

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 33

Summary of the Emma Kleven No. 1 Well Burleigh County, North Dakota

By John W. Caldwell
November 28, 1953

Hunt Oil Company-Emma Kleven No. 1, Burleigh County, North Dakota, Section 18, T. 140N., R. 80W., (325 feet E. of W. line and 660 feet N. of S. line, Section 18). Elevation G.L. 1910, total depth 8115.

The Hunt #1 Kleven was spudded September 20, 1952, and 10 3/4 inch casing was run at 708 feet, cemented with 450 sacks. The well was plugged November 16, 1952.

Cement plugs were set at the following depths and in the following formations.

<u>Formation</u>	<u>Depth</u>
Red River	7464-7550 with 30 sacks
Devonian	5857-5900 with 15 sacks
Mississippian	4903-4960 with 20 sacks
Dakota	2993-3050 with 20 sacks
Greenhorn	2480-2538 with 20 sacks
Bottom of Surface Casing	650- 713 with 30 sacks
Surface Plug	Ground- 31 with 15 sacks

Cores

The well was cored from 5048 to 5101 and recovered 23 feet of anhydrite and 30 feet of limestone, with no indication of oil shows.

Tests

DST 7729-63: Tool open 3 hours, shut in 30 minutes. Good blow 25 minutes, died, covered 315 feet slightly oil cut mud, 7185 feet salt water. F.P. 3700#, S.I.P. 3700#, H.P. 4500#.

Water analysis from DST 7729-63:

Analysis from Top of Test

Constituents	PPM
Sodium	8,046
Calcium	1,558
Magnesium	175
Sulfate	2,872
Chloride	12,800
Bicarbonate	1,295
Observed pH	7.9
Res @ 68° F. ohms/meter	0.29
Calculated total solids	26,089

Analysis from Middle of Test

Constituents	PPM
Sodium	51,666
Calcium	2,859
Magnesium	489
Sulphate	2,789
Chloride	84,000
Bicarbonate	135
Observed pH	7.4
Res @ 68° F. ohms/meter	0.07
Calculated total solids	141,878

Analysis from Bottom of Test

Constituents	PPM
Sodium	52,358
Calcium	2,801
Magnesium	485
Sulphate	2,757
Chloride	85,000
Bicarbonate	105
Observed pH	6.9
Res @ 68° F. ohms/meter	0.07
Calculated total solids	143,453

Formation tops determined from sample and electric logs, not all lithologic formation tops called in following list. Colors determined from rock color chart.

FORMATION TOPS

<u>System and Formation</u>	<u>Tops</u>
Cretaceous	<u>Depth</u>
Niobrara	2020
Greenhorn	2481
Muddy	2900
Dakota	3125
Jurassic	
Morrison	3360
Sundance	3380
Piper	3841
Triassic	
Spearfish	3987
Mississippian	
Amsden	4032
Big Snowy	4234
Charles	4533
Mission Canyon	4912
Lodgepole	5211
Englewood	5811
Devonian	
Three Forks	5830
Nisku	5850

<u>System and Formation</u>	<u>Tops</u>
Duperow	5909
Souris River	6133
Dawson Bay	6260
Elk Point	6372
Ashern	6418
Silurian	
Interlake	6431
Ordovician	
Upper Stony Mountain	6700
Stony Mountain Shale	6798
Red River	6896
Winnipeg Formation	
Winnipeg Shale	7561
Winnipeg Sand	7725

Hunt #1 Kleven
Sec. 18-14ON-80W C SW SW
Burleigh Co. N. D.

