

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 16

Summary of the Henry O. Bakken No. 1

Williams County, North Dakota

By Sidney B. Anderson

July, 1953

Amerada Petroleum Corporation - Harry O . Bakken #1 well, Williams County, North Dakota, SW 1/4, NW 1/4, Section 12, T. 157N., R. 95W., (1985 feet S. of N. Line, 659 feet E. of W. line, Section 12.) G.L. 2439 K.B. 2458.

The Amerada Henry O. Bakken was spudded July 13, 1951, and 13 3/8 inch casing was run at 412 feet with 325 sacks; 9 5/8 inch casing was run at 6238 with 1500 sacks. The well was completed April 19, 1952. Set 5 1/2 inch casing at 13,066 feet with 2000 sacks.

TESTS

- DST #1 7395 - 7415. Open 1 hour, shut in 15 minutes. Recovered 30 feet drilling mud, FP - 0#, BHP - 0#, HP - 300#.
- DST #2 7994 - 8049. Open 1 hour, shut in 15 minutes. Recovered 45 feet drilling mud, FP - 0#, BHP - 0#, HP - 4600#.
- DST #3 8186 - 8264. Open 3 hours, recovered 510 feet black oily sulphur mud with show of gas, FP - 120#, BHP - 320#, HP - 4975#.
- DST #4 8258 - 8307. Open 1 hour, shut in 15 minutes. Recovered 37 feet gas cut mud, FP - 0#, BHP - 0#, HP - 4815#.
- DST #5 8304 - 8360. Open 1 hour, Oil to surface in 40 minutes, flowed to pits for 20 minutes, no gauge, 40.4 gravity, IFP - 800#, FFP - 1000#, BHP - 3700#, HP - 4900#.
- DST #6 8361 - 8394. Open 1 hour, shut in 15 minutes, recovered 1700 feet sulphur water, FFP - 100#, No BHP, HP - 4900#.
- DST #7 8486 - 8544. Open 2 hours, shut in 15 minutes, recovered 40 feet of gas cut mud and 1320 feet of sulphur water, IFP - 200#, FFP - 975#, BHP - 3300#, HP - 4925#.
- DST #8 9908 - 10,030. Open 4 hours, shut in 15 minutes, fair blow for 1/2 hours, weak blow for 3 1/2 hours, recovered 200 feet water cushion, 690 feet gas cut salt water, IFP - 880#, FFP - 1255#, BHP - 3975#, HP - 5370#.
- DST #9 10,170 - 10,223. Open 4 hours, shut in 15 minutes, fair blow, recovered 2000 feet water cushion, 4570 feet salt water, IFP - 1210#, FFP - 3320#, BHP - 4305#, HP - 5640#.

- DST #10 10,310 - 10,410. Open 3 hours, shut in 15 minutes, fair to good blow, recovered 2000 feet water cushion, 7140 feet salt water, IFP - 2945#, FFP - 4710#, BHP - 4710#, HP - 5640#.
- DST #11 11,561 - 11,655. Open 2 1/4 hours, shut in 15 minutes, good blow for 1 hour, fair blow for 30 minutes and died. Recovered 3500 feet salt water, 3200 feet water cushion, IFP - 1600#, FFP - 2800#, BHP - 4050#, HP - 6650#.
- DST #12 12,390 - 12,550. Open 4 hours, shut in 15 minutes, fair blow, recovered 4350 feet of water cushion, 450 feet of gas above cushion, 430 feet gas cut mud, 1100 feet of oil and gas cut mud, IFP - 2090#, FFP-2395#, BHP - 4380#, HP - 6910#.
- DST #13 12,966 - 13,034. Open 3 1/2 hours, shut in 20 minutes, good to fair blow, recovered 5000 feet water cushion, 5420 feet of slightly oil and gas cut salt water and 180 feet of salt crystals, IFP - 5690#, BHP - 6380#, HP - 7770#.
- DST #14 13,567 - 13,629. Open 2 hours, shut in 15 minutes, weak blow for 15 minutes and died; recovered 5600 feet water cushion and 45 feet drilling mud, IFP - 2000#, FFP - 2000#, BHP - 2500#, HP - 7800#.
- DST #15 13,629 - 13,709. Packer failed.
- DST #16 13,550 - 13,709. Open 3 hours, shut in 15 minutes, weak blow for 2 hours and died. Recovered 5500 feet water cushion, 270 feet foamy mud, IFP - 2580#, FFP - 2630#, BHP - 2955#, HP - 7540#.

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

FORMATION TOPS

Cretaceous System	
Fox Hills Formation	1635
Pierre Formation	1960
Niobrara Formation	3390
Greenhorn Member	4090
"Muddy Sand"	4543
Dakota	4817
Jurassic System	
Morrison Formation	5230
Sundance Formation	5420
Piper Formation (Sawtooth)	5960
Triassic System	
Spearfish Formation	6242
Mississippian System	
Amsden Formation	6750
Big Snowy Group	
Heath Formation	6910
Kibbey Formation	7340
Kibbey Lime	7370

Madison Group	
Charles Formation	7500
Base of Last Salt	8117
Englewood Formation	9615
Devonian System	
Lyleton Formation	9790
Upper Devonian Limestone	9910
Manitoban Formation	10,700
Winnipegogan Formation	10,895
"Devonian Salt"	10,965
Ashern Formation	11,539
Silurian System	
Stonewall Formation	11,564
Ordovician System	
Stony Mountain Shale Member	12,755
Red River Formation	12,825
Winnipeg Formation	13,410
Winnipeg Sand	13,559
Total Depth	13,709

HENRY O. BAKKEN NO. 1

<u>From</u>	<u>To</u>	<u>Formation</u>
420	450	Shale, light brown gray with very fine sand grains, soft and lumpy.
450	480	Shale and sandstone, as above.
480	540	Shale and sandstone as above, with little coal.
540	570	Sandstone, yellow gray 5Y8/1, soft shale, calcareous cement, fine grained.
570	600	Shale and sandstone as above and medium light gray N6 shale, calcareous.
600	630	Shale as above, silty, calcareous.
630	690	Shale as above, calcareous, some coal.
690	780	Shale, as above, calcareous.
780	810	Shale, very pale yellow brown to very pale orange calcareous.
810	840	Missing.
840	870	Shale, very pale yellow brown and yellow gray calcareous.
870	900	Lignite, black, and little shale as above.
900	1030	Lignite and siltstone, lignite and yellow gray calcareous, clayey siltstone.
1030	1060	Lignite, and yellow gray calcareous, clayey siltstone.
1060	1090	Siltstone same as above and a little lignite.
1090	1120	Lignite and siltstone as above, and much lignite.
1120	1140	Siltstone as above, and a little lignite.
1140	1170	Siltstone as above, a little brown black carbonaceous material.
1170	1200	Siltstone as above.
1200	1230	Siltstone as above, bentonitic.
1230	1260	Siltstone as above, some fine grained sandstone.
1260	1290	Siltstone and lignite as above, some fine grained sandstone; bentonitic slightly calcareous.

