, soft, dry
110'	14½'	Clay
124½'	2½'	Coal, (water 27' from top)
127'	3'	Clay
130'	Bottom	

2" standard pipe down to coal at 124½' and drove tight.

EMMONS COUNTY

Hazelton, North Dakota

8" well, total depth 120', completed October 1, 1902.
Well was tested at a rate of 75 gallons per minute. Water rose to within 70' from surface.

<u>Elevation</u>	
1979-1904	75' blue clay
1904-1899	End of casing
1899-1859	45' Blue sand rock

GOLDEN VALLEY COUNTY

N. P. Well at Beach, Golden Valley County, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0- 25	Clay
25- 35	Sand
35- 60	Blue clay
60- 135	White clay
135- 175	Coal
175- 225	Shale
225- 235	Limerock and shale
235- 242	Coal
242- 260	Shale
260- 262	Rock
262- 295	Shale
295- 298	Rock
298- 346	Sand and shale
346-1038	Shale

Beach, North Dakota Sec. 24, T. 140, R. 106W.
Well No. 1, Total Depth 1042', drilled 1906.

<u>Elevation</u>	
2751-2726	25' Brown clay
2726-2716	10' Quicksand
2716-2691	25' Blue clay
2691-2616	75' White clay
2616-2576	40' Coal and clay
2576-2526	50' Blue shale
2526-2516	3' lime rock
	7' White shale
2516-2509	7' Coal
2509-2487	22' Blue shale
2487-2452	2' Lime rock
	33' Blue shale
2452-2401	3' Gray lime rock
	48' Shale mixed with sand
2401-2351	50' Blue shale
2351-2326	25' White shale
2326-1709	617' Blue shale

Well No. 2 - 10", total depth 85', drilled 1906
35 hours test gave average of 43,000 gallons per 24 hours.

<u>Elevation</u>	
2751	70' drift
	5' Lime rock
	10' Fine sand

Well No. 3 - 10", Total Depth 76', drilled 1906

<u>Elevation</u>	
2751	25' clay
	10' Clay and sand
	21' Clay
	5' Fine sand
	15' Clay and sand

GRAND FORKS COUNTY

Northwood test hole No. 1, Northwood, Grand Forks County, North Dakota

<u>From</u>	<u>To</u>	<u>Thickness</u>	<u>Material</u>
0	4	4	Black soil
4	9	5	Yellow sandy soil
9	17	8	Yellow clay
17	24	7	A few inches hard strip black or quicksand
24	35	11	Black sand with some clay
35	59	24	Sandy clay but a little coarse sand (50 to 58 very fine sand)
59	62	3	Coarse sand or fine gravel
62	84	22	Sandy clay a little harder formation
84	106	22	Sandy clay
106	111	5	Boulder clay
111	115	4	A thin layer of black slate
115	117	2	Some gravel
117	124	7	Bright coarse sand
124	133	9	Believed to be boulder clay
133	136	3	Some stone and dark gravel
136	144	8	Stone and gravel
144	145	1	Clay with some gravel
			Black quicksand with plenty of water

Log of Bridgeman-Russell Well, Grand Forks, North Dakota

<u>From</u>	<u>To</u>	<u>Thickness</u>	<u>Material</u>
0	18	18	Soil
18	100	82	Silt
100	180	80	Boulder drift
180	197	17	Glacial drift, with many rocks
197	210	13	Blue clay or fine shale
210	212	2	Soft, muddy clay
212	225	13	White sand

No water of practical amount was found before the 225 foot level

Well Log 6/20/40

Drilled for Grand Forks Airport
 Contractor - H. C. Ringdahl and Son
 Total Depth of hole is 135'
 Water level from surface 2'
 Capacity tested to 300 gallons per hour
 Lowered 100 feet while testing

Remarks:

Formations passed through and thickness:
 Yellow clay 20'
 Sticky soft blue clay 20-110'
 Sticky soft gray clay 110-131'
 Fine sand 131-133'
 Clay 133-135'

DETAILED LOG OF UNIVERSITY TEST HOLE

By A. L. Greenlee

Grand Forks County, North Dakota (con't.)

University Test Hole (con't.)

Total Depth	Kind of Strata
0- 2	Loam soil
2- 20	Yellow clayey lake silt, no boulders
20- 78	Blue clayey lake silt, no boulders
78-153	Blue clay drift with small gravel size pebbles
153-175	Blue clay composed of broken blue shale with small boulders $\frac{1}{8}$ " to $1\frac{1}{2}$ " in diameter)
175-185	Blue clay with blue shale and boulders and only very little sand mixture. Boulder chips of igneous red granite and milky white quartz.
185-190	Blue clay with blue shale and very little sand. Boulder chips of crystalline quartz and white limestone.
190-195	Blue clay with blue shale and very little sand. Boulders chips of dark gray limestone, white limestone, pink quartz granite, and crystalline pyrite.
195-200	Blue clay with blue shale and very little sand. Boulder chips of flesh-colored limestone, pink quartz granite and pyrite.
200-210	Blue clay with blue shale and very little sand. Boulder chips of pink quartz granite, white limestone, chert, and pyrite
210-225	Blue clay with blue shale and very little sand. Boulder chips of pink quartz granite, pink limestone, and pyrite.
225-250	Blue clay with blue shale and very little sand. Boulders chips of white limestone, gray limestone, flesh-colored limestone and pyrite
250-262	Blue clay boulder encountered. Boulder chips of black and white quartz granite.
262-266	Blue clay with blue shale and very little sand. Boulder chips of gray fossiliferous limestone, purple limestone, white limestone, black and white granite, basalt pebbles, green quartz and pyrite.
266-270	Blue clay with blue shale and very little sand. Boulder chips are rounded pebbles of white, gray and pink limestone, pink, and black and white quartz granite; green quartz, and pyrite.
270-275	Hard blue clay with very little sand. Boulder chips and pebbles of white gray, and soft red limestone, green quartz granite and pyrite.
275-279	Hard blue clay with some sand, white quartz, sandstone boulder well cemented, black and white granite chips, pink quartz chips, basalt pebbles.
279-282	Hard blue clay. Drill bit on boulder of white quartz sandstone. Also chips of white, gray, and purple limestone.
282-284	Sandy blue clay. Round crystalline quartz grains, chips of white, gray and buff-colored limestone. Purple limestone (not mottled), black and crystalline quartz granite, basalt, and pyrite.
284-287	Very little clay. Sand and boulders with chips of dark red, buff, and white quartz granite, pink granite, some water.
287-290	Blue clay with very little sand. Chips and pebbles of white and red limestone, green quartzite, pink quartz granite, black and white granite, basalt, and pyrite.
290-295	Blue clay. Boulder chips of mottled gray limestone, milky white limestone, black and white granite, pink quartz granite, and pyrite
295-307	Hard clay with some sand and pebbles. Boulder chips of purple-red mottled limestone. Also white and gray limestone, black and white granite, pink granite and pyrite.
307-312	Hard sandy blue clay. Boulders present an abundance of mottled red limestone chips, also gray and white limestone, black and white granite and basalt.

Grand Forks County, North Dakota (con't.)

- 312-317 Hard blue clay with boulder chips of mottled red on gray limestone, purple and white limestone, black-white granite, basalt, and pyrite.
- 317-327 Blue-gray clay, red on gray mottled, pink and dark brown limestone, black-white, pink, and green granite, and pyrite.
- 327-335 Blue-gray clay, very little sand. Softer but boulders present. Abundant crystalline white limestone chips, also red on gray mottled limestone, purple and oyster gray limestone, black and white and red quartz granite and pyrite.
- 335-342 Soft blue clay and some sand and boulders. Mottled red on gray and white limestone, biotite quartz granite (black-white) red quartz granite and pyrite.
- 342-347 Brown-gray clay and some sand. Mottled red on gray limestone, crystalline quartz-biotite, red granite, and pyrite.
- 347-368 Blue-gray clay with very little sand. Boulder chips and pebbles of dark gray, white, mottled red on gray limestone, black and white granite, red quartz, basalt and pyrite.
- 368-373 Hard red shale with very little sand
- 373-402 Red shale. Small amount of green quartz sand and chips of brown mottled limestone and white and red quartz sandstone.
- 402-407 Hard red shale and red-purple limestone with well-rounded grains of milky and crystalline quartz sand in purple limestone matrix
- 407-412 Well cemented white quartz sandstone. Mud solution still red with chips of red mottled limestone, also chips of granite and pyrite. Hard drilling.
- 412-418 White quartz sandstone composed of well rounded crystalline quartz sand. Increasing amount of quartz-biotite fragments, some milky white quartz chips and red quartz and pyrite in quartz granite. A trace of red limestone and blue shale. Very hard.

Note: Samples collected from rotary type drill cuttings show "follow down" from higher formations but changes are believed accurate and the predominant characteristics of the samples have been emphasized.

The red shale and red-purple limestones are similar to Paleozoic sediments known to exist in the area south of Winnipeg, Manitoba, and are believed to be of that age. The absence of the Dakota sandstones are overlying Benton, Niobrara, and Pierre shales is noteworthy. The extreme thickness of the glacial drift indicates that the Cretaceous rocks do not exist here or have been removed perhaps by pre-glacial streams and the site tested is a glacial filled valley of the pre-glacial Red River of the North.

Log of well drilled on F. S. Haynes farm. SE₄ SW₄ Sec. 29, T. 153N., R. 54W. .
Grand Forks County, Grand Forks, North Dakota

0- 2	Top soil
2- 28	Yellow clay and sand
28-250 (app.)	Blue clay
250-434	Gray shale
434-442	Hard limestone-cored
442-447	Sand
447-515	Black shale
515-532	Dakota sand
532-	White shale

Well Log
Armour Pecking Company Well, Grand Forks, North Dakota

Grand Forks County, North Dakota (con't.)

0-130	Lake clay
130-209	Blue shale
209-214	White sand
214-220	Sand and shale
220-257	Red shale
257-290	White sand
	150 gallons per minute. Drawdown 58'. Static level 12' from surface
290-	Soft shale, gray

Given verbally by Charles Porter, driller

HETTINGER COUNTY

Rex Livestock well SE of Mott, Hettinger County, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0- 1	Chocolate colored silt loam
1- 6	Yellow clay
6- 9	Coal, slacked
9- 37	Blue clay
37- 38	Rock
38- 60	Blue clay
60- 65	Black clay
65- 66	Coal
66- 95	Whitish blue clay
95- 97	Blue sand, no water
97-105	Coal
105-106	Black clay
106-108	Coal
108-118	Blue clay
118-119	Rock
119-132	Blue clay
132-133	Coal
133-152	Blue clay
152-153	Soft rock
153-162	Blue clay with strata of shells and coal flakes
162-164	Coal
164-180	Dark clay and very fine sand
180-190	Fine white sand, supplies 1 gallon per minute
190-202	Blue clay
202-225	Soft sandrock and water

Log of Well, Regent, North Dakota, 1937

<u>Depth in Feet</u>	<u>Formation</u>	<u>Depth in Feet</u>	<u>Formation</u>
0- 6	Sand and yellow clay	195-215	Coal
6- 23	Yellow clay	215-287	Gray clay
23- 34	Blue clay	287-304	Sandy clay
34- 37	Coal	304-333	Gray clay
37- 51	Blue clay	333-334	Rock
51- 52	Coal	334-340	Coal
52-163	Blue clay	340-347	Clay
163-178	Gray clay	347-348	Hard shale
178-181	Coal	348-358	Sandy clay
181-195	Clay	358-362	Coal

Hettinger County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>	<u>Depth in Feet</u>	<u>Formation</u>
362-368	Clay	636-649	Loose sand
368-379	Sandy clay	649-678	Solid sand
379-383	Hard sand		
383-434	Sandy clay	Casing: 350.75'	8" Casing
434-435	Rock	354.16'	6" Casing
435-491	Sandy clay		
491-508	Gray clay	Perforations:	
508-508.2	Rock		
508-526	Gray-blue clay	356-364'	6" Casing
526-548	Blue sand	376-384	6" Casing
548-549	Rock	526-545	6" Casing
549-583	Sand top - dry sand	577-583	6" Casing
583-585	Rock	633-678	6" Casing
585-633	Sandy clay		
633-635	Loose sand - water	Water level static about 240'	
635-636	Rock		

KIDDER COUNTY

A. C. Townley Interests
 #1 Robinson Patented Land, Robinson Field
 Elevation 1800' by Aneroid
 Commenced
 Completed

Section 12, T. 142N., R. 72W.
 NW NW NE
 200' from N. line; 2440' from E. line
 Kidder County
 North Dakota

Log:

<u>From</u>	<u>To</u>	<u>Formation and Remarks</u>
0	625	Soft dark shale
625	628	Shale and lime
628	890	Dark soft shale
890	950	Soft cavy shale
950	1075	Soft dark shale
1075	1135	Dark soft cavy shale
1135	1225	Dark shale
1225	1260	Brown shale
1260	1315	Gray shale
1315	1375	Dark shale
1375	1400	Cavy shale
1400	1695	Dark shale
1695	1730	Very hard black rubbery shale
1730	1796	Shale; show gas at 1796'
1796	1797	Sand; little oil rose on water
1797	1900	Shale; record incomplete
1900	2000	Black, rotten, cavy shale; some lime
2000	2275	Shale
2275	2340	Dakota sandstone; water; light show oil at 2275'
2340	2345	Soft coal
2345	2355	Very hard sand
2355	2360	white sand
2360	2365	Red rock
2365	2400	White shale

Madoga, North Dakota

4" test well, total depth 250'. Located at Station 7104 + 53. 91' north of main track.

Kidder County, North Dakota (con't.)

10" well at Station 7104 + 60. Depth 90' located Sta. 7104 + 60, 91' north of main track.

Elevation
1796-1706 90' gravel and sand

4" test well Station 7104 + 53

Elevation
1796-1769 27' sand
1769-1707 62' sand and water
1707-1672 35' clay and sand
1672-1666 6' sand and water
1666-1546 120' blue clay

Dawson, North Dakota

West Well, 10"

Total Depth from surface 135', drilled 1907, located in dug well. Water level 1911 was 13' from surface, and pumping test gave 4000 gallons per hours.

Elevation
1742.96-1731.95 11' soil and sand
1731.95-1726.95 5' clay
1726.95-1718.95 8' sand
1718.95-1703.95 15' clay and sand
1703.95-1695.95 8' sand
1695.95-1671.95 24' clay and sand
1671.95-1660.95 11' clay
1660.95-1551.95 9' sand
1551.95-1525.95 26' clay
1525.95-1507.95 18' sand

East Well, 10"

Total depth 140', drilled 1909. Water level 1911 was 13' from surface, and pump test gave 6000 gallons per hour.

