

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 209

Summary of the Kerr-McGee, et al. Arlot Johnson Estate #1
Divide County, North Dakota
Well No. 1546 - Permit No. 1558

by William P. Eastwood

Kerr-McGee, Argo Oil Corporation, Dakamont Exploration Corporation - Johnson Estate #1, Divide County, North Dakota, C NE 1/4 SW 1/4 Section 34, T. 162N., R. 101W. (660 feet from North line and 1980 feet from West line). Elevation K.B. 2261; G.L. 2250.

Kerr-McGee, Argo Oil, Dakamont Exploration - Johnson Estate #1 was spudded October 1, 1957 and 650 feet of 10 3/4 inch surface casing was set with 650 sacks of cement. The well was completed as a producer in the Red River on February 26, 1958. Top of pay - 11,246; TD - 11,782; PB -11,498.

DST #1; 7215-7235. Open 4 hours, SI 30 minutes. Recovered 1000 feet WC; 1334' MCSW; 1325 feet black sulphur water. IFP 740#; FFP 1923#; IHP 4338#; FHP 4300# 30 minutes. SIP 2993#; BHT 183° F.

DST #2: 9148-9189. Open 3 hours, SI 30 minutes. Recovered 4170 feet fluid 180 feet MCSW; 3690 feet SW; 300 feet black sulphur water. IFP 100#; FFP 2255#; IHP 5230#; FHP 5210# 30 minutes. SIP 3930#.

DST #3: 10,340-10386. Open 3 hours, SI 30 minutes. Recovered 550 feet SWCM; 600 feet MCSW; 8300 SW. IFP 2195#; FFP 4800#; IHP 5825#; FHP 5825# 30 minutes. SIP 4830#.

DST #4: 10,922-11,047. Open 4 hours, SI 30 minutes. Recovered 1320 feet WC; 180 feet Sli. OCWC; 460 feet GC and Sli OCMSW. IFP 1045#; FFP 1355#; IHP and FHP 6320# 30 minutes. SIP 4230#.

DST #5: 11,262-11,280. Open 4 hours, SI 30 minutes. Recovered 4 gallons of free oil; 1390 feet WC; 180 feet OCWC; 240 feet MCSW. IFP 680#; FFP 820#; IHP and FHP 6220# 30 minutes. SIP 4750#.

DST #6: 11,236-11,300. Open 4 hours, SI 45 minutes. Recovered 1760 feet gas in drill pipe; 50 feet free oil; 90 feet HO and GCWC; 90 feet Sli 0 and GCWC; 1320 feet GCWC; 720 feet GCM. IFP 715#; FFP 1115#; IHP and FHP 6380# 45 minutes. SIP 4525#.

DST #7: 11,296-11,357. Packer failed.

DST #8: 11,363-11,417. Open 3 hours, SI 30 minutes. Recovered 1500 feet WC; 315 feet mud. IFP 700#; FFP 890#; IHP and FHP 6300# 30 minutes. SIP 4750#.

Cores:

#1 7207-35
#2 7341-57
#3 10,366-86
#4 11,085-143
#5 11,280-300
#6 11,359-417

Completion Information:

Perforated 11,746-60 (Winnipeg) W/4 per foot. Set packer at 11,722. Swabbed 3 hours, recovered gas and load water. Swabbed 1/2-2 BWH with slight oil scum SI 30 minutes. Swabbed 2 barrels black, salty water. Sand fract.

Perforated (Red River) 11,371-90 acidized with 1000 gallons. Swabbed into tanks at rate of 15 BFPH, 30%-70% oil, rest salt water. Squeezed perfs. 11,371-90.

Perforated 11,336-46; 11,305-26 and acidized. Swabbed 18 1/2 BPPH, 66% oil, 34% water. Set Packer. Perforated 11,256-11,291. Perforated 11,312-26, 11,256-80 with 4 holes per foot, acidized with 500 gallons. Swabbed 3 hours at rate of 14 BFPH 45% oil, 50% water, 3% basic sediment. Swabbed 5 hours at rate of 14.4 BFPH, 50% oil, 50% water. SI 1 hour, flowed 2 BOPH 38% water, 2% BS, 1/4" choke. Flowed 2.55 BOPH, 30% water 5% BS, 1/4" choke. Flowed 6.7 BOPH, 0.4% water, 12/64" choke. Flowed 41 BOPH, 2% water, 12/64" choke. Flowed 1.65 BOPH, 0.4 of water. Flowed .84 BOPH, 0.4 water, 12/64" choke. Flowed 1.53 BOPH, 27% water; 12/64" choke. Flowed 2.1 BOPH, 0.1 water, oil 36 gravity.