<u>From</u>	<u>To</u>	<u>Formation</u>
1290	1320	Siltstone as above, bentonitic.
1320	1350	Siltstone as above.
1350	1380	Siltstone as above, much very fine grained sandstone, bentonitic.
1380	1410	Siltstone as above, much very fine grained sandstone, bentonitic.
1410	1470	Siltstone and lignite as above.
1470	1530	Siltstone as above, bentonitic.
1530	1560	Siltstone as above, little lignite in siltstone.
1580	1590	Siltstone as above, some calcareous.
1590	1620	Sandstone, yellow gray calcareous cement, siltstone as above, and some lignite.
1620	1680	Siltstone and lignite as above.
Fox Hills Formation 1635		
1680	1710	Siltstone as above, rounded quartz grain.
1710	1740	Siltstone, light gray N7.
1740	1770	Mostly sandstone, fine grained, yellow gray to light gray, some siltstone.
1770	1800	Siltstone and sandstone same as above.
1800	1860	Sandstone, light olive gray, fine grained.
1860	1890	Sandstone, light olive gray, fine grained; some lignite shell fragments.
1890	1920	Siltstone, light olive gray; very little sand.
Pierre Formation 1960		
1920	1980	Siltstone, light olive gray.
1980	2010	Siltstone, light olive gray and medium gray.
2010	2070	Siltstone, light olive gray.
2070	2130	Siltstone, light olive gray, bentonitic.
2130	2160	Siltstone, light olive gray, some medium light gray shale.
2160	2200	Siltstone and shale same as above.
2200	2220	Missing.
2220	2310	Shale, medium light gray N6.
2310	2370	Shale, medium light gray N6; some light olive gray siltstone.
2370	2400	Shale and siltstone same as above.
2400	2430	Shale and siltstone same as above.
2430	2460	Siltstone, light olive gray, few sand grains, shell fragments.
2460	2490	Siltstone, light olive gray.
2490	2520	Shale, green gray 5GY6/1.
2520	2550	Shale, green gray and medium light gray N6.
2550	2580	Shale, green gray and medium light gray, shell fragments.
2580	2610	Shale same as above, shell fragments.
2610	2670	Shale as above, medium light gray.
2670	2970	Shale, green gray 5GY6/1.
2970	3000	Shale same as above, very pale yellow brown siltstone.
3000	3030	Shale as above, and some fine grained sandstone.
3030	3060	Shale same as above.

<u>From</u>	<u>To</u>	<u>Formation</u>
3060	3090	Shale as above, medium light gray N6.
3090	3150	Shale as above, green gray.
3150	3180	Shale, green gray 5GY6/1, and dark gray N3; Little gray limestone.
3180	3210	Shale, green gray 5GY6/1, and dark gray N3.
3210	3240	Shale, green gray.
3240	3270	Shale as above; piece of lignite.
3270	3300	Shale as above; iron concretion.
3300	3330	Shale same as above; some white to light gray limestone, dense.
3330	3360	Shale and limestone same as above.
3360	3390	Shale some as above.
Niobrara Formation 3390		
3390	3400	Shale green gray as above.
3400	3450	Shale same as above.
3450	3480	Shale as above and pieces of medium dark gray, dense limestone.
3480	3570	Shale same as above.
3570	3600	Shale same as above, and little brown shale.
3600	3630	Shale same as above, and little brown limestone.
3630	3660	Shale green gray and light gray.
3660	3690	Shale same as above; light gray siltstone.
3690	3750	Shale, green gray.
3750	3780	Shale same as above, an little brown shale.
3780	3810	Shale, medium dark gray and dark gray N3; white specks and little sandstone and glauconite, calcareous.
3810	3870	Shale same as above.
3870	3900	Shale, dark gray N3 and medium dark gray N4, some white specks; pieces of medium dark gray limestone.
3900	3930	Shale dark gray N3 and medium dark gray N4, calcareous, white specks. Inoceramus Prisms.
3930	3960	Shale same as above.
3960	3990	Shale dark gray N3 and medium light gray; some white specks.
3990	4020	Shale, mostly medium light gray and some dark gray.
4020	4050	Shale, mostly medium light gray and some dark gray, few white specks in dark gray.
4050	4080	Shale same as above.
4080	4110	Shale same as above, few white specks in dark gray.
Greenhorn Member 4090		
4110	4140	Shale same as above
4140	4200	Shale same as above; little very fine grained sandstone or siltstone with glauconite.
4200	4230	Missing.
4230	4260	Shale same as above, dark gray, calcareous, and few white specks.
4260	4290	Shale, medium dark gray N6 with white specks.
4290	4320	Shale same as above, white specks.
4320	4350	Shale, medium dark gray N4, white specs, and yellow gray shale 5Y8/1.

<u>From</u>	<u>To</u>	<u>Formation</u>
4350	4410	Shale, medium dark gray N4, white specks.
4410	4440	Shale, medium dark gray; one piece of limestone, brown gray 5YR4/1. Inoceramus Prisms.
4440	4470	Shale same as above.
4470	4500	Shale as above, few white specks.
4500	4520	Shale same as above.
4520	4530	Shale and sandstone, shale as above, few quartz grains.
4530	4550	Shale same as above.
" Muddy Sand" 4543		
4550	4560	Shale as above, little light gray N7 sandstone, very fine grained with glauconite.
4560	4590	Shale same as above
4590	4600	Shale as above; pieces of brown gray limestone and sandstone.
4600	4620	Shale, medium dark gray.
4620	4630	Shale, medium dark gray, few quartz grains.
4630	4650	Shale, medium dark gray.
4650	4670	Shale, medium dark gray, little light gray N7 sandstone, very fine grained, glauconite.
4670	4690	Shale, medium dark gray, little light gray N7 sandstone very fine grained.
4690	4700	Shale, medium dark gray, little light gray N7; pieces of dark gray limestone and sandstone.
4700	4710	Shale as above, little light gray sandstone, and little pale yellow brown sandstone.
4710	4760	Shale as above, little light gray sandstone with glauconite.
4760	4770	Shale as above, little reddish sandstone with glauconite.
4770	4810	Shale as above, little gray, very fine grained sandstone with glauconite.
4810	4830	Shale same as above.
Dakota 4817		
4830	4840	Shale as above and little light gray, very fine grained sandstone with glauconite.
4840	4860	Shale and sandstone, shale as above, much very fine grained sandstone, light gray to yellow gray 5Y8/1.
4860	4870	Shale and sandstone, pale yellow brown 10YR6/2, and light gray very fine grained sandstone, and some pale yellow brown shale.
4870	4880	Shale, medium dark gray and some light gray sandstone as above.
4880	4900	Shale, medium dark gray and some light gray sandstone and brown sandstone, very fine grained, quite dense.
4900	4950	Shale same as above, little sandstone.
4950	4960	Shale as above, very little sandstone, piece of gray dense limestone.
4960	4990	Shale as above, little sandstone as above. Inoceramus Prisms. No Inoceramus Prisms from 80-90.

<u>From</u>	<u>To</u>	<u>Formation</u>
4990	5000	Shale same as above, little sandstone as above, and few medium grained quartz grains.
5000	5010	Shale same as above, little sandstone as above, and some medium quartz grains.
5010	5020	Shale same as above, some light olive gray shale or aguagel.
5020	5030	Shale same as above, some sandstone as above, fine to medium.
5030	5040	Shale same as above, little red sandstone, fine grained.
5040	5050	Shale same as above, yellow gray and medium gray sandstone, fine grained. Large pieces cave?
5050	5060	Shale as above, red brown and medium gray sandstone, fine grained.
5060	5070	Shale as above, yellow gray and medium gray sandstone, fine grained.
5070	5080	Shale as above, little light gray sandstone with some glauconite.
5080	5090	Shale as above, little light gray sandstone, and light olive gray, some siltstone.
5090	5100	Shale as above, little sandstone as above, some reddish brown sandstone; shell fragments.
5100	5110	Shale as above and green gray 5GY6/1, little sandstone as above 5YR4/1 brown gray; pieces of limestone.
5110	5120	Shale as above, little sandstone as above, medium dark gray and light gray.
5120	5130	Shale as above, little sandstone as above.
5130	5140	Shale and sandstone same as above, some medium to coarse free quartz grains.
5140	5150	Shale same as above and some medium to coarse free quartz grains; little fine grained gray sandstone.
5150	5160	Shale same as above and some medium to coarse free quartz grains.
5160	5180	Shale same as above, and much medium to coarse free quartz grains.
5180	5190	Shale same as above, and much medium to coarse free quartz grains, little fine grained sandstone.
5190	5220	Shale and sandstone same as above.
Break		
5220	5230	Shale, dark gray N3, very little sand.
Morrison Formation 5230		
5230	5270	Shale, dark gray N3.
5270	5280	Shale, dark gray N3, Inoceramus Prisms.
5280	5320	Shale, dark gray N3.
5320	5330	Shale same as above, one piece of light gray fine grained sandstone, glauconite. Cave?
5330	5540	Shale same as above, few pieces of light gray fine grained sandstone, glauconite.
5340	5350	Missing.
5350	5370	Shale, same as above.