Elevation
~~1742.96-1731.95~~ 11' soil and sand
1731.95-1726.95 5' clay
1726.95-1718.95 8' sand
1718.95-1703.95 15' clay and sand
1703.95-1695.95 8' sand
1695.95-1671.95 24' clay and sand
1671.95-1660.95 11' clay
1660.95-1551.95 9' sand
1551.95-1525.95 26' clay
1525.95-1502.95 23' sand

New Well, 20"

Elevation
1745.3-1743.8 1.5' loam
1743.8-1732.5 11.3' sand and clay
1732.5-1729.5 3.0' sand
1729.5-1720.3 9.2' clay
1720.3-1705.3 15.0' sand and clay

Kidder County, North Dakota (con't.)

1705.3-1679.3	26.0 sand
1679.3-1673.3	6.0 clay
1673.3-1664.3	9.0 sand and clay
1664.3-1649.3	15.0 clay
1649.3-1626.3	23.0 sand and clay
1626.3-1624.3	2.0 sand, clay and gravel
1624.3-1617.3	7.0 fine sand
1617.3-1607.3	10.0 coarse sand
1607.3-1580.3	27.0 fine sand
1580.3-1574.3	6.0 gravel
1574.3-1571.3 Elev. Bottom	* 3.0 clay and gravel

Depth of clay and gravel strata not determined

- *20" o.d. pipe-slotted from 167 to 170' in 6" vein of water bearing gravel.
- El. 1578.3 to El. 1575.3

LA MOURE COUNTY

Edgeley, North Dakota

Edgeley Artesian well, total depth 1354'. Drilled 1894 (Not N. P. Ry.)
Well gives a flow of 500 gallons per minute with a pressure of 60 lbs. per sq. inch.
Casing is 6" at top and 4½" at bottom. Water has a sodium taste.
Coming up with the water is a considerable flow of gas, which lights with a match
and burns in the stream until extinguished or put out. Altitude of Edgeley is 1557.

Above report is from a report by Mr. P. B. Groat dated Oct. 9, 1895 to N. P. Land
Commissioner.

New 4" well for Section house.

This well is 97' deep and formations gone through are:

First 15'6"	Sand
15'6" to 19'	Rock which required blasting. Probably a large boulder.
19' to 23'	Rock and sand
23' to 26'	Blue clay
26' to 55'	Shale and black sand
55' to 97'	Slate

Elevation

0-15'6"	15'6" sand
15'6"-19'	3'6" rock
19'-23'	4' rock and sand
23'-26'	3' blue clay
26'-55'	29' shale and black sand
55'-97'	42' slate

LOGAN COUNTY

Log of T. A. Thompson Well

SW SW Sec. 26, T. 134N., R. 72W., Logan County
2½ miles west of Burnstad, North Dakota
Drilled by Moorhead Gas and Oil Co. in 1930-31.

- Logan County, North Dakota (con't.)

<u>Formation</u>	<u>Character of strata penetrated</u>	<u>Depth in Feet</u>
	Drift	0- 10
Fox Hills	Gray shale	10- 90
	Green sand	90- 95
	Light gray shale	95- 145
Pierre	Gray shale, light	145- 655
	Slightly sandy shale (showed some gas, no water)	655- 660
	Gray shale, light	660-1065
Niobrara	Gray shale, calcereous	1065-1285
Benton	Gray shale, brownish streaks of lime and darker	1285-1495
Dakota	1st Dakota Sand, grading from shale to sandy shale	1495-1530
	(pure fine gray sand at about center for about 12'; Water came up in the hole about 600' in this sand and there was quite a show of gas.)	
	Gray shale	1530-1610
	2nd Dakota sand, grading from shale to sand and back to shale	1610-1630
	(About 10' of clear sand same as above. Some gas and water in this sand came up about 1200' in hole)	
	Gray and brownish shale	1630-1770
	Sandy shale and sand then back to shale (This sand is coarser than above, about the same color, some gas and water came up to about the same level as from the 2nd Dakota.)	1770-1785
Unknown	Varicolored shale, reddish-brown mixed with hard lime ledges	1785-2140
	White sand, coarse and sharp, some gas and water	2140-2150

FROM THIS POINT TO BOTTOM OF HOLE AT 2940
 The drilling was through shale, lime and shaley
 lime. Some of the lime ledges were very hard and
 colors ran from white to red, and brown. Also
 had sandy streaks or sand came down from above.
 This was drilled and Mr. Coray of Baker, Montana,
 thought it was possibly an unconformity.

At no time, in this hole, did we have sufficient water to come to top.

MC LEAN COUNTY

Soo line well at Max, McLean County, North Dakota

McLean County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>
0- 50	Surface deposits
50- 135	Soft blue gray shale
135- 143	Coal; little water
143- 250	Blue gray shale
250- 259	Coal; little water
259- 300	Shale
300- 400	Fine gray sandy shale
400- 410	Coal
410- 570	Shale, some light streaks
570- 571	Soft gray sandstone
571- 700	Shale
700- 720	Fine gray shaley sandstone and shale
720- 765	Shaley sandstone
765- 768	Flint rock, hard and very heavy
768-1065	Shale, blue streaked with light
1065-1067	Flint rock, coarse gray sandy
1067-1090	Shale, with flint rock layers
1090-1190	Sandy clay shale
1190-1480	Blue gray shale
1480-1778	Slate
1778-1902	Shale
1902-1970	Slate
1970-2312	Shale
2312-2500	Not specified

Hermon Hanson Oil Syndicate
 Log of Hanson Farm - Well No. 1
 Sec. 3, T. 146N., R. 81W.
 From March 26, 1929 to August 18, 1929
 Elevation: 1928 (aneroid)

<u>Description of Formation</u>	<u>Depth in Feet</u>
Brown shale	603-633
Brown shale	633-642
Light gray sand, dark clay	642-670
Dark clay	670-685
Dark clay impregnated with layers of asphalt. Hard shell	685-697
Shell	697
Hard shell	697
Hard shell to gray sand (H ₂ O)	697-730
white lime hard	730-739
Sand black shale	739-750
Black shale	750-752
Black shale	752-758
Green (sand) ?	758-775
Brown gumbo	775-785
Dark blue (gumbo) sticky	785-794
Gray and blue shale	794-806
Gray varied shale all colors with some oil around 814'	806-818
Gray shale	818-833
Dark gray sand (water)	833-848

<u>Description of Formation</u>	<u>Depth in Feet</u>
Sand	848-857
Sand (water) blue shale caving some	857-865
Blue shale	865-868
Blue shale caving some	868-871
Black and gray shale	871-880
Gray shale. Water level 170' hole caving.	880-888
Gray shale	888-898
Gray shale	898-900
Gray shale	900-905
Gray shale dry hole	905-930
Brown shale to gray	930-955
Gray shale hole dry caving bad. Cave at bottom around 956'	955-967.
Gray shale	967-970
Gray shale	970-975
Gray shale	975-990
Gray shale sticky	990-1005
Gray hard shell- sandy shale	1005-1014
Dark shale	1014-1028
Dark shale 0 to 32 gypsum	1028-1032
Dark shale	1032-1035
Dark shale	1035-1057
Dark shale	1057-1059
Dark shale	1059-1074
Dark shale	1074-1079
Dark shale	1079-1087
Dark shale	1087-1089
Dark shale	1089-1100
Dark shale gray shale	1100-1110
Gray shale dark shale	1110-1113
Dark shale	1113-1125
Dark shale	1125-1133
Dark shale	1133-1147
Dark shale	1147-1157
Dark shale sticky	1157-1165
Dark shale	1165-1175
Dark shale sticky	1175-1185
Dark shale	1185-1187
Dark shale	1187-1189
Dark shale black sticky shale	1189-1199
Little streak of Benton, etc. around 1199	
Black shale	1199-1200
Black shale	1200-1214
Black shale-blue	1214-1223
Blue shale	1223-1228
Blue shale	1228-1232
Blue shale-gray shale	1232-1245
Gray shale	1245-1247
Gray shale light shale	1247-1257
Hard shell 1262 1' thick	
Gray shale	1257-1268

McLean County, North Dakota (con't.)

<u>Description of Formation</u>	<u>Depth in Feet</u>
Gray shale	1268-1278
Gray shale	1278-1288
Gray shale	1288-1290
Gray shale	1290-1300
Gray shale	1300-1312
Gray shale	1312-1313
Gray shale	1313-1324
Gray shale	1324-1337
Gray shale	1337-1345
Gray shale	1345-1353
Light shale - gets iron ? lime,	
limeshell	1353-1361
Gray shale	1361-1373
Gray shale	1373-1385
Gray shale	1385-1395
Gray shale	1395-1402
Gray shale	1402-1413
Gray shale	1413-1418
Gray shale	1418-1430
Light shale-harder	1430-1440
Gray shale	1440-1446
Gray shale	1446-1453
Gray shale	1453-1458
Gray shale with white clay	1458-1462
Limeshell	1462-1467
Lime-gray shale	1467-1477
Light shale	1477-1487
Gray shale	1487-1497
1480 to 90 light shale	
1490 to 1500 lime shell	
and slate	1497-1500
Light shale	1500-1506
Light shale sticky	1506-1518
Light shale	1518-1534
Light shale 06 to 40	1
Black shale 40 to 46	1534-1546
Gray shale	1546-1548
Gray shale	1548-1565
Gray shale	1565-1580
Gray shale	1580-1585
Gray shale	1585-1592
Gray shale	1592-1602
Soft gray shale	1602-1626
Hard dark shale	1626-1630
Lime streaks	1630-1635
Dark shale hard yellow streaks	1635-1700
Black soft shale	1700-1720
Hard black shale	1720-1725
Soft black shale	1725-1730
Soft black shale	1730-1745
Dark gray shale	1745-1820
Soft gray shale	1820-1840

MERCER COUNTY

Location: 670' N. and 150' E of SW corner SE $\frac{1}{4}$ SW $\frac{1}{4}$
 Sec. 21, T. 145N., R. 86W., Mercer County, North
 Dakota. Surface Elevation: about 2000

Truax Traer Coal Company, Hazen, North Dakota

<u>Log of Well</u>	<u>Thickness</u>	<u>Depth</u>
Fort Union formation		
Yellow clay	10	10
Coal	10	20
Yellow clay	13	33
Coal, a little water	2	35
Hard blue clay	35	70
Hard blue rock and clay	25	95
Coal	10	105
Hard blue rock and clay	26	131
Gray shale, some blue sand	59	190
Coal	8	198
Lance-Cannonball Member		
Layers of gray shale and blue clay	212	410
Blue clay and blue sandrock	30	440
Coal	10	450
Gray shale and sandstone	10	460
Blue clay	15	475
Hard sandstone	5	480
Blue clay	24	504
Coal	11	515
Blue sandrock	45	560
Lance-Ludlow Member		
Sandstone and gray shale	21	581
Coal	14	595
Gray and blue shale	55	650
Coal	5	655
Gray shale and blue clay	16	671
Coal	7	678
Hell Creek Formation		
Gray shale and sandstone	9	687
Blue clay	98	785
Sandy clay, a little water	20	805
Blue clay, hard sticky	76	881
Hard blue sandstone	5	886
Blue clay	113	999
Soft coal	4	1003
Fox Hills Sandstone		
Blue sandstone, some water	2	1005
Soft sandstone	5	1010
8" I.D. Casing Surface to 197'		
6" I.D. Casing Surface to 586'		
5-3/16" I.D. Casing Surface to 868'		

Mercer County, North Dakota (con't.)

Drilled July 30, 1942

at Buckli, on Knife River, South of Golden Valley, North Dakota

<u>Depth</u>	<u>Thickness</u>	
	12'	Top; and sandy clay
12'	53'	Gravel; and some sand, water
65'	3'	Coal, soft
68'	13'	Gravel, solid
81'	2'	Coal, hard
83'	6'	Clay
89'	2'	Rock, white
91'	8'	Clay, blue
99'	3'	Coal
102'	7'	Clay, blue
109'	2'	Rock
111'	4'	Clay, blue
115'	4'	Coal, real hard
119'	45'	Clay, blue
164'	4'	Coal, hard
168'	27'	Clay, blue
195'	1'	Rock, hard
196'	22'	Clay, blue
218'	1'	Coal, dry
219'	4'	Sand, white
223'	1'	Coal
224'	11'	Sand
235'	1'	Coal
236'	10'	Sand)
246'	2'	Coal)----Water: Flowing over the top 2 G.P.M.
248'	6'	Sand)
254'	Bottom	Rock

2" well

MORTON COUNTY

N. P. Well at Sims, Morton County, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0- 10	Drift
10- 18	Coal
18- 60	Sandstone and shale
60- 65	Coal
65- 125	Sandstone and shale
125- 130	Coal
130- 325	Soft sandstone
325- 330	Coal
330- 372	Very soft sandstone
372- 375	Hard bed sandstone
375- 635	Shale with sulphur
635- 710	Soft sandstone
710- 716	Good coal
716-1310	Shale with sulphur

Sims, North Dakota

Drill hole total depth 1311 feet. Drilled some time between 1890-1900

Morton County, North Dakota (con't.)

This drilling was a failure as no water was found.

Note: The strata are as per recollection of drill man, who had lost his records.

Elevation

1960-1896	10' drifts
	4' coal
	50' Sandstone
1896-1832	4' coal
	60' sandstone and shale
1832-1629	3' coal
	200' soft sandstone
1629-1586	3' coal
	40' very soft sandstone
1586-1324	2' hard sandstone
	260' shale carrying sulphur
1324-1254	70' soft sandstone
1254- 649	5' good coal
	600' shale carrying sulphur

Mandan, North Dakota

8" well drilled by the city in 1890's total depth 2000'. In the sand rock 440 to 480' from surface a good flow of water was found, which rose 15" above ground, below this level no water was found.

Elevation

1640-1580	60' sand and mud
1580-1560	20' sand and gravel
1560-1200	360' clay
1200-1160	40' sand rock water
1160- 360 below sea level	1520' clay

MC HENRY COUNTY

G. N. Ry. Well at Genoa, McHenry County, North Dakota

Depth in Feet

Formation

0-100	Sticky blue clay
100-160	Gray clay
160-181	Hardpan with gravel mixed
181-200	Clay
200-225	Fine sand, some water
225-228	Black hardpan
228-235	Red sandy clay
235-420	Clay
420-485	White sandy clay
485-489	White slate
489-583	Sticky blue clay
583-623	Gray clay
623-674	Soft slate
674-720	Slate
720-840	Black slate

Geological Interpretation

Depth in Feet

Drift

0-225

McHenry County, North Dakota (con't.)