<u>From</u>	<u>To</u>	<u>Formation</u>
710	720	Shale, medium light gray, silty.
720	750	Shale, medium light gray, silty, lumpy.
750	790	Shale, medium light gray, slightly bentonitic.
790	800	Shale, dark yellow brown, very silty with very fine sand.
800	830	Shale, medium light gray, silty with very fine sand.
830	840	Shale, medium dark gray, lignitic micaceous.
840	870	Shale, medium gray, bentonitic, few carbonaceous remains.
870	880	Shale, medium gray, bentonitic.
880	890	Shale, medium dark gray, bentonitic, silty.
890	930	Shale, medium gray, bentonitic.
930	970	Shale, medium gray, slight bentonitic.
970	980	Shale, medium gray, slightly bentonitic, little pale reddish brown shale, micaceous, sandy.
980	1000	Shale, medium gray, plant fragments replaced with pyrite.
1000	1010	Shale, medium dark gray, plant fragments replaced with pyrite.
1010	1020	Shale, olive gray, slightly bentonitic.
1020	1030	Shale, medium gray, slightly bentonitic, calcareous.
1030	1050	Shale, medium gray, bentonitic, calcareous.
1050	1060	Shale, medium gray, slightly bentonitic.
1060	1070	Shale, medium gray, slightly bentonitic, calcareous.
1070	1090	Shale, medium gray to light olive gray, slightly bentonitic, slight calcareous.
1090	1110	Shale, medium gray, slightly bentonitic, slight calcareous, pyrite.
1110	1130	Shale, medium gray, calcareous.
1130	1140	Shale, medium gray, bentonitic, calcareous.
1140	1150	Shale, medium gray, slightly bentonitic, slight calcareous.
1150	1160	Shale, medium gray, slightly bentonitic.
1160	1180	Shale, medium light gray, compact.

<u>From</u>	<u>To</u>	<u>Formation</u>
1180	1200	Missing.
1200	1250	Shale, medium light gray, compact.
1250	1280	Shale, medium gray, dense, compact.
1280	1290	Shale, medium gray, soft, lumpy, slight calcareous, slightly bentonitic.
1290	1320	Shale, medium light gray, dense, compact.
1320	1340	Shale, medium gray, soft, lumpy, slight calcareous, slightly bentonitic. Shale as above.
1340	1450	Shale, medium light gray, dense, compact.
1450	1470	Shale, medium gray, soft, lumpy, slight calcareous, slightly bentonitic. Shale as above.
1470	1530	Shale, medium light gray, dense, compact.
1530	1550	Shale, medium light gray, soft, lumpy, slight calcareous, slightly bentonitic.
1550	1600	Shale, medium light gray, soft, lumpy, slight bentonitic.
1600	1640	Shale, medium light gray, soft, lumpy, slight calcareous, slightly bentonitic, inoceramus.
1640	1660	Shale, medium gray, soft, lumpy, bentonitic.
1660	1670	Shale, medium gray, slightly bentonitic, sandy, soft, lumpy.
1670	1680	Shale, medium gray, bentonitic sandy, soft, lumpy.
1680	1760	Shale, medium gray, bentonitic calcareous, soft, lumpy.
1760	1800	Shale, medium gray, large amount bentonitic, calcareous, soft, lumpy.
1800	1820	Shale, medium gray, bentonitic, calcareous, few carbonaceous remains.
1820	1880	Shale, medium gray, bentonitic, calcareous.
1880	1920	Shale, medium gray, bentonitic, calcareous, shell fragments.
1920	1990	Shale, medium gray, bentonitic, calcareous, shell fragments.
1990	2000	Shale, dark gray.
2010	2020	Shale, dark gray, some medium gray shale, bentonitic and calcareous.
2020	2040	Shale, dark gray, lignitic, little medium gray shale.
2040	2050	Shale, medium gray, bentonitic, calcareous, little dark gray shale as above.
2050	2100	Shale, medium gray, bentonitic, calcareous.
2100	2120	Shale, medium dark gray, calcareous bentonitic.
2120	2150	Shale, medium gray, bentonitic, calcareous.
2150	2170	Shale, medium dark gray, bentonitic, calcareous.
2170	2220	Shale, medium gray, bentonitic, calcareous.
2220	2280	Shale, medium gray, slightly bentonitic, calcareous.
2280	2300	Shale, medium gray, bentonitic, calcareous.
2300	2350	Shale, medium gray, slightly bentonitic, calcareous.
2350	2380	Shale, medium dark gray, slightly bentonitic, calcareous.
2380	2390	Shale, medium gray, bentonitic, calcareous.
2390	2410	Shale, medium gray, calcareous, slightly bentonitic.
2410	2420	Shale, medium dark gray, calcareous, slightly bentonitic.
2420	2430	Shale, medium gray, calcareous, bentonitic.
2430	2460	Shale medium dark gray, calcareous, bentonitic.
2460	2500	Shale, medium gray, calcareous, bentonitic.
2500	2510	Shale, medium gray, bentonitic, calcareous, large amount shell fragments.