<u>From</u>	<u>To</u>	<u>Formation</u>
5370	5380	Shale, dark gray N3.
5390	5400	Shale, dark gray N3, little salt and pepper sandstone, fine grained.
5400	5410	Shale, dark gray N3.
5410	5430	Shale, dark gray N3, little light gray sandstone, fine grained, little glauconite.
Sundance 5420		
5430	5440	Shale, dark gray to medium light gray N6; more salt and pepper sandstone, fine grained, glauconitic.
5440	5470	Same as above with some salt and pepper sandstone.
5470	5480	Same as above, 50% sandstone, yellow gray to light gray, fine grained, glauconitic.
5480	5500	Same as above, much sandstone as above.
5500	5510	Same as above.
5510	5570	Shale, dark gray and much light gray, some glauconitic sandstone.
5570	5580	Same as above, mostly dark gray shale.
5580	5600	Same as above.
5600	5620	Same as above, mostly shale.
5620	5630	Same as above, mostly shale, sandstone glauconitic.
5630	5640	Same as above, mostly medium light gray shale, sandstone glauconitic.
5640	5680	As above, little sandstone, fine grained.
5680	5690	Shale, medium light gray, little sandstone, fine grained.
5690	5710	Shale, medium light gray, little sandstone, fine grained.
5710	5730	Same as above, glauconitic.
5730	5790	Shale, medium light gray, little sandstone, fine grained.
5790	5800	Shale, medium light gray; few pieces of reddish shale.
5800	5820	Shale, medium light gray and green gray 5GY6/1 and few pieces of reddish shale. Little very light gray dense limestone.
5820	5840	Shale as above.
5840	5850	Shale, medium light gray and green gray; little fine grained sandstone.
5850	5860	Shale, medium light gray and green gray, little light olive gray dense limestone.
5860	5870	Shale, medium light gray, some yellow gray oolitic limestone.
5870	5880	Shale, medium light gray, few pieces reddish shale; some yellow gray limestone, little sandstone, calc. cement.
5880	5890	Green gray shale, little fine grained sandstone.
5890	5900	Green gray shale, few pieces red shale, little sandstone as above.
5900	5910	Same as above, slightly glauconitic.
5910	5920	Same as above.
5920	5930	As above with medium dark gray shale.

<u>From</u>	<u>To</u>	<u>Formation</u>
5930	5940	Shale, medium dark gray, little light gray; little fine grained sandstone.
5940	5950	Shale, green gray and little reddish; little fine grain sandstone, some glauconitic.
Piper Formation 5960		
5950	5960	Shale, green gray and medium dark gray, little reddish.
5960	5970	Shale, green gray and medium dark gray.
5970	5990	Shale, green gray, some reddish and some medium dark gray; some light gray dense limestone.
5990	6000	Same as above, limestone, yellow gray dense.
6000	6010	Green gray shale, much limestone as above.
6010	6030	Limestone as above, some variegated shale.
6030	6040	As above, dense, little green gray shale.
6040	6080	As above, dense and variegated shale.
6080	6100	Mostly variegated shale, little limestone.
6100	6110	Mostly variegated shale, some green gray silty shale, little limestone.
6110	6140	Mostly variegated shale, some fine grained sandstone, green gray; little limestone.
6140	6150	Variegated shale.
6150	6160	Variegated shale, little fine grained green gray sandstone.
6160	6190	Variegated shale.
6190	6200	Variegated shale, green gray and gray red 10R4/2 shale, gray shale.
6200	6210	Variegated shale, green gray and gray red, little moderate red brown shale.
6210	6230	Variegated shale, moderate red brown, very fine grained sandstone or siltstone.
6230	6240	Limestone, very pale orange, pinpoint porosity, much red brown fine grained sandstone.
6240	6250	As above, sandy, some pinpoint porosity.
6250	6260	Sandstone, moderate red brown 10R4/6, fine grained, some gray shale.
6260	6300	Missing.
6300	6320	Sandstone, moderate red brown 10R4/6, fine grained.
6320	6330	Sandstone as above, little limestone as above.
6330	6360	Limestone, yellow gray 5Y8/1, some pinpoint porosity.
6360	6370	Limestone as above, sandy, sandstone as above, red brown 10R4/6.
6370	6410	Sandstone as above, fine grained, some gray shale.
6410	6420	As above, some medium grained free quartz.
6420	6440	Sandstone as above, 50% limestone as above, little pinpoint porosity.
6440	6460	Sandstone as above, little limestone.
6460	6480	As above, little gray shale.
6480	6490	Sandstone as above, little limestone.
6490	6500	Sandstone as above, some medium grained free quartz; little limestone.

<u>From</u>	<u>To</u>	<u>Formation</u>
6500	6520	Sandstone as above, some medium grained free quartz.
6520	6530	As above, some free quartz, little pale red sandstone, 10R6/2, slightly calcareous.
6530	6540	As above, some free quartz, medium to coarse, fair porosity, little pale red sandstone.
6540	6560	As above, some free medium to coarse quartz, little dark gray shale.
6560	6570	Same as above, some siltstone, same color.
6570	6580	As above, some siltstone, same color, little free quartz, medium to coarse.
6580	6590	Sandstone and siltstone as above.
6590	6620	Same as above. Color as above.
6620	6630	Siltstone, color as above, some white specks, little yellow gray limestone, dense.
6630	6640	Siltstone, color as above, some white specks.
6640	6650	Siltstone, color as above.
6650	6660	Missing.
6660	6670	Siltstone, color as above, little medium grained free quartz.
6670	6680	Siltstone as above, few medium grained free quartz.
6680	6690	As above with some medium grained free quartz.
6690	6750	Siltstone, color as above.
Amsden 6750		
6750	6760	Siltstone as above, pale red brown dolomite, 10R5/4, gray red 10R4/2.
6760	6770	Siltstone as above, pale red and gray dolomite, dense.
6770	6780	Siltstone as above shale, dark red brown 10R3/4.
6780	6790	Siltstone as above, dolomite, varicolored, dense to saccharoidal, vuggy.
6790	6810	Siltstone and shale as above, dolomite, varicolored, white limestone.
6810	6820	Mostly shale and siltstone as above, little sand.
6820	6850	Variegated shale, splintery, greasy, mostly reddish shades.
6850	6870	Shale as above, few rounded medium quartz grains.
6870	6880	Variegated shale as above, little white fine grained sandstone.
6880	6890	Variegated shale as above.
6890	6900	Variegated shale, mostly gray red as above and pale red brown.
Heath Formation 6910		
6900	6910	Same as above, some gray red; contains rounded quartz.
6910	7000	Shale, as above.
7000	7300	Missing.
7300	7310	Shale, much medium dark gray to dark gray, red shale.
7310	7320	Shale, as above, few rounded quartz grains.
7320	7330	Shale as above, mostly gray.
7330	7340	Shale as above, mostly gray, few free quartz grains.