<u>Geological Interpretation</u>	<u>Depth in Feet</u>
Fort Union Formation	225-264
Pierre Shale	264-351

Velva, North Dakota Well Log, McHenry County

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Sand	12	0	12
Blue clay	26	12	38
Boulders and gravel ~ (very little water)	8	38	46
Blue clay	114	46	160
Sand (no water)	12	160	172
Blue clay	98	172	270
Blue clay with sand	40	270	310
Blue clay, fine sand (no water)	31	310	341

MCKENZIE COUNTY

Log of Great Northern R.R. Well #2, Watford City, McKenzie County, North Dakota

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Gray clay	9	0	9
Yellow clay	12	9	21
Red sandstone	24	21	45
Blue clay	3	45	48
Flour sand W.B.	4	48	52
Brown sandstone	15	52	67
Blue slate	12	67	79
Soft coal W.B.	3	79	82
Blue slate W.B.	11	82	93
Soft coal W.B.	1	93	94

PEMBINA COUNTY

Crystal, Pembina County, North Dakota
Well Log North of the Depot

	<u>Thickness</u>	<u>Depth</u>
Black loam	3	3
Yellow clay	10	13
Quicksand	20	33
Blue clay	80	113
Clay and Quicksand	8	121
Slate	3	124
Hardpan	3	127
Quicksand	4	131
Slate	10	141
Quicksand	4	145
Cement Rock with small veins of sand and gravel	36	181
Coarse sand	2	183
Hard rock		

Log of 5Inch well drilled well in bottom of 7X7 timber curbed well 22 feet deep.
Work completed April 1891.

Pembina County, North Dakota (con't.)

Casing cut off 15 feet below surface and water flowed at rate of 100 gallons per hour. With suction pipe of Windmill pump placed 44 feet below surface; 350 to 360 gallons per hour was obtained.

RAMSEY COUNTY

WELL LOG:

Brocket, North Dakota, Ramsey County, 220' North of depot. Drilled January 1919 by Ry. Co. forces.

0- 10'	Yellow clay
10- 16'	Soft blue sandy clay
16- 29'	Soft blue clay
29- 31'	Coarse sand and gravel (some water)
31-131'	Blue shale

6" Casing set at 109½ feet. Water stands at 11 feet and pumped down to 103 feet when pumping 7 gallons per minute. About 10 gallons per minute came from cracks in shale at 47', which is now cased off. Well not used by Ry. Co. Village uses it to a extent.

Partial analysis of water from this well is given below in grains per gallon.

Total Hardness	6.3
Sodium Carbonate	43.2
Alkali Salts	153.9
Total Dissolved Solids	160.2

(From letter to Mr. Simpson from B. W. DeGeer of the Great Northern Railway Company, May 2, 1936)

REPORT OF WELL May 15, 1946

Owner Philip G. Schiele, Webster, North Dakota
Location 10 E. 1N. 3E. of Webster, North Dakota (at NE corner of house)
Date Completed May 15, 1946
Drilled by C. A. Simpson, Bisbee, North Dakota

Log

0- 1	Topsoil
1- 25	Yellow clay and rocks
25- 32	Blue clay
32- 74	Blue shale
74-101	Hard blue shale
101-137	Blue shale

Casing
104' of 4" pipe
37' of 3" perforated pipe

Yield
3 1/3 GPM (5' /min) at 65'
4 2/3 GPM (7' /min) at 100'

REPORT ON WELL May 1946

Owner Ted O'Brien
Location 10 E. 1N. 1E of Webster, North Dakota

Ramsey County, North Dakota (con't.)

Drilled by C. A. Simpson, Bisbee, North Dakota

Log

0- 1	Topsoil
1- 27	Yellow clay
27- 50	Blue clay
50- 60	Blue shale
60- 74	Soft grey shale
74-102	Hard blue shale
102-138	Blue shale

- Casing 111' 4" black pipe
 31' 3" perforated pipe
 Water level 20' below
 Yield 6 gallons per minute at 35'
 9 gallons per minute at 45'

REPORT OF WELL May 7, 1946

Owner Peter Schwan, Webster, North Dakota
 Location 10 E, 1N of Webster, North Dakota
 Drilled by C. A. Simpson, Bisbee, North Dakota
 Casing 124' of 4" pipe
 Aquifer Water comes from shale
 Water level 12' below
 Yield 25 gallons per minute at 25'
 6 gallons per minute at 16'
 Quality Soft water

REPORT OF WELL MAY 22, 1946

Owner Bert Schiele
 Location 10 E, 5S of Webster, North Dakota
 Drilled by C. A. Simpson, Bisbee, North Dakota
 Log

0- 1	Topsoil
1- 20	Yellow clay and rocks
20- 40	Blue clay and rocks
40-134	Blue shale

Casing 103' of 4" black pipe
 35' of 3" perforated pipe
 Water level 20' below
 Yield 3 gallons per minute at 65'
 5 gallons per minute at 85'
 Quality Somewhat soft, with trace of salt
 Was becoming saltier as drilled deeper

31' of 1 1/2 and 72' of 7/16 rod

REPORT OF WELL May 17, 1946

Owner Jacob Zeigler, 507 2nd Street, Devils Lake, North Dakota
 Location On farm 10E, 3S, 3E of Webster, North Dakota. Well at NW corner of house.
 Drilled by C. A. Simpson, Bisbee, North Dakota
 Date Completed May 17, 1946

Ramsey County, North Dakota (con't.)

Log

0- 1 Topsoil
 1- 35 Yellow clay
 35- 40 Gravelly brown clay
 40- 62 Gravelly blue clay
 62- 70 Blue shale
 70-100 Hard blue shale
 100-125 Blue shale

Casing 102' of 4" black pipe.
 29' of 3" perforated pipe.
 Water level 4'/min at 55' - 5'/min at 65'
 7'/min at 70'
 4 2/3 G. P. M. at 70'
 Quality Soft with trace of salt.

REPORT OF WELL April 30, 1946

Owner Village of Crary
 Location West end of town hall
 Driller C. A. Simpson, Bisbee, N. Dak.
 Log

0-151 Clay, gravelly clay, muddy gravel
 and some rocks
 151-161 Dirty fine and coarse sand
 (about 5'/min of dirty water)
 161-165 Blue clay
 165-175 Shale
 175-198 Fine mushy sand.
 (water, but sand heaves)
 198-232 Sandy shale and shale
 232-233 Shale, gravel

Water level 21' below
 Yield 3 1/3 G.P.M. at 100'
 Casing 235' of 4" black pipe
 40' 8" of 3" perforated
 black pipe
 Quality of water Trace of salt, slightly
 cloudy.

REPORT OF WELL April 20, 1946

Owner Vernon Hilgers, Crary N. Dak.
 Location 1/2 mile East of Crary, N. Dak.
 Driller C. A. Simpson, Bisbee, N. Dak.
 Date Completed April 20, 1946
 Log

0- 1 Top
 1- 23 Yellow clay
 23- 48 Gravelly blue clay
 48- 53 Coarse dirty sand (heaves)
 53- 59 Gravelly blue clay and rocks
 59- 64 Coarse and fine sand, dirty
 64- 90 Gravelly blue clay
 90-100 Gray clay
 100-120 Blue clay and rocks
 120-125 Fine sand and gravel
 125-142 Blue clay and rocks
 142-143 Broken shale or shale gravel
 143-150 Blue shale
 150-151 Shale gravel

Water level
 Yield 4 2/3 G.P.M. 54' (7'/min)
 Material 2 3/4" cyl.
 76' 1 1/4" pipe
 76' 7/16 rod
 149' 8" of 4" pipe
 4" flange
 Pump head

REPORT OF WELL April 16, 1946

Owner Pat Davis, Crary, North Dakota
 Location 1/2 mile south, 1/4 mile east of Crary
 Driller C. A. Simpson, Bisbee, North Dakota
 Log

0- 1 Topsoil
 1-20 Yellow clay

Ransom County, North Dakota (con't.)

20- 40	Blue clay
40- 78	Hard gravelly blue clay with rocks
78-152	Sand and gravel with clay
152-159	Sand and gravel

Static level 18' below surface
 Yield, bailer: 4 2/3 gallons per minute at 100'
 (7' /min in 4" hole at 100')
 2 1/2" cylinder placed down 106'

REPORT OF WELL June 4, 1946

Owner R. J. Brown, Crary, North Dakota
 Location 2S, 1E, of Crary. NE corner of house.
 Drilled by C. A. Simpson, Bisbee, North Dakota
 Log

0- 3	Topsoil
1- 31	Gravelly yellow clay
31- 86	Gravelly gray clay
86- 87	Gravel, water
87- 98	Muddy gravel
98-122	Blue shale (1st water at 110')

Casing 108' of 4" black pipe
 19' 8" of 3" perforated pipe

Water level 30' below
 Yield 4 gallons per minute at 52'
 Pump 2 1/2" cyl.
 62' of 1 1/2" pipe
 54' of 7/16" rod

REPORT OF WELL May 3, 1946

Owner Clarence Stromme, Rohrville, North Dakota
 Location 5 1/2 miles North of Rohrville
 Drilled by C. A. Simpson, Bisbee, North Dakota
 (Bill Bolmer)

Log 0- 62 Drift
 62-139 Shale

Casing 103' 7" of 4" black pipe
 38' of 3" perforated pipe (black)
 Static level 20' below
 Yield 5 gallons per minute at 65'

RANSOM COUNTY

Log of Soldiers Home Well, Lisbon, Ransom County, North Dakota

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Drift	154	0	154
Gray shale	456	154	610
Water-bearing sandstone and gray shale-	40	610	650
Gray shale	152	650	802
Water-bearing sandstone	7	802	809
Red shale	26	809	835

Ransom County, North Dakota (con't.)

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Gray sand - not water-bearing	70	835	905
Hard light-colored rock	3	905	908
Dark green granite	3	908	911

Log of Test Hole #1 (in park), Lisbon, North Dakota

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Sandy loam	30	0	30
Clay and boulders	32	32	62
Clay and gravel	1	62	63
Sandy clay	2	63	65
Gravel	2	65	67
Soft clay and sand	8	67	75
Humbo	51	75	126

Log of Test Hole #2 (South end), Lisbon, North Dakota

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
beck loam	6	0	6
rown clay	14	6	20
ue sandy clay	88	20	108
umbo	6	108	114

RICHLAND COUNTY

11 Test Well at Wapeton

Ruddy Bros. No. 1, H. W. Snowden)

Samples examined by P. E. Dennis, September 3, 1948

0-95	No samples
95-100	Sand, fine to medium, silty, grains angular and dirty covered
100-105	Sand, coarse, dirty
105-110	Clay, sand and gravel (gravelly till ?)
110-130	Clay, dark gray, gravel and sand (till)
130-135	Pebbles (ls) and clay (till)
135-145	Clay, dark gray, gravel and sand (till)
145-155	Clay, sand and gravel (gravelly till)
155-160	Clay, dark gray (and silt, yellow-cavings)
160-175	Clay, dark gray, gravel and sand (till)
175-200	Clay, sand and gravel (gravelly till)
200-205	Clay, dark gray (and silt, yellow-cavings)
205-220	Clay, dark gray, sand and gravel (sandy till)
220-235	Clay, gravel and sand (till)
235-245	Clay and pebbles (till)
245-265	Clay, gravel and sand (till)
265-270	Clay and pebbles (till)
270-275	Clay, gravel and sand (till)
275-280	Pebbles, gray clay (and light greenish-gray clay, granite)
280-315	Granite, weathered (and limestone cavings) light greenish-gray clay
315-320	No sample
320-350	Clay, light greenish-gray, micaceous (decomposed granite)

Richland County, North Dakota, (con't.)

350-360	No sample
360-385	Clay, light greenish-gray, micaceous (decomposed granite)
385-390	No sample
390-425	Granite, decomposed (and limestone pebbles cavings)
425-445	Chips of decomposed granite (sand and gravel, dirty cavings)
445-450	No sample
450-489	Schist chips, angular (and sand cavings)
500-505	(Pebbles-cavings)
505-695	Crystalline rocks, angular chips (a few limestone pebbles cavings)

Fairview Jct., North Dakota June 1904

Well located 34 feet from ctr. of main track and 78 feet from H. B. of east Wyetrack

Elevation

965-963	2' Black soil
963-951	12' Gray clay
951-933	18' Yellow clay
933-903	30' Blue clay
903-865	38' Hardpan and blue clay, slightly mixed with sand
865-815	50' Blue clay
815-810	5' Blue clay and quicksand (small amount of water)
810-792	18' Blue clay, sand, and gravel
792-787	5' Hard sand (dry)
787-777	10' Hard sand and gravel
777-758	19' Sand and gravel
758-748	10' Quicksand (some water)
748-737	11' Sand and gravel (some water)
737-725	12' Fine sand, some clay (some water)
725-701	24' Fine sand on top, coarse sand and gravel bottom (water)
701-691	9½' Sand and gravel, water.
	½' Hard black clay

ROLLETTE COUNTY

Log of Test Hole #1, Rolla, North Dakota
North End of Third Street

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Coarse sand and gravel	8	0	8
Coarse gravel	2	8	10
Coarse gravel with some clay	2	10	12
Coarse sand and gravel with more clay	3	12	15
Coarse dark sand	5	15	20
Coarse gravel with some clay	4	20	24
Black sticky clay, till	4	24	28
Dark clay with some sand, probably till	39	28	67
Dark clay with sand, till	10	67	77
Dark-brownish clay, gravelly sand, till	28	77	105
Very dark sticky blue clay, shale	21	105	126

Log of Test Hole #2, Rolla, North Dakota
North End of Second Street

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Brownish clay, sand and gravel, till	12	0	12

Rollette County, North Dakota (con't.)

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Brown clay and fine sand, till	8	12	20
Brownish clay, sand and gravel, till	4	20	24
Blue boulder clay, till	4	24	28

Log of Test Hole #3, Rolla, North Dakota
Triangle at intersection of 2nd St. and Section Line Road.

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Assorted brownish sand and gravel, clay	11	0	11
Coarse gravel with little clay	2½	11	13½
Coarse gravelly clay	1	13½	14½
Coarse dark sand	7½	14½	22
Dark sandy clay	8	22	30
Dark brownish sandy clay	15	30	45
Coarse gravelly sand	10	45	55
Yellow sandy clay			55
Dark sandy clay	8	55	63
Dark sandy clay	7	63	70
Coarse dark sand	32	70	102
Yellowish clay, till (?)	8	102	110
Dark blackish clay, shale	25	110	135

Log of Test Hole #4, Rolla, North Dakota
Bank pasture near railway, midway between elevator and section line.