SI 8 days, CP 625#. Flowed unguaged amount of gas for 1 hour, died, 1/4" choke. Flowed small amount of oil (unguaged) died, 3% BS & W. pumped 156 B0, 24 hours, grind out 38% salt water. Pumping 5 to 6 BOPH and 5 to 6 BWPH at end of 24 hour test TP-75 to 125#, SIP-525#.

April-23, 1958 pumped 152 BOPD, 102 BWPD, 114.1 MCFD gas.

May 9, 1958 pumped 89 BOPD, 90 BWPD, 66.95 MCFD gas.

Casing and Tubing Record:

650 feet of 10 3/4" surface casing set with 650 sacks of cement. 11,769 feet of 5 1/2 inch casing set with 835 sack of cement. 11,250 feet of 2 3/8 OD tubing.

Producing Zone:

Red River. 11,256-80; 11,312-26; 11,371-90.

Formation tops were determined from samples and electric logs. Depths were determined from the electric log depth unless otherwise stated. Not all lithologic tops in the section were picked. Colors were determined from the Rock Color Chart.

FORMATION TOPS

Cretaceous System	
Pierre formation	1315
Niobrara formation	3520
Greenhorn formation	3895
Mowry formation	4186
Basal Cretaceous sandstones	4647
Jurassic System	
Piper limestone	5822
Triassic System	
Spearfish formation	6090
Mississippian System	
Kibbey Sand	6443
Kibbey limestone	6498
Charles formation	6640
Base of last salt	7078

Midale equivalent	7320
Nesson equivalent	7378
Englewood formation	8435
Devonian System	
Lyleton formation	8548
Nisku equivalent	8712
Duperow formation	8809
Souris River formation	9248
Dawson Bay formation	9598
Prairie evaporite formation	9730
Winnipegosis formation	10031
Ashern formation	10255
Silurian System	
Interlake group	10292
Ordovician System	
Stony Mountain formation	
Upper	10960
lower	11100
Red River formation	11130
Winnipeg formation	
shale member	11595
sandstone member	11740
T.D.	11782
P.B.	11498

650-680	Very coarse well-rounded sand and gravel. Quartz, chert, etc.
680-710	As above with common grayish brown soft shale.
710-740	Quartz and chert sand and gravel as above.
740-770	As above.
770-800	Sand gravel and shale as above rare lignite.
800-810	Sand and gravel as above.
810-820	As above with dark brown shale.
820-830	As above.
830-840	As above.
840-850	As above, common lignite.
850-860	Common grayish brown shale, coarse rounded quartz and chert sand and lignite.
860-870	Shale, and lignite as above, rare sand.
870-880	Shale sand and abundant lignite.
880-890	As above with rare very light gray shale.
890-900	Shale, dark brown; common lignite and coarse sand.
900-910	As above, common very light gray shale.
910-920	Lignite sand, and dark brown shale as above. No very light gray shale seen.
920-930	As above.
930-940	As above.
940-950	As above.
950-960	Lignite with rare grayish brown shale and coarse sand.
960-970	Grayish brown shale, common lignite and coarse sand.
970-980	As above; rare very light gray shale and rare gravel.
980-990	Abundant very coarse rounded clear and red quartz sand, common grayish brown shale and lignite rare very light gray fine grained friable sandstone.

990-1000 Abundant coarse sand and fine grained sandstone as above, common lignite rare grayish brown shale.

1000-1010 As above.

1010-1020 As above, common gravel.

1020-1030 As above with abundant very light gray fine grained very friable sandstone.

1030-1040 Abundant coarse clear to red quartz sand; very common friable sandstone as above common lignite.

1040-1050 As above with rare lignite.

1050-1060 As above.

1060-1070 As above.

1070-1080 Coarse sand and very rare lignite as above; common fine grained friable sandstone.

1080-1090 As above.

1090-1100 As above; rare grayish brown shale.

1100-1110 Coarse sand as above; common lignite rare fine grained sandstone and rare gravel.

1110-1120 Sand and lignite as above; common fine grained sandstone as above.

1120-1130 As above; rare gravel.

1130-1140 Abundant fine grained friable very light gray sandstone common coarse sand as above; common lignite.

1140-1150 As above; rare lignite and white shale.

1150-1160 Abundant lignite common dark brown to grayish brown shale, rare very light gray shale very rare coarse sand no fine grained sandstone seen.

1160-1170 Lignite and shale as above, common coarse sand and fine grained sandstone as above; common gravel.