<u>From</u>	<u>To</u>	<u>Formation</u>
2510	2520	Shale, medium dark gray, slightly bentonitic, calcareous, large amount shell fragments.
2520	2530	Shale, dark gray, calcareous, some shell fragments.
2530	2550	Shale, dark gray, calcareous, some shell fragments, white specks.
2550	2570	Shale, medium gray, calcareous, large amount of shell fragments.
2570	2600	Shale, medium dark gray, some limestone, some shell fragments.
2600	2620	Shale, dark gray, some shell fragments, lignitic.
2620	2640	Shale, medium dark gray, few shell fragments, pyrite.
2640	2660	Shale, medium dark gray, few shell fragments.
2660	2680	Shale, medium gray, calcareous, bentonitic.
2680	2690	Shale, medium dark gray, calcareous slightly bentonitic.
2690	2700	Shale, dark gray, lignitic in part.
2700	2720	Shale, medium dark gray, calcareous, slightly bentonitic.
2720	2770	Shale, dark gray, lignitic.
2770	2790	Shale, dark gray, lignitic, pyrite.
2790	2810	Shale, medium dark gray.
2810	2840	Shale, dark gray, micaceous, pyrite.
2840	2860	Shale, medium dark gray, bentonitic.
2860	2880	Shale, medium dark gray, calcareous slightly bentonitic.
2880	2890	Shale, medium dark gray, slightly calcareous.
2890	2910	Shale, medium dark gray.
2910	2950	Shale, medium dark gray, slight calcareous slightly bentonitic.
2950	2990	Shale, dark gray, lignitic.
2990	3050	Shale, medium dark gray, slight calcareous, lignitic in part.
3050	3080	Shale, medium dark gray, lignitic in part.
3080	3100	Shale, medium dark gray.
3100	3130	Shale, medium dark gray, slightly calcareous.
3130	3150	Missing.
3150	3170	Shale, medium dark gray, little white fine grained sand calcareous cement.
3170	3190	Shale, medium dark gray, some coarse angular to rounded quartz grains.
3190	3220	Sandstone, loose coarse grained, rounded, frosted, large amount shale as above, porous.
3217		Circulation 15 minutes. Sandstone, loose coarse, grained, angular to subrounded, frosted, porous.
3217		Circulation 30 minutes. Sandstone as above, porous.
3217		Circulation 45 minutes. Sandstone as above, some medium, dark gray shale, porous.
3217		Circulation 60 minutes. Sandstone as above, little medium dark gray shale.
3217		Circulation 1 1/4 hours. Shale, medium dark gray, some sand as above.
3217		Circulation 1 1/2 hours. Shale, medium, dark gray, little sand as above.
3220	3240	Sandstone, loose coarse grained, angular to subrounded frosted, some shale as above, porous.