<u>From</u>	<u>To</u>	<u>Formation</u>
Kibbey 7340		
7340	7350	Sandstone, pale red 10R6/2, calcareous, fine grained.
7350	7360	Shale, reddish gray and little green, sandstone as above.
7360	7370	As above, medium grained, free quartz sand.
7370	7380	As above, mostly gray shale.
7380	7390	Floury gypsum, alabaster, anhydrite, some red and gray shale.
7390	7400	As above with brown gray, dense, lithographic limestone.
7400	7420	Missing.
7420	7430	Shale, mostly gray, dark gray N3, some red; limestone as above.
7430	7450	Shale and limestone as above, fine to medium calcareous sandstone.
7450	7460	Shale, gray, gray green, light brown, and reddish as above.
7460	7470	As above, little gray orange 10YR7/4 limestone, granular.
7470	7480	As above, granular, gray orange, some porosity.
7480	7490	Limestone, gray orange as above, granular, good porosity.
Charles Formation 7500		
7490	7500	As above, anhydrite, salt efflorescence, calcareous.
7500	7520	Anhydrite, salt as above.
7520	7530	Shale, mostly gray, some anhydrite as above.
7530	7560	Same as above.
7560	7570	Same as above, some salt.
7570	7620	Same as above.
7620	7630	Salt crystals.
7630	7670	Salt crystals, little reddish shale.
7670	7680	Gray shale and yellow gray anhydrite.
7680	7690	Yellow gray anhydrite.
7690	7700	Missing.
7700	7710	Anhydrite, reddish stain from shale.
7710	7720	Same as above, white anhydrite.
7720	7730	Shale, some gray, red and green, white anhydrite.
7730	7740	Same as above, more salt.
7740	7760	Salt crystals.
7760	7770	Missing.
7770	7780	White anhydrite and variegated shale.
7780	7800	White anhydrite and variegated shale, some oolitic limestone, light gray.
7800	7830	Salt crystals.
7830	7840	Salt crystals, little dark gray N3 shale.
7840	7850	Salt crystals, little light olive gray limestone, some pinpoint porosity, little red and gray shale, gray dolomite.
7850	7870	Limestone, light olive gray, good pinpoint porosity.
7870	7880	Limestone, light olive gray, fair pinpoint porosity.
7880	7890	White anhydrite, limestone as above, fair porosity.

<u>From</u>	<u>To</u>	<u>Formation</u>
7890	7900	Same as above.
7900	7910	Some white anhydrite, brown gray shale and gray shale, salt efflorescence.
7910	7920	White anhydrite, pale red shale 5R6/2.
7920	7930	White anhydrite, some white dolomite.
7930	7940	White anhydrite, some light olive gray limestone, fair porosity.
7940	7950	Same as above, quite dense.
7950	7960	Limestone and anhydrite as above, light gray dolomite, quite dense.
7960	7970	As above, quite dense, very little limestone.
7970	7980	Mostly variegated shale.
7980	7990	Brown gray limestone, 5YR4/1. Some medium gray shale N5.
7990	8000	Limestone as above, quite dense, white anhydrite.
8000	8010	Brown gray limestone, light brown gray limestone; little white anhydrite, light brown gray limestone, good porosity.
8010	8020	Brown gray limestone, some porosity.
Core #1		
8024	8028	Brown gray limestone, quite dense, some porosity.
8028	8036	Dolomite, light gray N7.
8036	8047	Dolomite, medium dark gray N4, dense.
8047	8049	White crystalline anhydrite, dense.
End Core #1		
8050	8060	White crystalline anhydrite and brown gray limestone, dense.
8060	8070	Brown gray dense limestone, medium gray dense dolomite, little white anhydrite.
Mission Canyon 8080		
8070	8080	Brown gray dense limestone, light gray N7, some porosity, some slightly saccharoidal.
8080	8090	Salt crystals.
8090	8100	Salt crystals.
8100	8110	Salt crystals, few pieces of anhydrite.
8110	8120	Salt crystals, little light gray limestone.
8120	8130	Little salt as above, dolomite, medium gray N5, dense some white anhydrite.
8130	8140	Dolomite, as above.
8140	8150	Dolomite as above, white anhydrite.
8150	8160	Dolomite as above, white anhydrite, brown gray limestone, dense.
8160	8170	Same as above.
8170	8180	Dolomite, medium light gray N6, dense.
8180	8196	Limestone, light brown gray, 5YR6/1, dense.
8196	8200	Limestone, light olive gray to light brown gray, dense. White dense anhydrite 8196-8200 1/2.
Core #2		
8200	8202	Limestone, brown gray 5YR4/1, dense and salt.

<u>From</u>	<u>To</u>	<u>Formation</u>
8202	8206	Limestone, medium dark gray, dense.
8206	8208 1/2	Limestone, brown gray 5YR4/1, quite dense, few pinpoint vugs.
8209	8211	Medium light gray dolomite N6 and light gray N7 anhydrite, dense.
8211	8221	Dolomite, medium gray N5, dense.
End Core #2		
8221	8230	Dolomite, medium gray N5 and pale yellow brown, lith.
Core #3		
8230	8240	Limestone, medium dark gray N4, dense crystalline and pale yellow brown, dense.
8240	8250	Limestone, medium gray, dense, crystalline.
8250	8260	Limestone, light brown gray 5YR6/1, dense crystalline.
End Core #3		
Core #4		
8264	8274	Limestone, medium dark gray, dense.
8274	8284	Limestone, brown gray 5YR4/1, dense.
8284	8294	Limestone, light olive gray, dense, coarsely crystalline.
End Core #4		
8294	8307	Missing.
8307	8310	Limestone as above, appears to be quite dense; some slight staining.
8310	8320	Limestone, medium gray N5 to brown gray, quite dense.
8320	8330	Limestone as above, some pinpoint porosity.
8330	8360	Limestone, light olive gray, fair pinpoint porosity.
8370	8380	Limestone, medium gray N5 to light olive gray, fair pinpoint porosity.
Core #5		
	8367 1/2	Limestone, medium gray dense.
8371 1/2	8373 1/2	Limestone, pale yellow brown, quite dense.
8373 1/2	8376 1/2	Limestone, light gray N7, dense, sublithographic.
8377 1/2	8380	Limestone, very light olive gray, dense, fine grained, little pinpoint porosity.
8380	8383	Limestone, light gray N7, dense sublithographic.
8383	8389 1/2	Limestone, light gray, dense to good pinpoint porosity.
8389 1/2	8394	Limestone, light olive gray, dense, fine grained.
End Core #5		
8390	8400	Limestone, light olive gray, dense; fine grained, some pinpoint porosity.
8400	8410	Limestone, light olive gray, fair to good porosity.
8410	8420	Limestone, light olive gray and dark yellow brown 10YR4/2 quite dense, some pinpoint porosity.
8420	8430	Limestone, light olive gray, slightly saccharoidal, little pinpoint porosity.
8430	8440	Limestone, light olive gray, some oolitic, little pinpoint porosity.
8440	8450	Limestone, light gray to brown gray, oolitic, dense.
8450	8490	Limestone, as above, mostly brown gray, oolitic, ostraced? dense.