1170-1180 Very abundant lignite, common coarse quartz sand; rare very light gray to white shale, rare light gray to yellowish gray shale and very fine-grained sandstone very rare light red-brown shale.

1180-1190 Abundant lignite common coarse quartz sand and fine grained friable sandstone rest as above.

1190-1200 Lignite sand and sandstone as above, rare light pink shale and yellowish gray shale.

1200-1210 As above.

1210-1220 Abundant grayish brown shale and lignite; common pale reddish-brown shale very rare coarse quartz sand.

1220-1230 Abundant lignite, common grayish-brown and yellowish gray shale rare coarse quartz sand very rare white shale.

1230-1240 Lignite and grayish brown shale, very rare coarse quartz sand and gravel

1240-1250 Abundant coarse quartz sand, common lignite rare white shale.

1250-1260 Abundant lignite and gray brown shale, common very light gray to yellowish-gray shale rare pale reddish brown very fine grained sandstone very rare coarse quartz sand.

1260-1270 As above.

1270-1280 As above.

1280-1290 Lignite and grayish brown shale, rare very light gray to yellowish gray shale rare coarse quartz sand.

1290-1300 Abundant coarse sand and gravel common yellowish gray shale, rare lignite and grayish brown shale.

1300-1310 As above rare reddish brown shale.

1310-1320 Abundant coarse sand and gravel rare grayish brown shale.

1315 Top of Pierre
 1320-1330 As above, common very light gray shale.
 1330-1340 As above, common iron-stained sand and shale.
 1340-1350 Abundant yellowish gray sandy shale; common coarse sand common iron staining rare ironstone concretion.
 1350-1360 As above.
 1360-1370 Abundant coarse quartz sand common yellowish gray shale rest as above.
 1370-1380 As above.
 1380-1390 As above rare white sandy limy shale.
 1390-1400 Very abundant medium light gray shale, rare iron-stained shale, very rare coarse quartz sand.
 1400-1410 Shale slightly micaceous as above.
 1410-1420 As above.
 1420-1430 Shale as above, rare ironstone concretions.
 1430-1440 Shale as above.
 1440-1450 As above.
 1450-1460 Shale and ironstone as above.
 1460-1470 As above, with coarse quartz sand (cave?)
 1470-1480 Shale and ironstone as above rare white shale.
 1480-1490 Shale and ironstone as above.
 1490-1500 As above.
 1500-1510 As above.
 1510-1520 As above.
 1520-1530 As above.
 1530-1540 As above
 1540-1550 Shale and ironstone as above.
 1550-1600 Shale and ironstone as above, very rare mollusk fragments very rare white shale.
 1600-1650 Shale and ironstone as above.
 1650-1700 As above lignite cavings.
 1700-1740 As above.
 1740-1800 As above rare dark gray shale.
 1800-1850 Medium gray micaceous shale and ironstone as above, rare white shale lignite cavings.
 1850-1900 Shale and ironstone as above.
 1900-1950 Shale and ironstone as above, coarse sand cavings.
 1950-2000 As above.
 2000-2050 As above, very are mollusk fragments sand cavings.
 2050-2100 As above.
 2100-2150 Medium light gray micaceous shale as above, rare ironstone concretions rare mollusk fragments.
 2150-2200 As above.
 2200-2250 As above very rare white shale.
 2250-2300 Gray shale ironstone and mollusk fragments as above.
 2300-2350 As above.
 2350-2400 As above.
 2400-2450 As above.
 2450-2500 As above, rare lignite cavings
 2500-2550 As above, very rare white very fine grained sandstone.
 2550-2600 As above lignite cavings.
 2600-2650 As above rare white shale lignite cavings.
 2650-2700 Gray shale ironstone and mollusk fragments as above.
 2700-2750 As above; rare dark gray shale.

2750-2800 Medium gray shale ironstone and mollusk fragments.
 2800-2850 As above.
 2850-2900 As above.
 2900-2950 As above.
 2950-3000 As above.
 3000-3050 As above, lignite cavings.
 3050-3100 As above.
 3100-3150 As above.
 3150-3200 As above.
 3200-3250 As above.
 3250-3260 Missing.
 3260-3300 Shale ironstone and mollusk fragments as above.
 3300-3350 As above, lignite cavings.
 3350-3400 Shale and mollusk fragments as above, very rare ironstone.
 3400-3450 Shale and mollusk fragments as above, very rare pyrite.
 3450-3500 As above.
 3500-3510 As above.
 3510-3520 As above very rare moderate orange pink fine grained sandstone.