<u>From</u>	<u>To</u>	<u>Formation</u>
3240	3250	Shale, medium dark gray, some sand as above, porous.
3250	3280	Shale, medium dark gray, lignitic in part, little sandy as above.
3284		Circulation. Shale, as above, little sand as before.
3280	3300	Shale, medium dark gray, lignitic in part, little fine, medium grained sand.
3300	3310	Sandstone, loose, medium-coarse grained, angular to subrounded, some shale as above, porous.
3310	3330	Sandstone, loose, medium-coarse grained, angular, to subrounded, little shale as above, porous.
3330	3400	Shale, medium dark gray, little sand as before.
3400	3420	Shale, medium dark gray, bentonitic, calcareous, little pyrite cemented sand.
3420	3430	Shale, medium dark gray, slightly bentonitic, calcareous.
3430	3450	Shale, medium gray, slightly bentonitic, calcareous.
3450	3480	Shale, medium light gray, calcareous, slightly bentonitic, silty.
3480	3510	Shale, medium light gray, calcareous, slightly bentonitic, some, gray-red brown siltstone calcareous cement.
3510	3530	Shale, medium light gray, calcareous, slightly bentonitic, little gray-red brown siltstone, calcareous cement.
3530	3580	Shale, medium light gray calcareous, slightly bentonitic, some white-red brown very fine grained sandstone, silty.
3580	3610	Shale, medium gray, calcareous, slightly bentonitic, some gray to white, very fine-fine grained sandstone silty, slight porous.
3610	3650	Shale, medium light gray calcareous, some white-gray, very fine-fine grained sandstone, silty, slight porous.
3650	3670	Shale, medium gray calcareous, little white-gray, very fine-fine grained sandstone, silty.
3670	3680	Shale, medium gray calcareous, numerous shell fragments.
3680	3690	Shale, medium gray, calcareous, slightly bentonitic.
3690	3700	Shale, medium gray and red-brown, calcareous, slightly bentonitic.
3700	3720	Missing.
3720	3760	Shale, medium gray calcareous, slightly bentonitic, little red-brown shale, shell fragments.
3760	3770	Missing.
3770	3780	Shale red-brown and gray, calcareous, little sugary white anhydrite.
3780	3800	Shale, red-brown and gray, calcareous, some white-pale yellow subcrystalline limestone, little white sugary anhydrite.
3800	3830	Shale, medium dark gray, some white to pale yellow limestone subcrystalline.
3830	3850	Shale, medium dark gray, some white to red-brown subcrystalline limestone.
3850	3860	Shale, medium dark gray, large amount white to pale yellow subcrystalline limestone.
3860	3870	Limestone, very light gray to yellowish gray subcrystalline limestone, some shale as above.

<u>From</u>	<u>To</u>	<u>Formation</u>
3870	3890	Limestone, as above, medium dark gray shale, red-brown, very calcareous shale.
3890	3920	Limestone, very light gray to yellowish gray subcrystalline, some medium gray shale.
3920	3930	Shale, medium light gray, little limestone as above, little white, subcrystalline dolomite.
3930	3960	Shale, medium dark gray, red-brown shale, white sugary anhydrite, little limestone and dolomite.
3960	4050	Shale, medium light gray, calcareous, some red-brown shale, little anhydrite.
4050	4070	Shale, medium light gray, calcareous red-brown shale, little white, pale red fine grained sandstone, slightly porous.
4067		Circulation 15 minutes. Sandstone, white-pale red fine grained, some red-brown and gray shale, porous.
4070	4090	Shale, medium light gray, red-brown shale, pale red sandstone, pinkish gray dolomite.
4090	4120	Shale, medium light gray, red-brown shale, some pinkish gray dolomite, pale red sandstone.
4120	4180	Shale, red-brown and gray, large amount white to pale red fine grained sandstone.
4180	4210	Shale, red-brown, olive-gray and medium gray, little light gray limestone.
4210	4220	Dolomite, yellow-gray fine grained, some shale as above, some white sugary anhydrite.
4220	4230	Dolomite, as above, large amount medium dark gray shale, some anhydrite.
4230	4250	Shale, medium dark gray shale, little dolomite as above and little anhydrite.
4250	4270	Shale, medium dark gray, little red-brown shale, small amounts of bentonitic and anhydrite.
4270	4290	Shale, medium dark gray, small amount of red-brown shale, anhydrite, and dolomite.
4290	4310	Shale, medium gray, some white sugary anhydrite, small amounts of red-brown shale and dolomite.
4310	4320	Dolomite, very light gray to yellow-gray fine grained, little red-brown and gray shale.
4320	4330	Missing.
4330	4350	Shale, medium light gray, little yellow-brown and red-brown shale, little dolomite as before.
4350	4360	Shale, medium light gray, little yellow-brown and red-brown shale, little anhydrite.
4360	4380	Dolomite, yellow-gray to light olive gray fine grained, little red-brown and gray shale.
4380	4410	Shale, red-brown and gray, splintery, little dolomite as above.
4410	4440	Shale, medium gray, small amounts of yellow-brown and red-brown shale, little gypsum, anhydrite, and bentonite.
4440	4450	Shale, medium dark gray, small amounts of yellow-brown and red-brown shale.
4450	4460	Shale, medium dark gray, small amounts of yellow-brown and red-brown shale, little fine-medium grained, loose sandstone.