<u>Material</u>	<u>Thickness</u>	<u>From</u>	<u>To</u>
Yellow sandy clay	9	0	9
Coarse gravel with some clay	4	9	13
Pieces of lignite	14	13	27
Coarse medium dark sand	3	27	30
Coarse sand	2	30	32
Coarse sand and gravel	2	32	34
Yellow sandy gravel, till	11	34	45
Yellow sandy clay, till	55	45	100
Dark sticky clay, till	35	100	135

REPORT OF WELL APRIL 27, 1940

Owner St. Anne's Mission, Belcourt, North Dakota
Location In pasture approximately 200 yards north of the school.
Date Completed April 27, 1940
Log

0- 1	Topsoil
1- 22	Yellow clay
22-120	Sandy blue clay, rocks
120-130	Very gravelly blue clay, rocks
130-135	Blue clay
135-146	Muddy yellow sand and gravel
146-176	Gravelly yellow clay
176-181	Muddy yellow sand and gravel
181-186	Sand and gravel
186-200	Very muddy sand and gravel
200-205	Muddy sand and gravel
205-212	Sand and gravel

Rollette County, North Dakota (con't.)

Water level 52 feet below surface
Supply Bail test showed water rose 6' in 4" pipe in one minute at 80'
and 10' at 120'.
Casing 208' of 4" black "National" pipe
Screen 4" X 6' Cook screen #24 slot

REPORT OF WELL September 16, 1939

Location 4 miles north, 1½ miles east of Dunseith, North Dakota. Farm.
Owner Charles Templeton
Log

0- 1	Topsoil
1- 29	Sandy brown clay
29- 31	Soft blue clay
31- 38	Rocks and blue clay
38- 79	Sandy blue clay
79- 80	Boulders
80-115	Sandy brown clay
115-140	Muddy sand and gravel
140-150	Fine sand and gravel
150-184	Muddy sand and gravel
184-189	Fine sand and gravel
189-192	Gravelly clay
192-213	Fine sand and gravel
213-215	Fine blue sand
215-220	Cleaner sand and gravel (could be screened)
220-231	Clay and gravel
231-245	Muddy sand and gravel
245-257	Gravelly clay
257-268	Muddy sand
268-299	Soft sandy blue clay
299-300	Sand and coarse gravel

Water level 76' below surface
Bail test 12 gallons per minute with 10' drawdown
Casing 303'7" of 4½" National black water well pipe

REPORT OF WELL Completed October 1938

Owner U.S.D.I., Turtle Mountain Agency
Location School on Great Walker Estate, N.W. of Belcourt on the
Turtle Mountain Indian Reservation.
Drilled by C. A. Simpson, Bisbee, North Dakota
Log

0- 1	Topsoil
1- 427	Yellow clay
42-157	Gray clay
157-160	Muddy sand
160-338	Gray clay, slightly sandy
338-340	Yellow clay
340-341	Gravel, source of supply

Water level 167' below surface
Test 12 gallons per minute with 4' drawdown

Rollette County, North Dakota (con't.)

REPORT OF WELL

Drilled July 15, 1940

Owner

Mrs. Jennie Rognas, Devils Lake

Location

Farm 4 miles SW of Rolla, North Dakota. (From corner on #5
1/4 mile W. of Wayne's Inn, drive 2 miles S, 1/2 mile W, and
1/2 miles S.)

Log

0- 1/2	Topsoil
1/2- 26	Yellow clay
26- 90	Blue clay
90- 99	Hard gravelly blue clay
99-110	Muddy sand
110-140	Gravelly blue clay, rocks
140-	Coarse sand. Source of water supply.

Water level

66' feet below surface

Pail Test

10 gallons per minute with 5' drawdown

REPORT OF WELL

Completed July 1938

Owner

U. S. D. I. National Park Service

Location

International Peace Gardens, near Lodge Hall, north of
Dunseith, North Dakota

Drilled by

C. A. Simpson, Bisbee, North Dakota

Log

0- 2	Black gumbo
2- 35	Yellow clay
35- 65	Dark yellow clay
65-205	Blue-gray clay
205-350	Gravelly gray clay
350-352	Gravel, mixed with yellow clay
352-358	Sandy blue clay
358-415	Slightly sandy yellow clay
415-442	Sandy gray clay
442-447	Gravel mixed with clay. Little water
447-451	Sand and gravel. Little dirty water.
451-455	Gravel, little water.
455-463	Sandy blue clay
463-475	Fine muddy sand
475-476	Fine sand with layers of clay
476-486	Blue shale
486-491	Chocolate colored shale
491-500	Fine dark sand and some water

Water supply small. Some sand with water if pumped too fast.

Diameter of well: 4"

REPORT OF WELL

Completed July, 1940

Owner

U. S. D. I., Turtle Mountain Agency

Location

East Side of Day School. Approximately 1 1/2 miles north and
4 miles west of Rolla, North Dakota

Drilled by

C. A. Simpson, Bisbee, North Dakota

Log

0- 1 1/2	Topsoil
1 1/2- 28	Gravelly yellow clay
28-146	Gravelly blue clay

Rollette County, North Dakota (con't.)

146-178	Soft sandy blue clay
178-180	Muddy gravel-little water
180-188	Gravelly blue clay
188-206	Gravelly brown clay
206-338	Blue clay, rocks
338-348	Soft sandy blue clay with a little muddy water
348-361	Muddy fine gray sand
361-375	Gravelly blue clay, rocks
375-384	Blue shale
384-389	Sandy blue shale, little water
389-392	Muddy sandstone, little water

Water level 122' below surface
 Test 6 gallons per minute at 300'
 Inclined to pump sand with the water if pumped faster than 3-4 gallons per minute

STARK COUNTY

Dickinson, North Dakota

Drill hole total depth 1802'10", completed February 1897. At a depth of 300' (Elevation 2100) water was struck, and water rose to within 7' from surface, this flow was considered very small and no test was made. Below this point no water was found.

Well No. 00

Elevation 2402

2402 -2394	8' Drift soil	2187.8-2164.3	2'6" Lignite coal
2394 -2385	9' Quicksand and gravel		21' Soapstone with clay
2385 -2349.8	6" lignite coal	2163.3-2106.3	58' soft sand and soapstone
	2' sand		
	8" Lignite coal	2106.3-2085.3	11' Sand, water
2349.8-2323.8	32' soapstone	2085.3-2073.3	22' Lignite coal
	5' Lignite coal and shale	2073.3-2036.3	37' Sand and soapstone
	2' Sand	2036.3-2011.3	25' Sand
	19' Soapstone	2011.3-1968.3	3' Soapstone
2323.8-2274.8	49' Sand		1' Lignite coal
2274.8-2270.8	3" Hard rock	1968.3-1954.8	39' Soapstone
	1' Sand		3'6" Lignite coal
	2" Hard rock	1954.8-1909.8	10' Soap and sandstone
	2' Sand	1909.8-1888	45' Soapstone
	8" Hard rock		9" Hard rock
2270.8-2246.8	24' Sand		21' Soft sand and soapstone
2246.8-2240.8	6' Soapstone		
2240.8-2228.8	2' Lignite coal and shale	1888 -1880	8' Lignite coal
	3' Soapstone	1880 -1854	26' Sand and shale
	7' Sandstone	1854 -1840	3' Lignite coal and shale
2228.8-2216.8	1' Hard sandrock		
	11' Sand		11' Sand
2216.8-2201.8	1' Lignite coal	1840 -1826	1' Hard rock
	8' Soapstone		13' Soapstone
	6' Sand	1826 -1808	2' Lignite coal
2201.8-2187.8	1' Lignite coal		16' Soapstone
	7' Soapstone	1808 -1789.5	1'6" Lignite coal
	6' Coarse sand		17' Soapstone

Stark County, North Dakota (con't.)

1769.5-1758	1'6" Lignite coal 30' Soft sand	1283 -1249	3' 31'	Lignite coal Gumbo and soapstone
1758 -1752	1' Lignite coal 5' Soapstone	1249 -1229	20' 3'	Soap and sandstone Hard fine sand rock
1752 -1703.5	1'6" Lignite coal 3' Soapstone 1' Lignite coal 3' Soapstone 40' White sand	1229 -1169 1169 -1127 1127 -1042	3' 57' 42' 5' 80'	Hard fine sand rock Sand and soapstone Stiff soapstone Soft soapstone Soapstone
1703.5-1697.5 1697.5-1686.5	6' Soapstone 5' Lignite coal 5' Soapstone	1042 - 988 988 - 977	4' 50' 11'	Sand Soapstone Sand and soapstone
1686.5-1617.5 1617.5-1590.5	67' Soapstone 2' Soapstone and fossil shells 5' Soapstone	977 - 941.2 941.2- 921.2	10" 35' 1'	Lignite coal Soapstone Lignite coal
1590.5-1561.5	20' Soft sand 2' Hard rock 27' Soft sand	921.2- 904.2 904.2- 892.2	17' 2' 10'	Soft sand and soapstone Lignite coal Soap and sandstone
1561.5-1516.5	5' Soapstone 1' Lignite coal 39' Soapstone	892.2- 847.2 847.2- 822.2	2' 43' 25'	Very hard soapstone Soapstone and fine sand Soapstone
1516.5-1479.5	7' Lignite coal 30' Sand and soapstone	822.2- 807.2 807.2- 782.2	15' 25'	Soft sand stone Soapstone
1479.5-1422.5 1422.5-1402.5 1402.5-1385.5 1385.5-1367-	57' Hard soapstone 20' Sand and soapstone 17' Soapstone 6" Lignite coal 3' Soapstone 2' Soap and sandstone 13' Soapstone	782.2- 772.2 772.2- 754.2 754.2- 704.2 704.2- 660.2 660.2- 599.2	10' 3' 15' 50' 44' 4' 54'	Soap and sandstone Hard sandstone Soft sandstone Stiff soapstone Soap and sandstone Hard sandstone Soft sand and soapstone
1367 -1341 1341 -1305 1305 -1283	26' Coarse soft sandstone 36' Stiff soapstone 22' Sand and soapstone	599.2-Bottom	3'	Hard rock Soft sandstone in Bottom

Well #1 Dickinson, North Dakota

Elevation

2398 -2396.5	1.5'	Black loam
2396.5-2389.0	1'	Yellow sandy clay
	3.5'	Blue sandy clay
2389.0-2368	3'	Quicksand mixed with yellow clay
	5.5'	Quicksand mixed with blue clay
	1.5'	Lignite coal
	2'	Blue clay
	2'	Lignite coal
2368 -2313	55'	Blue clay-streaks of lignite coal running thru every 5 or 6'
2313 -2302	11'	Laminated shale
2302 -2300	2'	Hard rock
2300 -2283.0	10'	Fine blue sand
2283.0-2280.0	2'	Hard rock
2280.0-2272.0	8'	Fine blue sand

Well #2 Dickinson, North Dakota

Stark County, North Dakota (con't.)

Elevation

2398 -2393	5' Fill cinders etc.
2393 -2391	2' Loam N. G.
2391 -2386	5' Yellow sandy clay
2386 -2374.5	0.5' Lignite coal
	5.5' Yellow sandy clay
	1.5' Lignite coal
	4' Quicksand mixed with yellow clay
2374.5-2371.5	3' Quicksand mixed with blue clay
2371.5-2343	28.5' Blue clay
-2343 -2337	6' Lignite
2337 -2334	2' Blue shale
	1' Fine sand
• 2334 -2323	11' Blue clay
2323 -2319	4' Luminated shale
2319 -2299	20' Fine blue sand
2299 -2291	3' Luminated shale
	1' Hard rock
	4' Fine blue sand
2291 -2285	6' Sand rock - soft
2285 -2238	47' Streak of shale and fine sand
2238 -2218	20' Blue clay
2218 -2198	20' Gumbo
2198 -2190.5	2' Shale
	5.5' Shale
2190.5-2185.5	5.5' Shale
2185.5-2179	2' Lignite
	4' Soapstone
2179 -2161	18' Blue shale
2161 -2157	4' Blue Clay
2157 -2129	28' Blue shale
2129 -2113	16' Brown clay shale
2113 -2103	10' Fine blue sand - water
2103 -2098	5' Brown clay shale
	2098 bottom of drilled well

N. P. Well at South Heart, Stark County, North Dakota

Depth in Feet

Formation

0- 42	Shale
42- 54	Coal
54- 69	Shale
69- 73	Coal
- 73-173	Shale
173-175	Coal
175-203	Shale
- 203-218	Sand
218-348	Shale
348-351	Rock
351-366	Shale
366-406	Rock
406-407	Coal
407-424	Shale

Stark County, North Dakota (con't.)

Drilled November 10, 1942
 Andrew Glick in Richardton, North Dakota
 Exact location not reported

<u>Depth</u>	<u>Thickness</u>	<u>Formation</u>
	25'	Top and red sandy clay
25'	20'	Clay, blue
45'	3'	Clay, black
48'	7'	Clay, blue
55'	5'	Clay, sandy
60'	20'	Sand, gray, dry
80'	19'	Clay, blue
99'	7'	Coal, water
106'		Clay, bottom

5" Well

Drilled July 30, 1942
 Al Buckli, on Knife River, South of Golden Valley, North Dakota
 Exact location not reported

<u>Depth</u>	<u>Thickness</u>	<u>Formation</u>
	12'	Top; and sandy clay
12'	53'	Gravel; and some sand, water
65'	3'	Coal, soft
68'	13'	Gravel, solid, water
81'	2'	Coal, hard
83'	6'	Clay
89'	2'	Rock, white
91'	8'	Clay, blue
99'	3'	Coal, dry
102'	7'	Clay, blue
109'	2'	Rock
111'	4'	Clay, blue
115'	4'	Coal, real hard
119'	45'	Clay, blue
164'	4'	Coal, hard
168'	27'	Clay, blue
195'	1'	Rock, hard
196'	22'	Clay, blue
218'	1'	Coal, dry
219'	4'	Sand, white
223'	1'	Coal
224'	11'	Sand.
235'	1'	Coal
236'	10'	Sand) --Water flowing over the top. 2 gal. P.M.
246'	2'	Coal)
248'	6'	Sand)
254'	Bottom	Rock

STUTSMAN COUNTY

Drilled for Joe Emo in May 1939
 Southwest $\frac{1}{4}$ of Sec. 36, T. 137 Woodburg, R. 64
 This well is 4" and 40' deep.

Finished in coarse sand

Tested for 10 hours at 10 gallons per minute with 3' drawdown

Static water level is 11'.