3520 Top of Niobrara
 3520-3530 As above.
 3530-3540 As above, rare fine grained glauconitic sandstone.
 3540-3550 Shale as above, rare fine grained moderate orange pink sandstone.
 3550-3600 Shale and mollusk fragments as above, very rare red very fine grained sandstone and pale brown shale.
 3600-3610 Shale and mollusk fragments as above, very rare white limestone.
 3610-3620 As above with rare medium gray sandy shale.
 3620-3630 Shale and mollusk fragments as above, rare moderate reddish orange very fine grained sandstone.
 3630-3640 Abundant dark gray spotted limy shale, rare very dark gray black shale rare white limestone. Very rare mollusk fragments.
 3640-3650 Abundant spotted shale as above, rare medium light gray shale.
 3650-3660 Abundant medium light gray shale, no spotted shale seen, rare mollusk fragments.
 3660-3670 Abundant medium light gray shale and dark gray shale, rare mollusk fragments.
 3670-3680 Medium light gray shale and mollusk fragments, no dark gray shale seen.
 3680-3690 As above, rare white limestone, very rare light red shale (cave?)
 3690-3700 Shale and mollusk fragments as above, common ironstone fragments.
 3700-3750 As above, rare dark gray shale and very rare red brown fine grained sandstone.
 3750-3760 Missing.
 3760-3800 Shale, mollusk fragments and ironstone as above.
 3800-3810 As above.
 3810-3850 As above, with rare to common spotted shale.
 3850-3900 As above.
 3900-3950 As above, rare glauconitic sandstone.
 3950-4000 Gray shale and spotted shale as above, very rare white limestone.
 4000-4010 Missing.
 4010-4050 Gray shale, spotted shale and mollusk fragments as above, rare white and glauconitic sandstone.
 4050-4100 Medium light gray shale spotted shale and mollusk fragments as above, rare dark gray to black shale and pale brown shale.

4100-4150 Medium light gray shale spotted shale and mollusk fragments as above, rare dark gray shale ironstone concretions and glauconitic sandstone.

4186 Top of Mowry Shale.

4150-4200 As above, no ironstone or glauconitic sandstone seen.

4200-4230 As above, rare glauconitic sandstone.

4230-4240 Abundant dark gray shale common dark gray spotted shale rare medium light gray shale.

4240-4250 Abundant medium light gray shale common dark gray shale and spotted shale.

4250-4260 As above.

4260-4270 As above.

4270-4280 Abundant gray shale rare spotted shale medium light gray shale and white shale.

4280-4290 Medium light gray shale, common spotted shale and dark gray shale.

4290-4300 As above.

4300-4310 Dark gray shale, rare spotted shale.

4310-4320 As above, with very rare medium light gray shale and mollusk fragments.

4320-4330 As above.

4330-4340 As above, very rare dark brown shale.

4340-4350 As above.

4350-4360 Abundant medium light gray shale common dark gray shale rare spotted shale.

4360-4370 As above, rare very light gray fine grained sandstone.

4370-4380 Abundant dark gray shale common medium light gray and spotted shale.

4380-4390 As above, ironstone concretions.

4390-4400 Abundant dark gray spotted shale, common ironstone and medium light gray shale.

4400-4410 As above very rare red brown very fine grained sandstone.

4410-4420 Abundant dark gray shale, common medium light gray shale, rare ironstone very rare spotted shale and light gray fine grained sandstone.

4420-4430 As above, very rare red brown very fine grained sandstone.

4430-4440 Shale and ironstone as above, very rare pyrite.

4440-4450 As above, very rare very fine grained red brown sandstone.

4450-4460 As above.

4460-4470 As above.

4470-4480 Abundant dark gray shale, common medium light gray shale and spotted shale rare red brown sandstone and ironstone very rare light gray sandstone.

4480-4490 As above with very rare pyrite no light gray sandstone seen.

4490-4500 Shale and ironstone as above.

4500-4510 As above, rare pink gypsum, red brown sandstone and light gray glauconitic sandstone.

4510-4520 Shale and ironstone as above; rare pyrite.

4520-4530 As above.

4530-4540 Very abundant dark gray shale rare medium light gray shale and light gray medium grained sandstone.

4540-4550 Abundant dark gray shale; common medium light gray shale, very rare ironstone and light gray medium-grained glauconitic sandstone.

4550-4560 Shale and sandstone as above, with common spotted shale.
 4560-4570 Shale as above, very rare limy, very fine grained silty sandstone.
 4570-4580 Shale as above, rare red brown very-fine-grained sandstone.
 4580-4590 Abundant dark gray shale, rare medium light gray shale.
 4590-4600 As above, rare ironstone and mollusk fragments.
 4600-4610 As above, rare red brown very fine grained sandstone.