<u>From</u>	<u>To</u>	<u>Formation</u>
4460	4480	Shale, medium dark gray and red-brown, little yellow-brown shale.
4480	4520	Shale, medium dark gray, little red-brown and yellow-brown shale.
4520	4530	Shale, red-brown, calcareous, little gray shale and anhydrite.
4530	4540	Shale, medium dark gray, some red-brown calcareous shale, little dolomite.
4540	4550	Dolomite, light olive gray fine grained, some medium gray shale.
4550	4560	Limestone, light gray to light olive gray, fine grained, little gray shale.
4560	4580	Limestone, light gray to light olive-gray, fine grained, some red-brown and gray shale.
4580	4590	Limestone, as above, few ostracods, large amount of red-brown and gray shale.
4590	4620	Shale, medium dark gray, some red-brown shale, little limestone as above.
4620	4660	Limestone, very light gray to light olive-gray, fine-medium grained, little red-brown and gray shale.
4660	4670	Limestone, very light gray to light olive-gray, subcrystalline to fine grained, little red-brown and gray shale.
4670	4680	Shale, medium gray, some limestone as above, little red-brown shale.
4680	4700	Limestone, very light gray to light olive-gray, fine to medium grained, little gray shale.
4700	4720	Dolomite, light gray fine grained, some medium gray shale, little limestone as above, little anhydrite.
4720	4730	Shale, medium dark gray, some dolomite as above.
4730	4740	Shale, medium dark gray, some limestone light gray subcrystalline, little light gray dolomite subcrystalline.
4740	4760	Limestone, light gray to olive gray fine to coarse grained, ostracods, little gray shale, little anhydrite.
4760	4770	Limestone, as above, some anhydrite, little gray shale.
4770	4790	Dolomite, light gray fine grained, little gray shale, little anhydrite.
4790	4800	Dolomite, as above, large amount of gray shale.
4800	4810	Dolomite, as above, little gray shale, little anhydrite, little limestone.
4810	4820	Limestone, very light gray to yellow gray fine to medium gray, little gray shale.
4820		Circulation 15 minutes. Limestone, very light gray to yellow-gray fine to medium gray, small amount of gray shale.
4820		Circulation 30 minutes. Limestone, as above, little gray shale.
4820		Circulation 45 minutes. Limestone, as above, little gray shale.
4820	4830	Limestone, very light gray to yellow-gray fine to medium grained, small amount of gray shale.
4830	4840	Limestone, as above, large amount of gray shale.