<u>From</u>	<u>To</u>	<u>Formation</u>
8490	8500	Limestone, medium gray to light olive gray, slightly saccharoidal, little pinpoint porosity.
8500	8510	Limestone, medium light gray, slightly saccharoidal, little pinpoint porosity.
8510	8560	Limestone, medium light gray and light olive gray, slightly saccharoidal, little pinpoint porosity.
8560	8580	Limestone as above, dolomitic.
Lodgepole 8580		
Core #6		
8567	8574	Dolomite, light olive gray, 5Y6/1, dense, fine grained.
8575	8576 1/2	As above, few pinpoint vugs.
8576	8586	Limestone, light olive, dense, coarsely crystalline, tight.
8586	8587	Limestone, as above.
End Core #6		
8587	8607	Missing.
8607	8610	Limestone, light gray N7 to light olive gray, little pinpoint porosity.
8610	8620	Limestone, dark gray with some brown mottling, dense.
8620	8760	Limestone, dark gray with brown mottling and some light gray, dense.
8760	8770	Limestone, as above, little white anhydrite.
8770	8780	Limestone as above, some light olive gray, dense, coarsely crystalline.
8780	8790	Limestone, as above, little white anhydrite.
8790	8800	Limestone as above.
8800	8810	Limestone as above, dense.
8810	8820	Limestone as above, mostly medium gray N5, dense, and little dark gray N3, splintery shale.
8820	8830	Limestone as above, dense.
8830	8840	Limestone as above, mostly medium gray, dense, little dark gray N3 splintery shale.
8840	8850	Limestone as above, medium gray and light olive gray.
8850	8860	Limestone, medium dark gray, dense.
8860	8880	Limestone, medium dark gray and light gray N7, dense.
8880	8890	Limestone, as above, little dark gray shale.
8890	8960	Limestone, medium dark gray, dense.
8960	8970	Limestone as above and very light gray limestone, dense.
8970	8980	Limestone, mostly very light gray, dense.
8980	8990	Limestone, medium gray N5 with brown mottling, some very light gray N7 and little white anhydrite, dense.
8990	9010	Limestone as above, dense.
9010	9020	Limestone as above, fine grained, dense.
9020	9050	Limestone as above, fine grained, dense.
9050	9170	Limestone, medium gray N5, dense, fine grained. 9120 and 9140 - missing.
9170	9270	Limestone, same as above, some very light gray, fine grained, dense.
9270	9280	Limestone as above, lithographic.

<u>From</u>	<u>To</u>	<u>Formation</u>
9280	9290	Limestone, dusky yellow brown 10YR2/2, medium gray and light gray, dense, fine grained.
9290	9340	Limestone as above, (dark limestone, lithographic).
9340	9350	Limestone, medium gray, dense, fine grained.
9350	9360	Limestone as above.
9360	9460	Limestone, medium gray to light gray, fine grained, dense.
9460	9470	Missing.
9470	9480	Limestone, as above.
9480	9500	Limestone as above, lithographic.
9500	9610	Limestone as above.
Englewood 9615		
9610	9620	Missing.
9620	9640	Shale, dark gray N3, carbonaceous.
9640	9650	Shale as above and some medium light gray sandstone.
9650	9660	Shale as above and much sandstone as above.
9660	9670	Shale as above, some yellow gray anhydrite, much medium gray sandstone.
9670	9680	Medium gray sandstone, little pinpoint porosity, some yellow gray anhydrite.
9680	9690	Medium gray sandstone.
9690	9720	Shale, dark gray N3, carbonaceous.
9720	9730	Shale as above, little light olive gray, slightly saccharoidal, dolomite.
9730	9740	Shale as above and much dolomite as above.
9740	9750	Shale and some dolomite as above, medium gray limestone with slight brown tinge, dense.
9750	9760	Dolomite, gray orange pink 5YR7/2, dense.
9760	9770	Dolomite as above and very light gray, dense dolomite.
9770	9780	Dolomite, gray orange pink, dense.
9780	9790	Dolomite as above, and white anhydrite.
9790	9800	Dolomite, gray orange pink, dense.
9800	9810	Dolomite as above, pale red 10R6/2 shale, calcareous.
9810	9820	Dolomite and shale as above, medium light gray shale, calcareous.
9820	9830	Dolomite as above, pale red and medium light gray shale, calcareous, slight green tinge under scope.
9830	9840	Dolomite as above, pale red and green gray 5GY6/1, slightly calcareous.
9840	9850	Shale, pale red and green gray 5GY6/1, slightly calcareous.
9850	9860	Dolomite and shale as above.
9860	9870	Dolomite as above, probably cave, shale as above, green gray 5G6/1.
9870	9880	Missing.
9880	9890	Shale as above, medium light gray limestone, fine grain, dense.
9990	9900	Shale as above, some dark gray N3 and medium gray N5 limestone, dense.

<u>From</u>	<u>To</u>	<u>Formation</u>
Upper Devonian Limestone 9910		
9900	9910	Variegated shale, little dolomite as above and little limestone as above, white anhydrite.
9910	9920	Variegated shale, little limestone as above, dense; white anhydrite.
9920	9930	Limestone, dusky yellow brown 10YR2/2, lithographic, little light gray, dense; little anhydrite.
9930	9950	Limestone as above, little porosity in few fragments.
9950	9960	Limestone as above.
9960	9970	Limestone as above and very light gray N8, little porosity in few fragments.
9970	9980	Limestone as above and little white anhydrite.
9980	9990	Limestone as above, some light brown gray, slightly saccharoidal dolomite.
9990	10,000	Limestone as above, some light brown gray limestone, little pinpoint porosity.
10,000	10,010	Missing.
10,010	10,020	Limestone, dusky yellow brown and very light gray, quite dense, little porosity.
10,020	10,030	Missing.
10,030	10,040	Limestone, as above.
10,040	10,080	Limestone, as above, dense, fine grained.
10,080	10,090	Limestone as above, dense.
10,090	10,100	Limestone as above and white anhydrite.
10,100	10,110	Limestone as above and little white anhydrite.
10,110	10,120	Limestone as above and white anhydrite.
10,120	10,140	Limestone as above and little white anhydrite.
10,140	10,180	Limestone as above.
10,180	10,190	Limestone as above; dolomite, pale yellow brown 10YR6/2, slightly saccharoidal, some porosity.
Core		
10,192	10,198 1/2	Limestone, light olive gray, slightly saccharoidal, quite dense.
10,198 1/2	10,202	Limestone, dusky yellow brown, white anhydrite.
10,202	10,207	Limestone, medium dark yellow brown, little pinpoint porosity.
10,207	10,210	Limestone, dusky yellow brown, dense, very few vugs, stain in one vug.
10,210	10,212	Limestone, dark yellow brown, dense, very few vugs, stain in one vug.
10,212	10,225	Dolomite, light gray N7, porosity, carbonaceous residue.
10,226	10,233	Limestone, dusky yellow brown, dense.
End of Core		
10,230	10,240	Limestone, pale yellow brown to dusky brown, little porosity, and some anhydrite.
10,240	10,270	Limestone, dusky brown to light gray.
10,270	10,280	Limestone as above, dense, some slightly saccharoidal.
Core #9		
10,280	10,285	Limestone, dusky yellow brown, dense.
10,285	10,299	Limestone, pale yellow brown, dense, finely crystalline.