<u>Depth in Feet</u>	<u>Formation</u>
0- 6	Brown clay
6-34	Blue clay
34-35	Hard pan
35-40	Sand mixed with shale and lignite
40-60 +	Sand

by Vernon E. Howell

Drilled for Mr. Frank P. Toay, Jamestown, North Dakota on December 4, 1939

North $\frac{1}{2}$ of Sec. 16, T. 138, R. 64

This is a 3" well, 196' deep replacing a 2" 320' well which was drilled in 1911.

Well is finished in coarse white sand.

Tested at 5 and 6 gallons per minute for 20 hours.

Static water level was 66' from surface

<u>Depth in Feet</u>	<u>Formation</u>
0- 6	Brown clay
6- 11	Red sand and clay
11- 38	Brown clay
38-187	Blue clay
187-190	Sand and lignite
190-196 +	White sand

by Vernon E. Howell

Drilled for McElroy Company, Jamestown, North Dakota on December 15, 1939

Southeast $\frac{1}{4}$ of Sec. 27, T. 139, R. 62, Stutsman County

Well was finished in coarse sand and gravel and developed with compressed air. A screen made of 2 $\frac{1}{2}$ " pipe, ten feet long was used.

147' 3" well

Static water level is 24'.

Tested at 7 $\frac{1}{2}$ gallons per minute for 12 hours, with 2' drawdown.

<u>Depth in Feet</u>	<u>Formation</u>
0- 37	Brown clay
37-134	Blue clay
134-137	Hardpan, gray
137-138	Sand, colored
138-143	Coarse sand, same
143-147	Sand and gravel

by Vernon E. Howell

Drilled for Mr. E. A. Howell, Sydney, North Dakota

On Northeast $\frac{1}{4}$ of Sec. 30, T. 138, R. 64

Drilled to a depth of 320' as a test hole and finished the well at 98' with a very strong flow of water.

Tested for 12 hours at 10 gallons per minute with no drawdown.

Static water level is 45'.

Four inch casing was used and the well developed air with the removal of 6 or more yards of sand, which left a screen of lignite and shale.

Chunks of lignite and shale were blown out with the sand, some pieces were 3 X 4" and were worn smooth and round.

Stutsman County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>
0- 1	Soil
1- 43	Brown clay
43- 60	Blue clay
60- 61	Fine sand
61- 96	Blue clay
96-101	Very fine sand, pieces of shale and lignite
101-126	Sandstone or hard sand
126-131	Lignite
131-134	Lignite pieces and shale
134-240	Sandstone
240-270	Sand, water turned gray color
270-320	Sand very fine, the drill sand easily through this
320- ?	Shale

By Vernon E. Howell

Woodworth, North Dakota
 6" drilled well, total depth 153' including 11' of dug well.
 Completed October 1911.
 Located opposite station 1083 -+ 79.
 56' north of main track.

Elevations

2014-2003	11' dug well
2003-1872.5	130.5' clay
1872.5-1862	10.5' sand
1862-1861	1' clay

Jamestown, North Dakota

Well #1

Elevations

1400-1280	120' soil, clay and gravel
1280- 115	1165' light blue and sandy shale
115- 105	10' sand rock (small flow)
105-Sea level	155' shale and iron pyrite
Sea Level-50	?
50 to 58	8' hard sand rock
58 to 76	18' soft sand rock (flow)

Jamestown, North Dakota

Well #2

Elevations

1425-1313	112' soil, clay and sand
1313- 125	1188' light and dark sandy shale
125-Sea level	182' Quicksand, shale and hard sandrock
Sea level-57	?
57 to 60	3' soft sand rock
60 to 70	10' hard sand rock and iron pyrite
70 to 86	10' soft sand rock (flow)
80 to 99	119' solid limestone

Jamestown, North Dakota

Well #3

Elevation

1396.47-1372.47	24' sand
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Stutsman County, North Dakota (cont.)

1372.47-1362.47	10' Hardpan and stone
1362.47-1350.47	1' Gravel
	11' Quicksand
1350.47-1330.47	1' Fine sand
	19' Gravel
1330.47-1313.47	17' Blue clay
1313.47-1292.47	21' Sand, gravel (water)

Jamestown, North Dakota

Well #4

Elevations

1396.47-1372.47	24' Sand
1372.47-1362.47	10' Hardpan and stone
1362.47-1350.47	1' Gravel
	11' Quicksand
1350.47-1330.47	1' Fine sand
	19' Gravel
1330.47-1311.47	19' Blue clay
1311.47-1292.47	19' Sand, gravel (water)
1292.47-1291.47	1' Blue shale

Jamestown, North Dakota

Well #5

Elevations

1398.1-1386.1	3' filling
	1' Black soil
	8' Clay and sand
1386.1-1361.1	25' Sand, gravel, clay
1361.1-1353.1	5' Boulders and sand
	3' Clay and sand
1353.1-1343.1	1' Coal
	9' Clay and sand
1343.1-1332.1	11' Blue clay
1332.1-1314.1	18' Sand and gravel
1314.1-1295.1	2' Coal and slate
	17' Gravel
1295.1-1294.1	1' shale

Windsor, North Dakota

10" well, total depth 457' located at Station 5759 + 56 + 64 north on main track

Drilled 1906

Elevations

1840-1729 3/4	Water level
1729 3/4-1407	433' clay, gumbo and shale
1407-1383	24' Sand and gravel

Asylum Well at Jamestown, Stutsman County, North Dakota

Elevation 1460' (app) from topographic map

Depth in Feet

Formation

0- 42	Blue clay
42- 91	Fine clay, impure
91-111	Quicksands

Stutsman County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Formation</u>
111-211	Shale and limestone fragments
211-361	Light colored shale
361-561	Dark shale
561-959	Light and dark shale
959-999	Sandy shale
999-1009	Sand
1009-1299	Blue shale with hard limestone layers
1299-1474	Quicksand with shale and limestone
1474-1481	Hard sandrock
1481-1505	Sandrock with 4 gallon flow
1505-1524	Limestone

Jamestown City Well, Stutsman County, North Dakota

<u>Depth in Feet</u>	<u>Formation</u>
0- 120	Soil clay and gravel
120-1025	Light shale
1025-1300	Blue shale with pyrite
1300-1385	Sandy shale
1385-1395	Sandrock with small flow
1395-1450	Shale and pyrite
1450-1458	Hard sandrock
1458-1476	Soft sandrock

TOWNER COUNTY

Well at Northgate School

<u>Depth in Feet</u>	<u>Formation</u>
0- 25	Sandy yellow clay
25- 27	Yellow clay small rocks
27- 45	Sandy yellow clay
45- 50	Sandy yellow clay
50- 55	Blue clay
55- 58	Blue clay, rocks
58- 74	Blue clay
74- 85	Blue clay
85- 87	Blue clay, rocks
87- 98	Blue clay
98-120	Blue clay rocks at 105
120-131	Fine brown sand
131-133	Sand and gravel water

Water level approximately 80' from surface.

Well was finished April 10, 1937

Log by
Robert Simpson
Well Driller, Bisbee, North Dakota

Test holes at Cando.

Drilled by C. A. Simpson, Bisbee, North Dakota
July 15, 1944

Towner County, North Dakota. (con't.)

#1

Location - 30' N. of NE corner of pump house.

<u>Formation</u>	<u>Thickness</u>	<u>Depth</u>
Yellow clay	40'	
Blue clay	10'	50'
Sand and gravel from 50' to 62' rather fine, nice and clean at first. Coarse at 55'. Good 55' to 62'.	12'	62'
Blue clay	5'	67'
Gravel, good	2'	69'
Blue clay	3'	72'

#2

Location - 30' SE of pump house

Yellow clay	40'	
Blue clay	21'	
Gravel- (62-65 good (65-71 good (some mud) (71-73 good	4 (11' in samples)	
Blue clay	35	100

#3

Location - 300' N of pump house

Yellow clay	35	
Blue clay-sandy	15 (52 coarse 50 (53 fine	
Sand and gravel Top half fine dirty	13 (55-60 good (60 good	63
Blue clay	8	71
Gravel (water)	2	73
Blue clay	22	95

Test holes at Cando

Drilled by C. A. Simpson, Bisbee, North Dakota

July 15, 1944

#4

Location - 250' SW of pump house

Yellow clay	45	
Blue clay and sand mixed	155	200

Layer of poor gravel at 70' and another at 79'. No gravel or sand that was clean and had any water to amount to anything.

#5

Location - 1½ blocks (375') N of Depot and Chev. Garage corner on Main Street and about 70' W of tracks or about 700' SW of pump house.

Yellow clay	20	
Blue clay-soft, fine sandy	40	60

Towner County, North Dakota (con't.)

<u>Formation</u>	<u>Thickness-</u>	<u>Depth</u>
Blue clay harder, gritty	60	120
Blue clay, sand and gravel	17	137
Sand, gravel, water 8 G.P.M.	2	139
Clay and dirty gravel	2	141
Blue clay	14	155
Blue clay, getting harder, some water	5	160
Blue clay drift	15	175

REPORT OF WELL

June 18, 1946

Owner Olaf Ness, Calio, North Dakota
 Location 6 miles E. of Egeland, N.D. on north side of road. Well
 NW of house about 150'.
 Drilled by C. A. Simpson, Bisbee, North Dakota
 Log

0- 1 Topsoil
 1-22 Yellow clay
 22-35 Blue clay
 35-130 Shale
 Casing 113½' of 40" black pipe
 Water level 18' below
 Yield 6 gallons per minute at 50'

REPORT OF WELL

June 21, 1946

Owner Markwardt Estate, Albert Markwardt, Bisbee, North Dakota
 Administrator
 Location On farm 6 E and 2 N of Bisbee E side of road. Well S of barn
 near E end.
 Drilled by C. A. Simpson, Bisbee, North Dakota F. J. S.
 Log

0- 1 Topsoil
 1- 32 Yellow clay
 32- 60 Gray clay
 60-107 Muddy sand and gravel

Remarks The sand was inclined to travel with the water. Sand was
 little cleaner and coarser at 80, 90, 104. Tried for well at
 91, 97, 104, 106, 107. About 1 gallon of pea gravel was
 poured in well. There was about 16" of sand and/or gravel in
 bottom of pipe at completion.
 Capacity 5 gallons per minute at 40'.
 Water level 35' below surface

REPORT OF WELL

June 25, 1946

Owner H. B. Brightbill, Cando, North Dakota
 Location SE¼ Sec. 16, T. 158, R. 67
 (½ mile E. of Prairie Rose School)
 Drilled by C. A. Simpson, Bisbee, North Dakota
 Log

0- 1 Topsoil
 1- 3 Gray clay
 3- 18 Yellow clay

Towner County, North Dakota (con't.)

Log (con't.)

18- 64	Sandy blue clay
64-140	Fine sand and fine muddy sand
140-	Coarse sand

Casing 143' of 4" black pipe
 Water level 3' above surface
 Yield Estimated flow 3 gallons per minute

REPORT OF WELL July 2, 1946

Owner John Novotny, Rock Lake, North Dakota
 Location 4 N., 3 1/2 E. of Rock Lake, North Dakota
 Drilled by C. A. Simpson, Bisbee, North Dakota
 Log

0- 1	Topsoil
1- 27	Yellow clay
27- 51	Blue clay, and hard packed blue clay with gravel and rocks
51- 70	Hard blue shale
70-128	Shale

Casing 99' of 4" black pipe
 13' 8" of 4" galv. pipe on top
 No 3" ?
 Yield 6 gallons per minute at 60'
 4 1/2 gallons per minute at 55'

Log of Plemel Well, near Cando, North Dakota

0- 54	Glacial drift
54- 160	Shale
160- 422	Shale
422-1026	Shale, quite hard
1026-1355	Shale
1355-1385	Shale, hard
1385-1387'6"	Sandstone, hard, dense with pyrite, cored
1387'6"-1435	Shale, red, and sandstone mixed
1435-1440	As above
1440-1453	Sandstone, hard
1453-1518	Shale, red with streaks of sandstone, shale sticky
1518-1590	Shells, hard of limestone (?)
1590-1610	Limestone, hard shells, and shale
1610-1625	Shale and hard limestone streaks
1625-1640	Sandstone streaks
1640-1650	Rock, very hard
1650-1660	Shale
1660-1680	Sand, coarse
1680-1760	Shale

This log compiled from remarks of J. E. Kennedy of Cando, North Dakota

TRAILL COUNTY

Location NW 1/4 Sec. 9, T. 142N., R. 51W.
 Well Started September 28, 1937
 Well Completed October 12, 1937

Trail County, North Dakota (con't.)

Casing Kind Standard Black Size 2"; Length 81' 3" 334'
 Length - Bottom 14' of 3" casing perforated; Size Opening
 16' overlap in casing
 Bottom 29' of 2" casing perforated

Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
353 -353'4"	
353'4"-353'8"	Rock
353'8"-370'	
370 -388	Clay
388 -395	
395 -410	
410 -415	Sand

Flows just a trickle
 Should be pumped at 100'
 to get 5 G.P.M.

Location NE $\frac{1}{4}$ Sec. 9, T. 142N, R. 51W.
 Well Started 7-12-37
 Well Completed 7-17-37
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0-40	Yellow clay
40-60	Gray clay
60-80	Sand and a large rock

Moved rig; unable to get through rock

Location NE $\frac{1}{4}$ Sec. 9, T. 142N., R. 51W.
 Well Started 7-19-37
 Well Completed 9-20-37
 Driller Hildreth (Incomplete by this driller)
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 40	Yellow clay
40- 60	Gray clay
60- 80	Sand
80- 90	Small stones and rock
90-100	Hardpan and stones
100-120	Hardpan and stones
120-140	Hardpan
140-157	Hardpan
157-160	Hardpan and stone
160-180	Hardpan
180-199	Clay
199-201	Stone
201-221	Clay
221-251	Hardpan
251-268	Hardpan
268-325	Clay
325-352	Hardpan and large stone
352-353	Rock

Location NW $\frac{1}{4}$ Sec. 10, T. 144N, R. 50W.
 Well Started 6-2-37
 Well Completed 6-9-37
 Water level below surface 6'
 Driller Dakota Artesian Well Co.

Trail County, North Dakota (con't.)

Casing Kind Standard Black; Size 3"; Length 170'
 Screen Length 10'; Diameter 1 1/4"; Size Opening #18 slot
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 5	Topsoil
5- 50	White clay
50- 55	White clay
55-105	Yellow clay
105-160	Blue clay
160-180	Gravel, rocks, and water

- Pumped 6 gallons per minute for 16 hours.