<u>From</u>	<u>To</u>	<u>Formation</u>
4840	4860	Shale, medium gray, some light gray dolomite, little limestone as above.
4860	4880	Shale, red-brown and gray, some dolomite and limestone.
4880	4890	Dolomite, light gray fine grained, some limestone, little gray shale.
4890	4910	Dolomite, light gray fine grained, little gray shale.
4910	4920	Dolomite, light gray fine grained, some limestone, little gray shale.
4920	4940	Limestone, very light gray to yellow-gray, fine to medium gray, little dolomite as above.
4940	4980	Limestone, very light gray to yellow-gray, fine to coarse grained, few oolites.
4980	5030	Limestone, white to yellow-gray, earthy to fine grained.
5030	5048	Shale, medium dark gray, little limestone as above.
Core 5048	5050	Anhydrite, sugary, light olive gray.
Core 5050	5053	Dolomite, medium light gray, dense, subcrystalline to fine grained.
Core 5053	5056	Anhydrite, medium light gray, fine grained.
Core 5059	5068	Anhydrite, medium dark gray, dolomitic, salty.
Core 5068	5074	Limestone, yellow-gray, medium grained, porous.
Core 5074	5095	Limestone, yellow-gray, medium to coarse grained, oolitic, porous.
Core 5095	5098	Limestone, yellow-gray, coarse grained, oolitic.
Core 5098	5101	Limestone, yellow-gray, fine to medium grained.
5110	5180	Limestone, yellow-gray, fine to medium grained, few oolites.
5180	5200	Limestone, yellow-gray, fine grained, little white earthy limestone.
5200	5240	Limestone, as above, little gray shale.
5240	5270	Limestone, yellow-gray, earthy to fine grain, few oolites.
5270	5280	Limestone, yellow-gray, fine to medium grain, oolitic.
5280	5300	Limestone, light gray to yellowish gray, fine to medium grain.
5300	5320	Limestone, as above, some gray shale.
5320	5340	Limestone, light gray to yellowish gray, fine to medium grain, few oolites.
5340	5370	Limestone, medium light gray, fine to medium grain.
5370	5410	Limestone, light gray, fine to medium grain, few oolites.
5410	5420	Limestone, as above, little gray shale.

<u>From</u>	<u>To</u>	<u>Formation</u>
420	5440	Limestone, as above, some gray shale, little red-brown shale.
5440	5460	Limestone, medium light gray, fine to medium grain, large amount of medium gray shale.
5460	5490	Limestone, as above, little gray shale.
5490	5500	Missing.
5500	5530	Limestone, light gray, earthy to medium grain.
5530	5560	Limestone, as above, large amount of gray shale, small amounts of red-brown and yellow-brown shale.
5560	5580	Shale, medium gray, some limestone as above, small amounts of red-brown and yellow-brown shale.
5580	5600	Limestone, medium light gray, earthy to medium grain.
5600	5630	Limestone, light gray, fine to medium grain.
5630	5640	Shale, medium dark gray cave, little limestone as above.
5640	5660	Limestone, medium gray, dense, fine grain, some shale as above.
5660	5690	Limestone, olive-gray to light gray dense, fine grain.
5690	5720	Limestone, as above, some gray shale.
5720	5740	Limestone, medium light gray to light gray, fine grain, little gray shale.
5740	5750	Missing.
5750	5810	Limestone, light gray, fine grain.
5810	5840	Shale, dark gray lignitic little limestone as above.
5840	5860	Dolomite, yellow-gray fine grain little light gray limestone.
5860	5890	Shale, medium gray, some dolomite and limestone as above.
5890	5900	Limestone, light olive-gray, saccharoidal.
5900	5910	Limestone, yellow-gray to light olive-gray, saccharoidal.
5910	5960	Limestone, yellow-gray to light olive-gray, saccharoidal.
5960	5980	Limestone, yellow-gray to light olive-gray, saccharoidal, little gray shale.
5980	6020	Limestone, yellow-gray to light olive-gray, saccharoidal, dolomitic in part.
6020	6030	Limestone, as above, some medium dark gray shale.
6030	6060	Dolomite, yellow-gray to light olive-gray, saccharoidal.
6060	6070	Dolomite, yellow-gray to light olive-gray, saccharoidal, some dense, fine grain limestone.
6070	6110	Limestone, yellow-gray, dense, fine grained.
6110	6170	Limestone, yellow-gray earthy to fine grained.
6170	6230	Limestone, as above, little medium gray shale.
6230	6250	Limestone, yellow-gray, fine grain, little medium gray, pale red and light tan shale.
6250	6270	Limestone, yellow-gray fine grain, little gray shale.
6270	6320	Limestone, yellow-gray to light gray, fine grain.
6320	6350	Limestone, white to yellowish gray, earthy to fine grain.
6350	6360	Limestone, light gray to yellow-gray, dense, fine grain.
6360	6370	Limestone, white to yellowish gray, earthy to fine grain.
6370	6380	Limestone, as above, little gray and greenish gray shale.
6380	6400	Limestone, as above, calcareous brownish gray shale and gray shale.
6400	6420	Shale, medium gray, little yellowish gray earthy to fine grained limestone.