<u>From</u>	<u>To</u>	<u>Formation</u>
10,299	10,312	Dolomite, dusky brown 5YR2/2, lithographic.
10,312	10,321	Limestone, dark yellow brown, dense, fine grained.
10,321	10,323	Dolomite, brown gray 5YR4/1, dense, fine grained.
10,323	10,326	Limestone, dark yellow brown 10YR4/2, dense, fine grained.
10,331	10,332	Dolomite, pale yellow brown, dense, fine grained.
10,332	10,336	Dolomite, dusky yellow brown, dense. Limestone, dusky yellow brown to dusky brown 5YR3/2.
10,338	10,339	Dolomite, pale yellow brown 10YR6/2, dense.
10,339	10,344	Dolomite, dusky brown, dense, fine grained.
10,344	10,362	Limestone, dark yellow brown, dense, fine grained.
End of Core		
10,360	10,370	Limestone, brown gray, slightly saccharoidal, and yellow gray with little pinpoint porosity, some red shale.
10,370	10,380	Limestone as above and dusky yellow brown dense.
10,380	10,390	Limestone as above, some slightly saccharoidal and some red shale.
10,390	10,400	Limestone as above, dense, finely crystalline.
10,400	10,410	Limestone as above, dense, some yellow gray limestone; little white anhydrite.
10,410	10,420	Limestone as above and red and gray shale.
10,420	10,430	Dolomite, dusky yellow brown, dense, some slightly saccharoidal, some white anhydrite, red and black shale.
10,430	10,440	Missing.
10,440	10,450	Limestone, dusky yellow brown, dense; shale as above and some white anhydrite.
10,450	10,460	Dolomite, light brown gray, slightly saccharoidal, shale as above, some yellow gray dolomite.
10,460	10,470	Missing.
10,470	10,480	Limestone, medium dark gray N4, dense; shale as above, little anhydrite.
10,480	10,490	Limestone, medium dark gray and dusky yellow brown 10YR2/2 dense, little shale as above.
10,490	10,500	Missing.
10,500	10,510	Dolomite, medium dark gray, dense, some slightly saccharoidal; dusky yellow brown limestone, dense.
10,510	10,520	Dolomite as above, little shale, red and dark gray N3.
10,520	10,530	Limestone, medium gray, dense; little shale as above and little white anhydrite.
10,530	10,540	Dolomite, medium light gray, dense and medium gray limestone, dense.
10,540	10,550	Same as above with some white anhydrite.
10,550	10,570	Missing.
10,570	10,580	Limestone, gray brown 5YR3/2, dense, very fine grained; light gray dense limestone.
10,580	10,585	Limestone, gray brown 5YR3/2, dense; light gray dolomite, dense slightly saccharoidal.
10,585	10,590	Dolomite, medium light gray, dense, some limestone as above.

<u>From</u>	<u>To</u>	<u>Formation</u>
10,590	10,595	Dolomite as above, little white anhydrite.
10,595	10,610	Dolomite as above.
10,610	10,620	Dolomite as above and medium gray, dense, limestone.
10,620	10,630	Mostly dolomite as above, some limestone as above with little white anhydrite at 30.
10,630	10,635	Limestone, medium gray N5 dense, some yellow brown, dense, limestone.
10,635	10,640	Limestone, medium gray N5, dense.
10,640	10,650	Limestone, medium dark gray N4, dense, some yellow brown, dense limestone.
10,650	10,655	Dolomite, medium light gray, dense. Some yellow brown limestone, dense.
10,655	10,660	As above, little white anhydrite.
10,660	10,665	Little dolomite as above, little white anhydrite, yellow brown and gray limestone, dense.
10,665	10,670	Dolomite, medium gray dense; yellow brown limestone, dense.
10,670	10,685	Light to medium gray limestone, dense.
10,685	10,690	Dolomite, medium gray dense, yellow gray limestone and brown gray and medium gray dense limestone.
10,690	10,695	Limestone, light to medium gray, dense, some light olive gray limestone.
Manitoban 10,700		
10,695	10,710	Limestone as above and white anhydrite.
10,710	10,740	As above, dense.
10,741	10,746	Dolomite, light gray dense and medium gray limestone.
10,740	10,750	Dolomite, yellow gray dense, medium gray limestone.
10,750	10,760	Dolomite, yellow gray 5Y8/1 dense, some medium gray limestone and dolomite.
10,760	10,775	Dolomite, medium gray N5 and yellow gray dense.
10,775	10,780	Dolomite as above, brown gray 5YR4/1, slightly saccharoidal, some pinpoint porosity,
10,780	10,785	Dolomite, brown gray, saccharoidal, fair porosity.
10,785	10,800	Dolomite as above, some white anhydrite.
10,800	10,805	Dolomite as above.
10,805	10,810	Dolomite as above, some medium gray dolomite.
10,810	10,830	Dolomite, brown gray, saccharoidal, fair porosity.
10,830	10,835	Dolomite as above, some porosity.
10,835	10,850	Dolomite as above, little white anhydrite.
10,850	10,855	Dolomite as above, little porosity, slightly saccharoidal, little white anhydrite.
10,855	10,870	Dolomite, brown gray saccharoidal, little porosity.
10,870	10,875	Dolomite as above and light gray limestone.
10,875	10,880	Dolomite as above, little pinpoint porosity.
10,880	10,885	Dolomite as above and light gray limestone.
10,885	10,890	Limestone, light gray dense.
Winnipegosan 10,895		
10,895	10,915	Limestone, light to medium gray and brown gray dolomitic, dense. Same as above; dense at 10 and 15.

<u>From</u>	<u>To</u>	<u>Formation</u>
10,915	10,955	Limestone as above, dense and little gray orange pink shale.
10,955	10,960	Limestone as above, dense, little dolomite, slightly saccharoidal; little coating of salt on cuttings.
Devonian Salt		
10,960	10,965	Limestone as above and little salt; red shale as above.
10,965	10,970	Limestone as above, little salt and red shale.
10,970	10,975	Limestone as above and salt.
10,975	10,980	Limestone as above, mostly salt.
10,980	10,985	Salt.
10,985	10,990	Limestone and salt.
10,990	11,190	Salt.
11,190	11,195	Salt and little medium dolomite.
11,195	11,200	Salt and medium gray dolomite; limestone, dense.
11,200	11,205	Medium light gray N6 to medium dark gray N5 dolomite dense; little salt and little brown gray limestone, dense.
11,205	11,210	Medium light gray to medium dark gray limestone, dense.
11,210	11,215	Limestone as above, little gray orange pink shale.
11,215	11,230	Limestone as above, little shale as above and some white anhydrite.
11,230	11,235	Limestone as above, little gray orange pink shale.
11,235	11,240	Same as above, little white anhydrite.
11,240	11,245	Same as above, some pale yellow brown dense limestone.
11,245	11,265	Limestone, medium light gray to medium gray, a little brown gray; little white anhydrite and shale as above.
11,265	11,270	Dolomite, light gray and pale yellow brown, dense; little white anhydrite and shale as above.
11,270	11,275	As above, little pinpoint porosity; some medium to medium dark gray dolomite.
11,275	11,290	Limestone, color as above, quite dense, dolomite at 90.
11,290	11,300	Dolomite, brown gray, slightly saccharoidal, little porosity.
11,300	11,305	Dolomite, brown gray, slightly saccharoidal.
11,305	11,315	Limestone, brown gray and light brown gray, slightly saccharoidal, little pinpoint porosity, little dolomite.
11,315	11,320	Limestone, medium gray N5 to brown gray, little pinpoint porosity.
11,320	11,325	Limestone as above, little salt.
11,325	11,330	Limestone as above, fine grained.
11,330	11,335	Limestone, dark gray N3 and limestone as above, dense.
11,335	11,350	Limestone as above, fine grained, dense.
11,350	11,355	Limestone, light gray N7 and medium dark gray, dense.
11,355	11,360	Limestone as above, salt coating on cutting.
11,360	11,440	Limestone as above.

<u>From</u>	<u>To</u>	<u>Formation</u>
11,440	11,445	Limestone, light gray N7 to brown gray, finely crystalline, dense.
11,445	11,450	Limestone as above, dense, finely crystalline.
11,450	11,455	Limestone as above, little white anhydrite.
11,455	11,470	Some limestone as above, medium light gray N6 dense, dolomite.
11,470	11,475	Light gray N7 dense dolomite, brown gray dense limestone.
11,475	11,485	Limestone, light gray N7 to medium dark gray N4, dense.
Core #10		
11,482	11,505	Dolomite, medium gray N5 dense fine grained.
Core #11 Ashern 11,539		
11,505	11,539	Limestone, brown gray, dense, fine grained.
11,539	11,548	Dolomite, gray orange pink, dense, fine grained.
Core #12 Stonewall 11,564		
11,548	11,564	Dolomite, pale yellow brown and medium dark gray, dense sublithographic laminated.
End of Core		
11,564	11,588	Dolomite, white, fair to good porosity, white to light gray, dense, saccharoidal, some white anhydrite.
11,588	11,590	Dolomite, light gray dense and little white anhydrite.
Core #13		
11,603	11,619 1/2	Dolomite, white, dense, few pinpoint vugs, sublithographic.
11,619 1/2	11,620	Dolomite, gray orange pink, sublithographic.
End of Core		
Core #14		
11,622	11,665	Dolomite, very light gray, few pinpoint vugs sublithographic
End of Core		
11,665	11,675	Dolomite as above.
11,675	11,685	Dolomite as above and some pale yellow brown dolomite, dense, few vugs.
11,685	11,690	Dolomite as above, good porosity in pale yellow brown dolomite.
11,690	11,695	Dolomite as above, some pinpoint porosity.
11,695	11,700	Missing.
11,700	11,705	Dolomite as above, some pinpoint porosity.
11,705	11,710	Dolomite, yellow gray to light gray, same as above, some pinpoint porosity.
11,710	11,715	Dolomite as above, very pale yellow brown, some pinpoint porosity, sublithographic.
11,715	11,725	Dolomite as above, some porosity.
11,725	11,730	Dolomite as, above, little pinpoint porosity.
11,730	11,755	Dolomite as above sublithographic.