Location NE 1/4 Sec. 10, T. 144N. R. 52W.
 Well started June 10, 1937
 Well Completed June 24, 1937
 Water level below surface not given

Casing Kind 3" Length 400'
 2" Black pipe 41'
 Screen Length 6'; Diameter 1 1/4"; Size Opening 18 Slot
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 14	Topsoil Clay
14- 59	Gravel
59- 90	Fine brown sand and clay Fine brown sand and clay
90-114	Gravel and clay Blue clay
114-155	Blue clay Rock and gravel
155-169	Blue clay Gravel
169-188	Gravel Blue clay
188-232	Gravel Rock Blue clay
232-282	Blue clay Shale
282-312 1/2	Shale
312 1/2-362 1/2	Hard shale Shale
372 1/2-378	Hard shale Shale
378-430	Shale Sand
430-447	Sand

Flowing well - 2 gallons per minute.

Location SE 1/4 SE 15, T. 145N. R. 50W.
 Well Started August 13, 1937
 Well Completed August 17, 1937
 Water level below surface 1'
 Driller Albert Herberg

Trail County, North Dakota (con't.)

Casing Kind Black; Size 3". Length 154' of 3"
 Used 8' slotted 1 1/2" pipe instead of screen 7' of 1 1/2"

Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 5	Topsoil
5- 25	Yellow clay
25-105	Blue clay
105-130	Blue clay
130-140	Sand
140-164	Sand

Pumped at 7' level - 5 gallons per minute

Location NE 1/4 Sec. 17, T. 145N., R. 51W.

Well Started 7-7-37

Well Completed 7-30-37

Water level below surface none given 2" 68'

Casing Kind Standard Black; Size 3"; Length 252'

Screen Length 60", Diameter 1 1/2"; Size Opening #18 slot

Driller Dakota Artesian Company

Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 4	Topsoil
4- 33	Yellow clay
33- 41	Blue clay
41- 56	Rock and gravel
56- 62	Blue clay
62- 74	Rock and gravel
74- 92	Blue clay
92-108	Rock and gravel
108-111	Sand
111-116	Rock and gravel
116-151	Blue clay
151-154	Rock
154-185	Blue clay
185-187	Rock and gravel
187-189	Rock and gravel
189-214	Boulders and clay
214-219	Blue clay
219-223	Rock
223-228	Rock
228-231	Rock
231-235	Rock
235-245	Gravel
245-249	Clay and rock
249-252	Sand
252-253 1/2	Hardpan
253 1/2-265	Clay
265-269	Fine sand
269-313	Fine sand and dirt
313-320	Artesian sand

Flowing well

Well pumped at 5 gallons per minute

Franklin County, North Dakota (cont.)

Location NE $\frac{1}{4}$ Sec. 29, T. 145N., R. 51W.
 Well Started 7-21-37
 Well Completed 8-4-37
 Flowing well
 Driller Albert Herberg
 Casing Kind Standard Black; Size 3"; Length 274'
 Screen Length 96"; Diameter 1 $\frac{1}{2}$ "; Size Opening 18 slot

Log	Depth in Feet	Kind of Strata
	0- 5	Topsoil
	5- 20	Yellow clay
	20- 40	Blue clay
	40- 80	Blue clay and small stones
	80- 90	Blue clay
	90- 95	Gravel
	95-130	Blue clay and small stones
	130-150	Blue clay and small stones
	150-170	Blue clay and gravel
	170-188	Blue clay and gravel
	188-214	Blue clay and gravel
	214-245	Blue clay and sand
	245-360	Gravel and sand
	260-275	Sand
	275-285	White sand

Well tested at 10 gallons per minute

Location NW $\frac{1}{4}$ Sec. 29, T. 145N., R. 51W.
 Well Started 8-5-37
 Well Completed 8-12-37
 Flowing well
 Driller Albert Herberg
 Casing Kind Standard Black; Size 3"; Length 228'
 Screen Length 6'; Diameter 1 $\frac{1}{2}$ "; Size Opening #18 slot
 Log

Depth in Feet	Kind of Strata
0- 5	Topsoil
5- 15	Yellow clay
15-100	Blue clay
100-105	Blue clay
105-111	Sand
111-140	Blue clay
140-205	Blue clay
205-215	Blue clay and gravel
215-225	Blue clay and stones
225-234	

Flows 3 $\frac{1}{2}$ gallons per minute at 1 $\frac{1}{2}$ ' above ground level

Location NE $\frac{1}{4}$ Sec. 33, T. 145N., R. 51W.
 Well Started 6-25-37
 Well Completed 7-2-37
 Water level above surface 2'
 Driller Dakota Artesian Company
 Casing Kind Standard Black; Size 3"; Length 281'
 Screen Length 4'; Diameter 1 $\frac{1}{2}$ "; Size Opening 10 slot

Trall County, North Dakota (con't.)

Log	Depth in Feet	Kind of Strata
	0- 1	Topsoil
	1- 70	Yellow clay
	70-140	Clay and gravel
	140-190	Clay and small rocks
	190-250	Sand and clay
	250-254	Hardpan
	254-280	Shale and clay
	280-285	Sand and water

Tested at 4 gallons per minute

Location SW $\frac{1}{4}$ Sec. 8, T. 145N., R. 52W.
 Well Started 7-8-37
 Well Completed 7-20-37
 Flowing Well
 Driller Independent Well Company
 Casing Kind Standard Black; Size 3"; Length 483'
 Screen Length 10'; Diameter 1 $\frac{1}{2}$ "; Size Opening 10 slot
 Log

Depth in Feet	Kind of Strata
0- 1 $\frac{1}{2}$	Topsoil
1 $\frac{1}{2}$ - 20	Yellow clay
20- 87	Blue clay
87-100	Gray clay
100-106	Sand
106-122	Gray clay
122-145	Slate
145-230	Shale
230-231	Boulder
231-270	Shale
270-300	Shale
300-354	Shale
354-362	Sand
362-403	Shale
403-405	Lime rock
405-415	Sand
415-484	Shale
484-492	Sand and water

Well tested at 18 gallons per minute

Location NE $\frac{1}{4}$ Sec. 18, T. 145N., R. 52W.
 Well Started 8-11-37
 Well Completed 8-19-37
 Driller Independent Drilling Company
 Flowing well
 Casing Kind Standard Black; Size 3"; Length 388'.
 Log

Depth in Feet	Kind of Strata
0- 2	Topsoil
2- 20	Yellow clay
20- 21	Gravel
21- 27	Yellow clay
27- 75	Blue clay
75-150	Gray clay

~~Tredwell County, North Dakota~~ (con't.)

150-151	Hardpan
151-186	Gray clay
186-188	Boulders
188-200	Sandy clay
200-235	Gray clay
235-299	Shale
299-302	Rock
302-304	Shale
304-307	Lime rock
307-316	Shale
316-325	Sandy shale
325-340	Shale
340-351	Sandy shale
351-363	Sand
363-387	Shale
387-395	Sand and water

Tested 4 gallons per minute

Location SE $\frac{1}{2}$ Sec. 18, T. 145N, R. 52W.
 Well Started 8-7-37
 Well Completed 8-10-37
 Driller Independent Drilling Company
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1 $\frac{1}{2}$	Topsoil
1 $\frac{1}{2}$ - 20	Yellow clay
20- 21	Gravel
21- 27	Yellow clay
27- 50	Blue clay
50- 75	Blue clay
75-150	Gray clay
150-151	Hardpan
151-160	Gray clay
160-186	Gray clay
186-188	Rock
188-240	Gray clay

Location SW $\frac{1}{2}$ Sec. 18, T. 145N., R. 52W.
 Well Started August 20, 1937
 Well Completed August 27, 1937
 Flowing well 7 gallons per minute. Total Depth of well 408'.
 Casing Kind: 3" Black; Size 3"; Length 397'.
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1	Topsoil
1- 8	Yellow clay
8- 10	Sand
10- 26	Yellow clay
26-112	Blue clay
112-113	Boulder
113-172	Gray clay
172-173	Boulder
173-184	Gray clay
184-186	Boulder
186-218	Gray clay

Pratt County, North Dakota (con't.)

Log (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
218-230	Shale
230-254	Shale
254-257	Sand
257-307	Shale
307-309	Lime rock
309-312	Shale
312-318	Lime rock
318-375	Shale
375-390	Sand
390-395	Shale
395-408	Sand

Location NE $\frac{1}{4}$ Sec. 19, T. 145N., R. 52W.
 Well started 7-28-37
 Well completed 8-6-37
 Flowing well
 Driller Independent Well Company
 Casing Kind Standard Black; Size 3"; Length 393'.
 Screen Length 10'; Diameter 1 $\frac{1}{2}$ "; Size Opening #18
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 2	Topsoil
2- 14	Yellow clay
4 - 15	Gravel
15- 22	Sandy yellow clay
22- 75	Blue clay
75-137	Gray clay
137-139	Lime rock
139-163	Slate
163-165	Rock
165-167	Gray clay
167-170	Rock
170-175	Gray clay
175-176	Rock
176-244	Shale
244-245	Rock
245-273	Shale
273-274	Lime rock
274-307	Shale
307-312	Lime rock
312-360	Shale
360-368	Sand
368-369	Lime rock
369-390	Sandy shale
390-393	Shale
393-400	Sand and water

Well flows at 2 gallons per minute

Location NW $\frac{1}{4}$ Sec. 19, T. 145N., R. 52W.
 Well started August 10, 1937
 Well completed August 27, 1937
 Flowing well - 8 gallons per minute

Trail County, North Dakota (con't.)

Casing Kind Standard Black; Size 242' of 3"; Length 242'
172' of 2"; 172'

Log	Depth in Feet	Kind of Strata
	0- 15	Top soil
	15- 60	Yellow clay
	60-100	Blue clay
	100-150	Blue clay
	150-170	Blue clay
	170-202	Blue clay
	202-235	Blue clay
	235-250	Sand
	250-280	Sand
	280-310	Sand
	310-342	Sand
	342-380	Blue clay
	380-400	Blue clay
	400-414	Sand

Sand prevented getting 3" casing beyond 242'

Location N. $\frac{1}{4}$ Sec. 20, T. 145N., R. 52W
Well started 7-21-37
Well completed 7-27-37
Flowing well
Driller Independent Well Co.
Casing Kind Standard Black; Size 3"; Length 376'
Screen Length 10'; Diameter $1\frac{1}{4}$ "; Size Opening #10 Slot

Log	Depth in Feet	Kind of Strata
	0- $1\frac{1}{2}$	Top soil
	$1\frac{1}{2}$ - 14	Yellow clay
	14- 21	Sand Yellow clay
	21- 68	Blue clay
	68- 85	Gray clay
	85-100	Gray clay
	100-103	Sand
	103-123	Gray clay
	123-125	Boulder
	125-147	Slate
	147-182	Shale
	182-255	Shale
	255-268	Sand
	268-283	Shale
	283-287	Lime rock
	287-290	Shale
	290-291	Lime rock
	291-315	Shale
	315-323	Sand
	323-357	Shale
	357-368	Sand
	368-376	Shale
	376-387	Sand and water

Water flows at the rate of 3 gallons per minute

~~Bill County, North Dakota~~ (cont.)

Location SW₄ Sec. 20, T. 145N., R. 52W.
 Well started 6-24-37
 Well completed 7-1-37
 Flowing 5 gallons per minute 24" above ground level
 Driller Independent Well Co.
 Casing Kind Standard Black; Size 3"; Length 385'
 Screen Length 10'; Diameter 1 1/4"; Size Opening 18 slot

Log	Depth in Feet	Kind of Strata
	0- 2	Top soil
	2- 19	Yellow clay
	19- 72	Blue clay
	72-126	Gray clay
	126-129	Sandy clay
	129-130	Sand
	130-147	Clay
	147-151	Sand
	151-154	Clay
	154-158	Sand
	158-224	Clay
	224-225	Gravel and boulder
	225-254	Clay
	254-255	Lime rock
	255-274	Clay
	274-305	Shale
	305-307	Lime rock
	307-358	Shale
	358-365	Sand
	365-373	Shale
	373-384	Sand
	384-391	Sandy shale
	391-405	Sand and water

Location NE₄ Sec. 23, T. 145N., R. 53W.
 Well started August 28, 1937
 Well completed September 4, 1937
 Flowing well - 18 gallons per minute
 Driller Independent Drilling Co.
 Casing Kind Standard Black; Size 3"; Length 419'

Log	Depth in Feet	Kind of Strata
	0- 1	Top soil
	1- 18	Yellow clay
	18- 80	Blue clay
	80-104	Blue clay
	104-122	Gray clay
	122-123	Boulder
	123-160	Gray clay
	160-225	Gray clay
	225-229	Shale
	229-230	Lime rock
	230-247	Shale
	247-249	Hardpan
	249-279	Shale
	279-280	Lime rock
	280-310	Shale

Trail County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
310-313	Shale
313-315	Lime rock
315-317	Shale
317-318	Lime rock
318-351	Shale
351-375	Sand
375-377	Shale
377-378	Lime rock
378-387	Sand
387-403	Shale
403-416	Hard sand
416-425	Sand

Location NW $\frac{1}{4}$ Sec. 25, T. 145N., R. 53W.
 Well started September 1, 1937
 Well completed September 7, 1937
 Flowing slightly
 Driller Geheard Kaas
 Casing Kind Standard Black; Size 3"; Length 354'

<u>Log</u>	<u>Depth in Feet</u>	<u>Kind of Strata</u>
	0- 2	Top soil
	2- 17	Yellow clay
	17- 90	
	90-176	
	176-240	
	240-305	
	305-347	Blue clay
	347-368	Sand

Location SE $\frac{1}{4}$ Sec. 25, T. 145N., R. 53W.
 Well started 9-6-37
 Well completed 9-15-37
 Flowing well
 Driller Independent Drilling Co. No. 3
 Casing Kind Standard Black; Size 3"; Length 415'

<u>Log</u>	<u>Depth in Feet</u>	<u>Kind of Strata</u>
	0- 1 $\frac{1}{2}$	Top soil
	1 $\frac{1}{2}$ - 2	Gravel
	2- 18	Yellow clay
	18- 73	Blue clay
	73-125	Gray clay
	125-127	Boulder
	127-145	Gray clay
	145-146	Boulder
	146-164	Gray clay
	164-180	Sand
	180-181	Lime stone
	181-227	Sandy clay
	227-247	Sand
	247-268	Gray clay
	268-312	Gray clay
	312-314	Lime stone

Trail County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
314-350	Sandy shale
350-360	Shale
360-366	Sand
366-380	Shale
380-415	Hard shale
415-425	Sand and water

Water flows at 9 gallons per minute

Location SW $\frac{1}{4}$ Sec. 25, T. 145N, R. 53W.
 Well started 8-28-37
 Well completed 9-4-37
 Flowing well
 Driller Independent Drilling Co.
 Casing Kind: Standard Black; Size 3"; Length 432'6"
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1 $\frac{1}{2}$	Top soil
1 $\frac{1}{2}$ - 18	Yellow clay
18- 72	Blue clay
72-108	Gray clay
108-112	Sandy clay
112-114	Boulder
114-140	Gray clay
140-141	Boulder
141-218	Gray clay
218-219	Boulder
219-240	Gray clay
240-310	Shale
310-320	Lime rock
320-335	Shale
335-351	Sandy shale
351-371	Sand
371-387	Sandy shale
387-410	Sandy shale
410-430	Shale
430-450	Sand and water

Water flows at 50 gallons per minute.