<u>From</u>	<u>To</u>	<u>Formation</u>
6420	6430	Limestone, light gray to yellow-gray earthy to fine grained, little medium gray shale.
6430	6460	Dolomite, yellow-gray, fine grain, little limestone as above.
6460	6470	Limestone, white to yellow-gray earthy to fine grain.
6470	6500	Limestone, grayish orange pink, fine grain, little fibrous gypsum.
6500	6520	Limestone, grayish orange-pink to yellow-gray, fine grain, little fibrous gypsum.
6520	6530	Limestone, grayish orange-pink to yellow-gray, earthy to fine grain, little gray shale.
6530	6540	Dolomite, white crystalline, dense, some limestone as above.
6540	6550	Limestone, light gray to yellowish gray, dolomitic, fine grain.
6550	6600	Dolomite, yellow-gray crystalline, dense.
6600	6610	Limestone, yellow-gray, fine grained.
6610	6670	Dolomite, yellow-gray dense crystalline to fine grained.
6670	6690	Dolomite, yellow-gray dense crystalline to fine grained, some medium light gray shale (Possibly cave).
6690	6710	Dolomite, yellow-gray dense crystalline to fine grained, little light brownish gray crystalline dolomite.
6710	6720	Dolomite, as above, some medium dark gray shale.
6730	6740	Dolomite, yellow-gray crystalline to fine grained, little light gray to yellow-gray limestone.
6750	6760	Limestone, white to yellow-gray earthy to fine grained, some yellow-gray fine grained dolomite.
6760	6770	Dolomite, yellow-gray fine grained.
6770	6800	Dolomite, yellow-gray to light olive-gray fine grained saccharoidal.
6800	6820	Limestone, yellow-gray crystalline to fine grained.
6820	6830	Limestone, as above, little gray and dark gray shale.
6830	6850	Limestone, light gray to medium light gray fine grained, little gray shale.
6850	6870	Limestone, light gray to medium light gray fine grained, little light to medium dark gray shale.
6870	6880	Limestone, as above, some light to medium dark gray shale.
6880	6900	Shale, light to medium dark gray, little limestone as above.
6900		Circulation 30 minutes. Shale, medium dark gray little shale as above.
6900	6910	Shale, medium dark gray, some limestone fine-medium grained.
6910	6930	Dolomite, light olive-gray fine grained, little limestone as above.
6930	6940	Limestone, light gray to yellow-gray, fine to coarse grained oolitic in part.
6940	6960	Dolomite, very light gray to yellow-gray fine grained, some limestone as above.
6960	6980	Limestone, yellow-gray to light olive-gray dense, fine grained.
6980	7020	Dolomite, yellow-gray to light olive-gray fine grained.
7020	7030	Dolomite yellow-gray, fine grained.
7030	7050	Dolomite, yellow-gray fine grained, some yellow-gray earthy to fine grained limestone.