<u>From</u>	<u>To</u>	<u>Formation</u>
11,755	11,765	Same as above with little pinpoint porosity.
11,765	11,770	Dolomite as above, sublithographic.
11,770	11,825	Dolomite as above, sublithographic, little pinpoint porosity.
11,825	11,835	Dolomite as above, sublithographic.
11,835	11,840	Same as above, little pinpoint porosity.
11,840	11,845	Dolomite as above, sublithographic.
11,845	11,855	Same as above, little pinpoint porosity.
11,855	11,860	Dolomite as above, some gray brown dolomite 5YR3/2.
11 860	11,870	Dolomite, same as above, fair porosity.
11,870	11,880	Dolomite, mostly dark yellow brown; sublithographic.
11,800	11,890	Dolomite, same as above, sublithographic, little pinpoint porosity.
11,890	11,910	Dolomite, same as above, fair porosity.
11,910	11,915	Dolomite, same as above, fair porosity, some light gray, sublithographic.
11,915	11,920	Dolomite, dark yellow brown, fair porosity, mostly light gray, dense lithographic.
11,920	11,925	Dolomite, mostly light gray, dense lithographic.
11,925	11,935	Dolomite, mostly light gray, dense sublithographic, little pinpoint porosity.
11,935	11,945	Dolomite, light gray to yellow gray 5Y8/1, sublithographic, dense.
11,945	11,950	Dolomite same as above, some slightly pinkish.
11,950	11,960	Dolomite sane as above, some pale red 10R6/2.
11,960	11,975	Dolomite, yellow gray to light gray, little pinpoint porosity.
11,975	11,980	Dolomite as above, fair pinpoint porosity.
11,980	11,985	Same as above with some pinpoint porosity.
11,985	11,990	Same as above with little pinpoint porosity.
11,990	12,000	Dolomite as above, dense.
12,000	12,010	Dolomite as above, little pinpoint porosity.
12 010	12,015	Dolomite as above, little pinpoint porosity, fine grained.
12,015	12,035	Dolomite as above fine grained and some gray red, purple 5RP4/2, fine grained dolomite.
12,035	12,040	Dolomite as above, little medium dark gray N4 shale.
12,040	12,045	Dolomite as above, shale as above and little green gray shale 5GY6/1.
12,045	12,055	Dolomite, mostly light gray to yellow gray, dense; little gray red purple.
12,055	12,060	Dolomite as above, fine grained, little pinpoint porosity; little shale as above.
12,060	12,070	Dolomite as above, some slightly saccharoidal, little pinpoint porosity.
12,070	12,075	Dolomite as above, some saccharoidal, fair porosity.
12,075	12,085	Dolomite as above, saccharoidal, little pinpoint porosity.
12,085	12,090	Dolomite as above, saccharoidal, dense.
12,090	12,100	Dolomite as above, sublithographic, little pinpoint porosity.
12,100	12,110	Dolomite as above, dense little pinpoint porosity.

<u>From</u>	<u>To</u>	<u>Formation</u>
12,110	12,120	Dolomite as above, sublithographic.
12,120	12,125	Dolomite as above, sublithographic, little pinpoint, porosity.
12,125	12,135	Dolomite as above, dense, little pinpoint porosity.
12,135	12,145	Dolomite, much light brown gray fine grained, dolomite as above, little pinpoint porosity. Dense at 45.
12,145	12,155	Dolomite as above, much light brown gray, dense, fine grained.
12,155	12,165	Dolomite, light gray, fine grained, dense.
12,165	12,170	Dolomite as above, some light brown gray, fine grained.
12,170	12,180	Dolomite, light olive gray, little pinpoint porosity, fine grained, dense, some slightly saccharoidal.
12,180	12,185	Missing.
12,185	12,190	Same as above.
12,190	12,195	Missing.
12,195	12,200	Dolomite, yellow gray to light brown gray, dense, very little porosity.
12,200	12,210	Dolomite, pale yellow brown, dense some slightly saccharoidal, little pinpoint porosity at 10'.
12,210	12,225	Dolomite, pale yellow brown, dense, fine grained, some slightly saccharoidal.
12,225	12,235	Dolomite, pale yellow brown, dense, fine grained, salt efflorescence, salt crystal; some slightly saccharoidal at 35'.
12,235	12,240	Missing.
12,240	12,245	Dolomite, pale yellow brown to gray brown, dense, fine grained.
12,245	12,250	Dolomite as above, dense to sublithographic, some slightly saccharoidal.
12,250	12,255	Dolomite as above, dense to sublithographic.
12,255	12,285	Missing.
12,285	12,305	Dolomite same as above mostly gray brown piece chert at 95.
12,305	12,310	Dolomite, gray brown and pale yellow brown, dense, fine grained.
12,310	12,315	Dolomite as above, dense, fine grained to sublithographic.
12,315	12,325	Dolomite as above, some slightly saccharoidal.
12,325	12,335	Dolomite, color as above, slightly saccharoidal, little pinpoint porosity.
12,335	12,340	Missing.
12,340	12,345	Dolomite as above, dense to slightly saccharoidal.
12,345	12,355	Dolomite as above, little pinpoint porosity, dense to slightly saccharoidal.
12,355	12,365	Dolomite as above, dense to slightly saccharoidal.
12,365	12,370	Dolomite as above, little pinpoint porosity.
12,370	12,385	Missing.
12,385	12,390	Dolomite as above, some pinpoint porosity, white anhydrite and red shale.

<u>From</u>	<u>To</u>	<u>Formation</u>
12,390	12,395	Dolomite, color as above, dense, little white anhydrite.
12,395	12,400	Dolomite color as above, dense, little porosity.
12,400	12,405	Dolomite, color as above, dense.
12,405	12,410	Dolomite, color as above, dense, little pinpoint porosity.
12,410	12,420	Dolomite, color as above, dense, little white anhydrite.
12,420	12,435	Dolomite, color as above, dense.
12,435	12,481	Dolomite, as above, dirty sample. 70 - Missing.
Core #16		
12,481	12,521	
	2 1/2	Dolomite, dusky yellow brown, fine grained, dense.
	2nd 5'	Dolomite, medium dark gray, dense.
	12 1/2	Dolomite, brown gray 5YR4/1, dense.
	13	Dolomite, dark yellow brown, 10YR4/2, dense.
	4	Dolomite, same as above, finely crystalline, dense.
End of Core		
12,620	12,625	Dolomite, same as above.
12,625	12,645	Dolomite, dusky yellow brown, dense.
Core #17		
12,551	12,566	
Top	1/2	Limestone, gray brown 5YR3/2, dense.
Middle	9 1/2	Limestone, medium dark gray N4, dense.
Bottom	1 1/2	Dolomite and limestone, medium gray N5, dense.
End of Core		
Core #18		
12,568	12,571 1/2	Dolomite, brown gray, dense, sublithographic.
12,571 1/2	12,581	Dolomite, brown gray, dense and light brown gray 5YR6/1.
12,581	12,598	Dolomite, dusky yellow brown, dense, fine grained, dense.
12,598	12,601	Dolomite, dusky yellow brown, fine grained, dense, few fractures.
12,601	12,603	Dolomite, dusky brown, fine grained, dense, little pyrite.
12,603	12,611	Dolomite, same as above.
End of Core		
Core #19		
12,611	12,615	Dolomite, same as above.
12,615	12,619	Dolomite, medium dark gray N4, fine grained, dense.
12,619	12,622	Dolomite, dusky yellow brown to gray brown, fine grained, dense, anhydritic in part.
12,622	12,630	Dolomite, dusky yellow brown, fine grained, dense.
12,630	12,636	Dolomite, dark gray N3, dense, shaley.
12,636	12,643	Dolomite, dusky brown, fine grained, dense.
12,643	12,645	Dolomite, medium dark gray N4, fine grained, dense.
12,645	12,646	Dolomite, light olive gray, anhydritic, dense.
End of Core		