Location NW $\frac{1}{4}$ Sec. 7, T. 146N., R. 49W.
 Well started August 18, 1937
 Well completed September 21, 1937
 Water level below surface 14'
 Driller Albert Herberg
 Casing Kind: Standard Black; Size 3"; Length 325'
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 3	Top soil
3- 18	Yellow clay
18- 85	Blue clay
85-121	Blue clay
121-135	Blue clay and stones
135-160	Blue clay and stones
160-200	Blue clay and stones
200-265	Blue clay and stones

Trail County, North Dakota (con't.)

Depth in Feet

Kind of Strata

265-330	Blue clay and stones
330-350	Blue clay and stones
350-390	Blue clay and shale
390-419	Blue clay and shale
419-421	Soft rock
421-423	Rock
423-430	Rock
430-445	Rock
445-463	Rock
463-465	Mud
465-467	

Pumped at 5 gallons per minute at 80'.

Location NW $\frac{1}{4}$ Sec. 8, T. 146N., R. 49W.
 Well started 9-22-37
 Well completed 9-25-37
 Water level below surface 14'
 Driller Albert Herberg
 Casing Kind: Standard Black; Size 3"; Length 163'3".
 Screen Length 10'; Diameter 1 $\frac{1}{4}$ "; Size Opening 18 slot.
 Log

Depth in Feet

Kind of Strata

0- 2	Top soil
2- 20	Yellow clay
20- 56	Blue clay
56-128	Blue clay
128-169	Sand and water

Pumped at 12 gallons per minute.

Location NE $\frac{1}{4}$ Sec. 9, T. 146N., R. 49W.
 Well started 9-27-37
 Well completed 9-29-37
 Water level below surface 4'
 Driller Albert Herberg
 Casing Kind: Standard Black; Size 3"; Length 133'
 Screen Length 8'; Diameter 1 $\frac{1}{4}$ "; Size Opening 18 slot
 Log

Depth in Feet

Kind of Strata

0- 20	Yellow clay
20- 55	Blue clay
55-123	Blue clay
123-128	Sand and water

Tested at 8 gallons per minute

Location SE $\frac{1}{4}$ Sec. 12, T. 146N., R. 51W.
 Well started 8-25-37
 Well completed 9-2-37
 Flowing well
 Driller Dakota Artesian Co.
 Casing Kind: Standard Black; Size 1 $\frac{1}{2}$ "; Length 7'.
 Log 3" 269'

Depth in Feet

Kind of Strata

0- 2	Top soil
------	----------

~~Trail~~ County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
2- 6	White clay
6- 16	Yellow clay
16- 51	Blue clay
51- 92	Blue clay
92- 95	Gravel
95-125	Blue clay and gravel
125-202	Blue clay
202-237	Sand and gravel
237-238	Rock
238-265	Sand and silt
265-286	Sand and water

Flows at 5 gallons per minute

Location SE $\frac{1}{4}$ Sec. 30, T. 146N., R. 51W.
 Well started 7-28-37
 Well completed 9-4-37
 Flow 15 gallons per minute
 Driller Olaf Herberg
 Casing Kind: Black; Size 3"; Length 302'8"
 Screen Length 10'; Diameter 1 $\frac{1}{4}$ "; Size Opening 60 mesh.
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 4	Top soil
4- 14	Gravel
14- 64	Clay
64- 86	Clay and gravel
86- 94	Stone and gravel
94-118	Hardpan, stones and clay
118-127	Hardpan and clay
127-130	Hardpan and clay
130-133	Hardpan and stone
133-144	Hardpan and stone
144-149	Hardpan and stone
149-160	Hardpan and stone
160-162	Hardpan and stone
162-174	Hardpan and stone
174-205	Clay
205-225	Clay
225-240	Clay and stone
240-270	Clay
270-333	Clay
333-355	Sand

Location SE $\frac{1}{4}$ Sec. 23, T. 146N., R. 53W.
 Well started 9-6-37
 Well completed 9-25-37
 Flowing: Flows 3 gallons per minute
 Driller Independent Drilling Co. #1
 Casing Kind: Standard Black; Size 3"; Length 433
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1	Top soil
1- 16	Yellow clay
16-103	Blue clay

Trail County, North Dakota, (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
103-138	Gray clay
138-140	Sand
140-154	Gray clay
154-170	Slate
170-188	Gray clay
188-189	Boulder
189-217	Gray clay
217-219	Boulder and gravel
219-222	Gray clay
222-223	Boulder
223-226	Gray clay
226-236	Shale
236-236 $\frac{1}{2}$	Lime rock
236 $\frac{1}{2}$ -271	Shale
271-272	Lime rock
272-282	Shale
282-287	Lime rock
287-330	Shale
330-333	Lime rock
333-353	Shale
353-376	Sand
376-388	Sandy shale
388-393	Shale
393-401	Hard sand
401-410	Sandy shale
410-411	Lime rock
411-413	Shale
413-433	Hard sand
433-434 $\frac{1}{2}$	Rock
434 $\frac{1}{2}$ -435 $\frac{1}{2}$	Sand
435 $\frac{1}{2}$ -438	Rock

Location NW $\frac{1}{4}$ Sec. 9, T. 147N. R. 49W.
 Well started 9-28-37
 Well completed 10-7-37
 Water level below surface 15'
 Pumped 6 gallons per minute
 Driller Dakota Artesian No. 1
 Casing Kind: Standard Black; Size 3"; Length 173'
 Screen Length 11'; Diameter 1 $\frac{1}{4}$ "; Size Opening 40 mesh
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1 $\frac{1}{2}$	Top soil
1 $\frac{1}{2}$ - 2	White clay
2- 27	Yellow clay
27- 80	
80-105	
105-125	
125-150	Blue clay
150-156	Sand
156-168	Shale
168-172	Silt
172-181	Gravel
181-183	Boulder

Trail, County, North Dakota (con't.)

Location SW $\frac{1}{4}$ Sec. 9, T. 147N., R. 49W.
 Well started 10-8-37
 Well completed 10-13-37
 Water level below surface 15'

Pumped 6 gallons per minute
 Driller Dakota Artesian No. 1 3" 176'6"
 Casing Kind: Standard Black; Size 2"; Length 40 mesh
 1 $\frac{1}{2}$ " 11'

Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 8	Yellow clay
8- 90	
90-145	Blue clay
145-151	Sand
151-153	Niggerhead rocks
153-163	Sand, trace of water
163-170	Shale
170-195	Sand

Location SE $\frac{1}{4}$ Sec. 30, T. 147N., R. 49W.
 Well started September 30, 1937
 Well completed October 4, 1937
 Water level below surface 13'

Pumped 5 gallons per minute at 20'
 Driller Albert Herberg
 Casing Kind: Standard Black; Size 3"; Length 134'
 Screen Length 6'; Diameter 1 $\frac{1}{4}$ "; Size Opening 40 mesh Johnson
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 5	Top soil
5- 20	Yellow clay
20- 65	
65-125	
125-130	Blue clay
130-137	Sand

Location NE $\frac{1}{4}$ Sec. 1, T. 147N., R. 50W.
 Well started 9-24-37
 Well completed 9-28-37

Flowing well
 Tested at 1 $\frac{1}{2}$ gallons per minute
 Driller Dakota Artesian No. 1
 Casing Kind: Standard Black; Size 3"; Length 180'
 Screen Length 10'; Diameter 1 $\frac{1}{2}$ "; Size Opening 10 slot
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1 $\frac{1}{2}$	Top soil
1 $\frac{1}{2}$ - 2	White clay
2- 29	Yellow clay
29-149	Blue clay
149-151	Rock
151-160	Sand
160-175	Shale
175-190	Sand and water

Trail County, North Dakota (con't.)

Location NW $\frac{1}{4}$ Sec. 1. T. 147N., R. 50W.
 Well started 9-20-37
 Well completed Incomplete
 Driller Dakota Artesian No. 2
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1 $\frac{1}{2}$	Top soil
1 $\frac{1}{2}$ - 7 $\frac{1}{2}$	White clay
7 $\frac{1}{2}$ - 37	Yellow clay
37- 42	
42-100	
100-136	Blue clay with rocks
136-144	Sand with some water
144-164	Shale with some rocks
164-174	Sand
174-194	
194-199	Shale with rocks
199-219	Sand with some water
219-239	Silt
239-258	Sand
258-265	Shale
265-270	Sand

Started new hole.

Location NW $\frac{1}{4}$ Sec. 1, T. 147N, R. 50W.
 Well started 9-30-37
 Well completed 10-9-37
 Water level below surface 8'

Pumped 4 $\frac{1}{2}$ gallons per minute

Driller Dakota Artesian
 Casing Kind: Standard Black; Size 3"; Length 165'
 2"; 80'
 Screen Length 6'; Diameter 1 $\frac{1}{2}$ "; Size Opening 40 mesh
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1 $\frac{1}{2}$	Top soil
1 $\frac{1}{2}$ - 7 $\frac{1}{2}$	White clay
7 $\frac{1}{2}$ - 37 $\frac{1}{2}$	Yellow clay
37 $\frac{1}{2}$ - 80	
80-125	
125-143	Blue clay with rocks
143-151	Sand
151-171	Shale
171-181	Sand
181-186	
186-200	Shale with rocks
200-220	Sand
220-240	Silt with a few niggerheads
240-255	Sand

Location SE $\frac{1}{4}$ Sec. 23, T. 147N, R. 50W.
 Well Started 10-19-37
 Well completed 10-22-37
 Water level below surface 7'
 Driller Dakota Artesian (1)

Frail County, North Dakota (con't.)

Casing Kind: Standard Black; Size 3"; Length 139'
 2"; 4'
 Screen Length 8'; Diameter 1 1/4"; Size Opening 40 mesh
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1 1/2	Top soil
1 1/2- 7 1/2	White clay
7 1/2- 33	Yellow clay
33- 85	
85-125	Blue clay
125-129	Gravel
129-134	Shale
134-140	Sand
140-146	Shale
146-155	Sand

Location NE 1/4 Sec. 23, T. 147N, R. 50W.

Well started 10-14-37

Well completed 10-18-37

7 gallons per minute when pumped

Driller Dakota Artesian No. 1

Casing Kind: Standard Black; Size 3"; Length 153'

Screen Length 5'; Diameter 1 1/4"; Size Opening 40 mesh.

Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1	Top soil
1- 2	White clay
2- 26	Yellow clay
26- 70	
70- 98	Blue clay
98-100	Boulder
100-125	Shale
125-129	Boulder
129-141	Shale
141-143	Silt and gravel
143-147	Boulder
147-158	Sand
158-161	Silt

Location SE 1/4 Sec. 31, T. 147N., R. 50W.

Well started 9-3-37

Well completed 9-14-37

Flowing: Flows 2 1/2 gallons per minute

Driller Dakota Artesian

Casing Kind: Standard Black; Size 3"; Length 380'

Screen Length 10'; Diameter 1 1/4"; Size Opening 10 slot

Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 5	White clay
5- 21	Yellow clay
21- 71	Blue clay
71-106	Blue clay
106-166	Blue clay
166-226	Blue clay

County, North Dakota (con't.)

<u>Log (con't.)</u>	<u>Depth in Feet</u>	<u>Kind of Strata</u>
	226-271	Blue clay
	271-274	Gravel and rocks
	274-341	Shale
	341-356	Sand and silt
	356-368	Gray sand
	368-370	Rock
	370-381	Fine sand
	381-390	Coarse sand and water

Location NW $\frac{1}{4}$ Sec. 31, T. 147N., R. 50W.
 Well started 9-1-37
 Well completed 9-9-37

Flows 1 qt. per minute; Pumps 6 gallons per minute
 Driller Dakota Artesian No. 2
 Casing Kind: Standard Black; Size 3"; Length 374'
 Screen Length 4'; Diameter 1 $\frac{1}{4}$ "; Size Opening 40 mesh
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1 $\frac{1}{2}$	Top soil
1 $\frac{1}{2}$ - 2	White clay
2 - 32	Yellow clay
32-100	
100-162	Blue clay
162-168	
168-170	Boulders
170-210	
210-230	Blue clay
230-290	
290-370	
370-374	Gray shale and small layers sand
374-376	Sand

Location SE $\frac{1}{4}$ Sec. 21, T. 147N., R. 52W.
 Well started 8-10-37
 Well completed 8-14-37
 Water level below surface 15'

Driller Dakota Artesian Co.
 Casing Kind: Standard Black; Size 3"; Length 346 $\frac{1}{4}$ '
 Screen Length 5'; Diameter 1 $\frac{1}{4}$ "; Size Opening 18 slot.
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 2	Top soil
2- 37	Yellow clay
37- 65	Blue clay
65- 92	Blue clay
92- 98	Gravel
98-158	Blue clay
158-190	Shale
190-194	Hardpan
194-217	Shale
217-256	Sand
256-297	Shale
297-309	Fine sand

Grand County, North Dakota (cont.)

Log (cont.)	Depth in Feet	Kind of Strata
	309-346	Shale
	346-365	Sand and water

Tested at 6 gallons per minute

Location NE $\frac{1}{4}$ Sec. 21, T. 147N, R. 52W.
 Well started 8-12-37
 Well completed 8-24-37
 Water level below surface 17'
 Driller Dakota Artesian
 Casing Kind: Standard Black; Size 3"; Length 320'
 Log

Depth in Feet	Kind of Strata
0- 2	Top soil
2- 8	White clay
8- 37	Yellow clay
37- 76	Blue clay
76- 84	Gravel
84-102	Blue clay
102-108	Coarse gravel
108-125	Blue clay
125-127	Rock
127-138	Blue clay
138-142	Gravel
142-148	Blue clay
148-230	Coarse gravel
230-233	Fine sand
233-234	Hardpan
234-260	Fine sand
260-272	Shale
272-290	Hard sand rock
290-305	Hard sand rock
305-317	Shale
317-318	Hardpan
318-320	Soft rock
320-321	Coarse gravel

Casing set in real coarse gravel

Do not need a screen.