<u>From</u>	<u>To</u>	<u>Formation</u>
7070	7080	Limestone, yellow-gray earthy to fine grained, little dolomite as above.
7080	7090	Shale, medium dark gray (cave?), little limestone as above.
7090	7110	Limestone, white to yellow-gray earthy to fine grained.
7110	7120	Limestone, white to yellow-gray, fine grained, few ostracods.
7120	7130	Limestone, white to yellow-gray fine grained.
7130	7160	Limestone, white to yellow-gray earthy to fine grained.
7160	7200	Limestone, white to yellow-gray earthy to fine grained.
7270	7290	Limestone, white to yellow-gray earthy to fine grained, medium dark gray shale (cave?).
7290	7320	Limestone, very light gray to yellow-gray, fine grained.
7320	7370	Missing.
7370	7410	Limestone, white to yellow-gray earthy to fine grained.
7410	7430	Limestone, white to yellow-gray earthy to fine grained, some medium dark gray shale (cave?).
7430	7470	Limestone, white to yellow-gray earthy to fine grained.
7470	7480	Limestone, white to yellow-gray fine grained.
7480	7520	Limestone, white to yellow-gray earthy to fine grained.
7520	7540	Limestone, white to yellow-gray earthy to fine grained, large amount of medium dark gray shale (cave?).
7540	7580	Limestone, white to yellow-gray earthy to fine grained.
7580	7590	Limestone, white to yellow-gray earthy to fine grained, little medium gray shale.
7590	7610	Shale, medium gray, some limestone as above.
7610	7630	Shale, dark greenish gray splintery with little olive-gray splintery shale.
7630	7650	Shale, olive-gray splintery with little dark greenish gray shale.
7650	7670	Limestone, white to yellowish gray earthy to fine grained.
7670	7740	Shale, dark greenish gray splintery with some olive-gray splintery shale.
7740	7750	Shale, as above, some fine to medium grained sandstone well rounded, frosted.
7763		Circulation 15 minutes. Shale and sand as above.
7763		Circulation 30 minutes. Shale and sand as above.
7763		Circulation 45 minutes. Shale and sand as above.
7763		Circulation 60 minutes. Shale and large amount of sand as above.
7760	7770	Shale, dark greenish gray splintery with some olive-gray splintery shale, some fine to medium grained sandstone well rounded, frosted.
7770	7790	Shale, as above, with large amount of sand as above.
7790	7800	Missing.
7800	7820	Shale, dark greenish gray and olive-gray splintery, little sandstone, fine to medium grained, little yellow-gray fine grained limestone.
7820	7850	Shale, dark greenish gray and olive-gray splintery, some yellow-gray fine grained limestone.
7850	7880	Shale, as above, little limestone as before.
7880	7900	Shale, as above, little fine grained sandstone slightly glauconitic.

<u>From</u>	<u>To</u>	<u>Formation</u>
7910		Circulation 1/2 hour. Shale, dark greenish gray, little glauconitic sandstone.
7910		Circulation 1 hour. Shale, dark greenish gray splintery.
7910		Circulation 1 1/2 hours. Shale, dark greenish gray splintery, with some olive-gray splintery shale.
7930	7970	Shale, as above.
7970	7980	Shale, dark greenish gray splintery, with some olive-gray splintery shale, little light olive-gray, fine grained sandstone.
7980	8000	Shale, as above, large amount of light olive-gray, fine grained sandstone.
8000	8010	Shale as above, little sandstone as before and a little yellow-gray, fine grained limestone.
8010	8030	Shale, dark greenish gray shale, some very fine to fine grained, yellow-gray to light olive-gray sandstone, little limestone, yellow-gray fine, grained.
8030	8050	Limestone, yellow-gray, fine grained slightly glauconitic, fine grained sandstone.
8050	8060	Limestone, as above, large amount of slightly glauconitic fine grained sandstone.
8060	8080	Sandstone, slightly glauconitic, fine grained, light olive-gray, little limestone as above, some dark greenish gray shale.
8080	8100	Shale, dark greenish gray splintery, little sand and limestone as before.
8115		Total depth.