<u>From</u>	<u>To</u>	<u>Formation</u>
12,646	12,650	Dolomite as above.
12,650	12,655	Dolomite, medium dark gray, fine grained dense dolomite, some white anhydrite.
12,655	12,665	Dolomite as above, little dense pale yellow brown limestone.
12,665	12,690	Limestone, medium dark gray N4, dense.
12,690	12,695	Limestone as above and yellow gray, 5Y8/1, dense.
12,695	12,700	Limestone as above, yellow gray and some light brown gray 5YR6/1, dense.
12,700	12,710	Dolomite, light brown gray, dense.
12,710	12,735	Dolomite, light olive gray 5Y6/1, dense.
12,735	12,740	Dolomite as above and brown gray, dense.
12,740	12,745	Limestone, color as above, some yellow gray, dense.
12,745	12,750	Missing.
Stony Mountain Shale Member 12,755		
12,750	12,755	Limestone, light brown gray and medium dark gray, dense.
12,755	12,760	Limestone, medium dark gray, some brown gray, dense.
12,760	12,765	Limestone, brown gray 5YR4/1.
12,765	12,770	Limestone, medium dark gray N4 with brown mottling, dense.
12,770	12,780	Limestone, brown gray and medium dark gray, dense.
12,780	12,810	Limestone, same as above, some yellow gray, dense, mostly brown gray.
12,810	12,815	Limestone as above, little white anhydrite.
12,815	12,825	Limestone as above.
Red River Formation 12,825		
12,825	12,830	Limestone, brown gray to medium dark gray, dense.
12,830	12,845	Limestone, brown gray and very light gray N8, dense.
12,845	12,850	Same as above, sublithographic.
12,850	12,890	Limestone as above, brown gray is sublithographic.
12,890	12,900	Dolomite, light brown gray, and brown gray, dense, and medium gray N5 limestone.
12,900	12,905	Limestone as above, fine grained, dense.
12,905	12,940	Limestone as above.
12,940	12,945	Limestone and dolomite, color as above, dense, fine grained.
12,945	12,960	Dolomite, color as above, dense, little limestone.
12,960	12,965	Same as above.
12,965	12,970	Dolomite, same as above, mostly gray brown 5YR3/2.
12,970	12,975	Dolomite, same as above, some slightly saccharoidal.
Core #20		
12,976	12,983	Dolomite, yellow gray, dense and brown gray dense, hard dolomite, yellow gray soft.
12,983	12,993	Dolomite and limestone, color as above, some slightly saccharoidal staining.
12,993	12,995	Dolomite, brown gray, fine grained.
12,995	12,999	Dolomite, as above, little pale yellow brown limestone slightly saccharoidal.

<u>From</u>	<u>To</u>	<u>Formation</u>
12,999	13,027	Dolomite as above, little pale yellow brown dolomite, slightly saccharoidal, fair porosity.
13,027	13,034	Limestone, gray brown, sublithographic dense, little pyrite.
End of Core		
13,035	13,040	Limestone as above, some slightly saccharoidal.
13,040	13,045	Limestone as above, some slightly saccharoidal, few pieces of white anhydrite.
13,045	13,050	Limestone as above, some dense to slightly saccharoidal.
13,450	13,055	Limestone, light gray to brown gray, dense to slightly saccharoidal.
13,055	13,070	Limestone as above, fine grained, slightly saccharoidal.
13,070	13,080	Limestone as above, fine grained, quite dense.
13,080	13,085	Limestone as above, fine grained, dense.
13,085	13,090	Limestone as above, fine grained, dense, some slightly saccharoidal.
13,090	13,095	Limestone as above, fine grained, dense to slightly saccharoidal.
13,095	13,120	Limestone as above, fine grained, dense.
13,120	13,125	Missing.
13,125	13,145	Same as above.
13,145	13,165	Limestone as above, some slightly saccharoidal.
13,165	13,200	Limestone same as above, dense.
13,200	13,205	Limestone, light gray and medium gray with some brown gray mottling, dense.
13,205	13,210	Limestone same as above, some brown gray, dense.
13,210	13,225	Limestone, light gray and brown gray as above, dense.
13,225	13,230	Limestone as above, little white anhydrite.
13,230	13,270	Limestone same as above.
13,270	13,325	Limestone same as above, dense to sublithographic.
13,325	13,345	Limestone same as above, dense.
13,345	13,350	Limestone same as above, dense, sublithographic.
13,350	13,355	Missing.
13,355	13,410	Limestone same as above, dense, sublithographic.
Winnipeg Shale Member 13,410		
13,410	13,420	Gray shale and some limestone as above.
13,420	13,425	Limestone as above, some medium dark gray shale.
13,425	13,430	Mostly shale as above, some limestone as above.
13,430	13,445	Shale as above.
13,445	13,450	Shale as above and some limestone as above.
13,450	13,465	Shale as above and some limestone as above.
13,465	13,475	Shale, dark gray N3 and some limestone as above.
13,475	13,495	Shale as above.
13,495	13,500	Missing.
13,500	13,505	Shale as above, splintery.
13,505	13,520	Shale, as above.
13,520	13,525	Missing.
13,525	13,535	Shale as above.
13,535	13,540	Shale as above, some limestone as above (cave ?).

<u>From</u>	<u>To</u>	<u>Formation</u>
13,540	13,545	Missing.
13,545	13,550	Shale as above.
13,550	13,555	Missing.
Winnipeg Sand	13,559	
13,555	13,560	Shale as above and some limestone (cave ?) as above, little cemented sandstone.
13,560	13,570	Shale as above and some limestone (cave ?) as above, white sandstone, medium grained, tight.
Core #21		
13,572	13,629	Sandstone, medium dark gray N4 to light gray N7, medium grained, tight.
Core #22		
13,629	13,642	Sandstone, very light gray, hard - poor to fair porosity mottled by black residue, medium to coarse grained.
13,642	13,656 1/2	Sandstone, same as above, poor porosity, dense.
13,656 1/2	13,658	Sandstone, very light gray, little black residue, hard tight.
Core #23		
13,658	13,664	Sandstone, clear to light gray, little pyrite, hard, tight and clear, fine to medium grained, hard tight, some black residue.
Core #24		
13,664	13,669	Sandstone, medium light gray N6, medium grained, hard tight.
Core #25		
13,699	13,709	Sandstone, same as above, some black residue no porosity.
	2nd Section	Very light gray N8, fine grained, no porosity, little black residue.
	3rd Section	Same as above.
	4th Section	Light gray N7, medium grained, hard tight.
Total Depth	13,709	