Well tested at 5 gallons per minute

Location SW $\frac{1}{4}$ Sec. 21, T. 147N, R. 52W.
 Well started 8-3-37
 Well completed 8-7-37
 Water level below surface 11'
 Driller Dakota Artesian No. 2
 Casing Kind: Standard Black; Size 3"; Length 369'.
 Screen Length 5'; Diameter 1 $\frac{1}{2}$ "; Size Opening 40 mesh.
 Log

Depth in Feet	Kind of Strata
0- 1	Top soil
1- 3	White clay
3- 28	Yellow clay
28- 90	Blue clay
90-115	Sand and gravel
115-130	Blue clay

Trail County, North Dakota (cont.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
130-149	Gravel
149-170	Hardpan
170-200	Shale
200-201	Rock
201-264	Shale
264-284	Shale
284-286	Hard shale
286-316	Shale
316-350	Fine sand and dirt
350-374	Sand and water

Well tested at 6 gallons per minute

Location NE $\frac{1}{4}$ Sec. 21, T. 147N, R. 52W.
 Well started 8-2-37
 Well completed 8-11-37
 Water level below surface 29'
 Driller Dakota Artesian Co.
 Casing Kind: Standard Black; Size 3"; Length 354'
 Screen Length 13'; Diameter 1 $\frac{1}{4}$ "; Size Opening 18 slot
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 1	Top soil
1- 3	White clay
3- 28	Yellow clay
28- 90	Blue clay
90-125	Sand and gravel
125-131	Blue clay
131-142	Gravel
142-171	Hard blue clay
171-172	Sand rock
172-197	Shale
197-199 $\frac{1}{2}$	Hard rock
199 $\frac{1}{2}$ -264	Shale
264-284 $\frac{1}{2}$	Shale
284 $\frac{1}{2}$ -286 $\frac{1}{2}$	Hard shale
286 $\frac{1}{2}$ -312 $\frac{1}{2}$	Shale
312 $\frac{1}{2}$ -347 $\frac{1}{2}$	Fine sand and dirt
347 $\frac{1}{2}$ -349	Shale
349-362	Artesian sand
362-372	Artesian sand

Tested at 5 gallons per minute

Location NE $\frac{1}{4}$ Sec. 9, T. 148N, R. 51W.
 Well started 7-7-37
 Well completed 7-10-37
 Log

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 40	Yellow clay
40- 60	Gray clay
60- 80	Sand
80- 90	Hardpan
90- 97	Stone

Ward County, North Dakota (con't.)

Log (con't.)	<u>Depth in Feet</u>	<u>Kind of Strata</u>
	120-160	Blue shale
	160-166	Coal, lignite
	166-175	Gray shale
	175-178	Coal, lignite
	178-243	Gray shale with thin layer sand, quite a pressure water
	243-244	Hard black shale, may be cap rock
	244-246	Black sandy shale, rather porous, with gas that forced the water up through the casing, on top of ground 18'.
	246-280	Dark shale rather white
	280-290	Hard layer, sand and shale mixture
	290-316	Thin layer of sand stone over gravel and sand with water that could not be lowered by bailing.
	316-385	Dark gray shale
	385-397	Mixture of dark sticky shale mixed with sand, very hard, something like the hard shale encountered at 243' that was drilled into 18"
	397-410	Shale dark brown
	410-418	Water sand, with quite a pressure of gas
	418-500	Hard shale with quite a pressure of gas
	500-500	Hard shale with quite a pressure of gas.

Log of Minot Creamery Co. Well, Minot, North Dakota
 Located on Fairview Addition, Lot 13, Block 2

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 34	Clay
34- 43	Dirty Sand
43- 58	Blue clay
58- 70	Sand and clay
70- 90	Soft blue clay
90-100	Fine dirty sand
100-120	Sand and layers of coal containing water

Blue clay starting at 120' which is the depth of the well.

Log of Bridgeman-Russell Well, Minot, North Dakota
 Located on Block 31, Lots 1 and 2, Great Northern Right of Way

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 12	Fill
12- 40	Very soft blue clay
40- 62	Clay mixed with gravel and sand
62- 80	Sand and gravel, waterbearing

Continous pumping for three hours at 30 gallons per minute. 1' drawdown

Ward County, North Dakota (con't.)

Log of Minot, North Dakota Well #3.
SW Corner of Block 5

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 86	Alluvium
86-124	Fine sand
124-130	Coarse sand
130-158	Coarse sand and gravel with particles of lignite

Log of Soo Line Well at Ryder, Ward County, North Dakota

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 54	Drift (?)
54- 81	Clay and boulders
81-125	Slate
125-137	Coal and water
137-168	Slate
168-207	Shale
207-212	Coal
212-234	Slate
234-236	Rock
236-245	Slate
245-246	Coal
246-264	Slate
264-282	Shale
282-288	Coal
288-296	Shale
296-299	Coal and water
299-301	Shale
301-303	Coal and water
303-338	Shale
338-361	Sandy shale
361-370	Shale
370-376	Coal
376-403	Shale
403-408	Coal and water
408-412	Shale
412-414	Coal
414-420	Shale
420-421	Coal
421-437	Shale
437-468	Slate
468-473	Hardrock
473-476	Shale
476-482	Coal
482-483	Shale
483-485	Shale and coal
485-490	Slate
490-496	Shale
496-498	Coal
498-505	Shale
505-532	Slate
532-543	Sand and shale
543-544	Coal
544-545	Shale

Ward County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
217-220	Soapstone
220-256	White shale
256-260	Coal
260-484	Shale, soapstone, layers of sand

Much gas encountered in the 3' of soapstone between 217' and 220'

L. R. Colvert Farm: 1 mile NE of Berthold SW $\frac{1}{4}$ of Sec. 15, T. 156N, R. 86W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 40	Top soil
40-180	Blue clay
180-310	Shale
310-323	Sand (some water)
323-400	Shale
400-400 $\frac{1}{2}$	Coal
400 $\frac{1}{2}$ -407	Coarse sand and gravel (water)

Water rose to within 50' of surface. No gas

Wm. Fisher Farm: 5 miles SW of Berthold. NW $\frac{1}{4}$ of Sec. 8, T. 155N, R. 86W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 20	Top soil
20-300	Blue clay
300-350	Fire clay
350-365	Coal
365-530	Hard white or gray substance with veins of sand and layers of shale

Great Northern Railway Well

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 35	Yellow clay
35- 40	Brown sandrock-soft
40- 72	Hard blue clay
72- 75	Boulders and broken stones
75-100	Hard blue clay
100-115	Shell rock-hard
115-160	Soft brownish clay
160-165	Some gravel little water
165-170	Bluish clay
170-190	Sandy clay - light in color
190-195	Broken stones and clay
195-222	Soft sandy clay
222-240	Quicksand
240-252	Bluish gray sandy shale, some water (rose 100')
252-265	Coal blossom
265-270	Shale
270-296	Sandy shale (bluish)
296-304	Sandy shale
304-306	Hard shale (dark reddish)
306-320	Sandy shale
320-325	Quicksand
325-335	Sandy shale

Ward County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
335-345	Quicksand
345-467	Fine clay, sand, and water
467-472	Fine clay, sand and water
472-476	Coal
476-492	Marl and soapstone
492-494	Coal and water
494-500	Marl and soapstone (some water)

• Peter Johnson Farm: 2 miles W. of Berthold, NE $\frac{1}{4}$ of Sec. 25, T. 156N, R. 87W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
	Top soil
	Blue clay
	Sandy soapstone
	Shale
	Sand (water)

No coal or gas encountered

Frank Lestey Farm: 8 miles NE of Berthold, NW Sec. 26, T. 157N. R. 86W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 60	Top soil
60-160	Blue clay
160-170	Gravel
170-220	Shale
220-224	Very hard black substance resembling coal
224-284	Soapstone
284-287	Sand (water)

No coal or gas encountered

Berthold City Well: Sec. 21, T. 156N, R. 81W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 25	Top soil
25-250	Blue clay
250-255	Sand (very black water)
255-560	Thin layers of coal and shale beds
560-570	Soapstone (water)

• Charles Quamas Farm: 4 $\frac{1}{2}$ miles NW of Berthold, Sec. 7, T. 156N, R. 86W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 40	Top soil
40-250	Blue clay
	Very light clay
	Shale
	Very fine sand (some water)
	Layers of soapstone and shale

Ward County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
380-398	Sand (water)
No coal or gas encountered	

Berthold, North Dakota Well logs

W. I. Meyers Farm: $1\frac{1}{2}$ miles E. of Berthold, NW Sec. 34, T. 156N, R. 86W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 50	Top soil
50-240	Blue clay
240-260	Shale
	Hard layer of dark brown substance with thick, black water
408	Soapstone
	Sand (water)
No coal or gas encountered	

Jacob Peterson Farm: 14 miles SW of Berthold

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 50	Top soil
50-200	Blue clay
200-240	Shale
240-249	Thin layers of coal and shale
249-252	Coal
Water found at 252'. No gas encountered.	

John Williams Farm: 3 miles E and 1 mile N of Berthold . SE $\frac{1}{2}$ of Sec. 18, T. 156N. R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 12	Top soil
12-200	Blue clay
200-202	Hard soapstone
202-220	Shale
220-235	Coal
Flowing well at 235'. No gas found.	

DES LACS, North Dakota Well Logs

Westley White Farm; SE of Des Lacs, T. 155N, R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 35	Top soil
35-125	Blue clay
125-153	Layers of sand, water, and white clay
Fine sand, water at 153'. No gas encountered.	

H. W. Gunter Farm: 6 miles SW of Des Lacs , S $\frac{1}{2}$ of 21, NE of 28, T. 155N. R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 25	Top soil
25- 85	Blue clay

Ward County, North Dakota (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
	Soapstone
	Fire clay
175	Coal

Large flow of water struck at 175'. Traces of oil in this well.

J. W. McMahan Farm: 3 miles SW of Des Lacs. N.W. of Sec. 15, T. 155N. R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 25	Top soil
25- 75	Blue clay
	Fire clay
162	Soapstone and thin layers of quicksand
165	Coal

Plenty of water at 162'. Some gas, and oil stains at 165'.

Lone Tree, North Dakota Well Logs

J. H. Berkhardt Farm: $3\frac{1}{2}$ miles SW of Lone Tree, NW $\frac{1}{4}$ of Sec. 19, T. 155N, R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 35	Top soil
35-125	Blue clay
125-126	Coal (thick black water)
126-200	Shale and soapstone
200- ?	Coal
237	Sand (water)

No gas encountered

Charles G. Larson Farm: 4 miles W and 1 mile N of Blune Ranch

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0-420	Soft shale
420-540	Hard and soft rock
540-600	Various substances
600-608	Hard rock
608-650	?
650-656	Coal
656-706	Shale
706-766	Black shale (with some gas)

DES LACS, North Dakota Well Logs

E. S. Waterman Farm: SE $\frac{1}{4}$ of Sec. 27, T. 155, R. 85: NE $\frac{1}{4}$ Sec. 34, T. 155, R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 25	Top soil
25- 75	Blue clay
75-125	White fire clay

Coal and water struck at 125'. Some gas was found.

Wm. Marshall Farm: 9 miles SE of Des Lacs, NW Sec. 33, T. 155N. R. 84W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 25	Top soil
25- 75	Blue clay

Ward County, North Dakota. (con't.)

<u>Depth in Feet</u>	<u>Kind of Strata</u>
	Quicksand
	Small gravel
	Small layers of blue clay
	Thin layers of quicksand
	Small deposits of slack coal

Solid veins of coal and plenty of water found at 200'. Some gas encountered.

Shannon Wagoner Farm: SW of Des Lacs, T. 154N, R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 35	Top soil
35-245	Blue clay
245-248	Slack coal
248-336	White fire clay
336-359	Coal (plenty of water)

No gas encountered in this well.

Wm. C. Tunstall Farm: SW of Des Lacs, Sec. 35, T. 155N., R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
-176	Blue clay
176-	Coal

Plenty of water at 176'. No gas encountered.

T. M. Williams; S. of Des Lacs, T. 154N, R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 35	Top soil
35-140	Blue clay
140-240	Quicksand
240-270	Fire clay
270-276	Coal
276-310	Clay
310-313	Coal

Stopped drilling in coal where plenty of water was found. No gas.

G. N. Gronigar Farm: NW Sec. 6, T. 154N. R. 84W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 25	Top soil
25- 75	Blue clay
75-175	Soapstone
175-177	Coal

Water found at 177'. No gas encountered.

Bridges Farm: T. 155N. R. 85W.

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 35	Top soil
35-176	Blue clay

Ward County, North Dakota (con't.)

Depth in Feet Kind of Strata

176-183 Shale
 183-186 Coal

T. J. Norton Farm: SW of Sec. 36, T. 156N, R. 85W.

Depth in Feet Kind of Strata

0- 50 Top soil
 50- 70 Sand (and water)
 70-180 Blue clay
 180-188 Limestone rock
 ? - ? Soapstone
 ? - ? Thin layers of coal

Water was found at 213'.

A. J. Smith Farm: 5 miles SE of Des Lacs

Depth in Feet Kind of Strata

0- 30 Top soil
 30-200 Blue clay
 200-205 Coal
 205-220 ?
 220-223 Very hard coal
 223-286 Soapstone

Coarse sand and gravel with plenty of water encountered at 286'. No gas encountered.

WELLS COUNTY

Log of Test Hole #4, Harvey, North Dakota

Depth in Feet Kind of Strata

9- 15 Fine, gray sand
 15- 17 Coarse sand and fine gravel
 17- 19 Coarse sand
 19- 21 Gravel with coarse sand
 21- 23 Coarse sand and gravel
 23- 25 Coarse gravel and sand
 25- 27 Coarse gravel and sand
 27- 31 Coarse gravel, sand, and a little clay
 31- 33 Coarse gravel and sand
 33- 35 Sand and coarse gravel
 35- 39 Coarse sand and gravel
 39- 41 Coarse gravel and sand
 41- 43 Coarse sand and gravel
 43- 45 Coarse gravel and sand
 45- 47 Coarse gravel and sand
 47- 49 Coarse gravel
 49- 51 Very coarse gravel
 51- 53 Coarse gravel and sand
 53- 55 Sand and fine gravel
 55- 57 Very coarse gravel
 57- 59 Coarse gravel and sand
 59- 61 Very coarse gravel

WILLIAMS COUNTY

Log of Well at Springbrook, Williams County, North Dakota.

T. 157N, R. 100W, Sec. 25, Qr. SW

Owner: S. A. Forseth

<u>Depth in Feet</u>	<u>Kind of Strata</u>
0- 8	Drift
8- 11	Rock
11- 32	Blue clay and boulders
32- 66	Blue clay, sand, and gravel
66-100	Blue clay
100-145	Quicksand and water, finished in gravel, cased out one vein on 42'.