4610 Top of Dakota
 4610-4620 Abundant light gray shale, common dark gray shale and spotted shale rare pyrite, red brown sandstone and glauconitic sandstone.
 4620-4630 As above.
 4630-4640 Abundant dark gray shale, common medium light gray shale, very rare blackish red sandstone, rare mollusk fragments.

4648 Dakota ?
 4640-4650 Shale as above, rare dark red brown very-fine-grained sandstone.
 4650-4660 Shale as above.
 4660-4670 As above.
 4670-4680 As above.
 4680-4690 As above, rare white fine-grained sandstone (sample T/Dakota).
 4690-4700 Shale and sandstone as above.
 4700-4710 Shale and white sandstone as above.
 4710-4720 Common white sandstone with shale as above.
 4720-4730 Abundant medium light gray shale, common white sandstone and dark gray shale.

4730-4740 As above with rare white gypsum.
 4740-4750 Shale and sandstone as above.
 4750-4760 As above.
 4760-4770 Shale and white to light pink sandstone as above.
 4770-4780 Shale and sandstone as above.
 4780-4790 As above.
 4790-4800 As above, rare white gypsum.
 4800-4810 Abundant very light brownish gray shale, common dark gray shale rare white sandstone.

4810-4820 Shale as above, very rare white sandstone.
 4820-4830 As above.
 4830-4840 As above, rare white sandstone.
 4840-4850 As above.
 4850-4860 Shale and sandstone as above with rare pale red shale.
 4860-4870 Gray shale and white sandstone as above.
 4870-4880 As above.
 4880-4890 As above.
 4890-4900 Shale as above, very rare white sandstone.
 4900-4910 As above, rare very pale brown shale.
 4910-4920 As above.
 4920-4930 As above.
 4930-4940 As above, very rare very light grayish gray shale.
 4940-4950 Light gray dark gray and pale brown shale as above no white sandstone seen.

4950-4960 As above.
 4960-4970 As above, rare white sandstone.
 4970-4980 Shale as above, very rare glauconitic sandstone.
 4980-4990 As above, very rare pyrite.
 4990-5000 Shale and sandstone as above.
 5000-5010 As above very rare glauconitic sandstone.

5010-5020 As above, rare white gypsum.
 5020-5030 Shale and sandstone as above.
 5030-5040 Shale and white sandstone as above, very rare very light grayish pink sandstone
 5040-5050 Shale and white and glauconitic sandstone rare white gypsum.
 5050-5060 As above.
 5060-5070 Shale as above.
 5070-5080 As above.
 5080-5090 As above, rare white sandstone.
 5090-5100 As above.
 5100-5200 Missing.
 5200-5210 Abundant medium light gray and dark gray shale.
 5210-5220 As above.
 5220-5230 As above rare white sandstone.
 5230-5240 As above.
 5240-5250 Shale as above, very rare glauconitic sandstone.
 5250-5260 Abundant pale yellowish brown shale, very common dark gray and medium light gray shale, very rare white sandstone.
 5260-5270 Shale as above.
 5270-5280 As above.
 5280-5290 AS above, rare white limestone.
 5290-5300 As above.
 5300-5310 As above.
 5310-5320 Shale as above very rare very pale brown siltstone, no white limestone seen.
 5320-5330 Shale as above rare white sandstone.
 5330-5340 As above, rare white limestone.
 5340-5350 As above.
 5350-5360 Shale as above.
 5360-5370 As above.
 5370-5380 As above, very rare white gypsum.
 5380-5390 As above.
 5390-5400 As above.
 5400-5410 As above, rare white sandstone.
 5410-5420 Shale as above.
 5420-5430 As above.
 5430-5440 As above, rare gypsum.
 5440-5450 As above.
 5450-5460 Missing.
 5600-5610 Common very pale brown to pale olive shale, common dark gray shale common grayish orange pink shale. Shale platy and not as silty as above.
 5610-5620 As above abundant pale olive clay shale rare muscovite flakes and orange pink sandstone.
 5620-5630 Shale as above, rare light gray sandstone and pyrite nodules.
 5630-5640 Abundant medium gray shale rare light olive gray shale and dark gray shale.
 5640-5650 Shale as above, rare red brown concretions.
 5650-5660 Shale as above, rare red brown shale and white gypsum.
 5660-5670 As above.
 5670-5680 As above, very rare light gray limestone.
 5680-5690 As above with rare pink gypsum.
 5690-5700 Shale as above with rare light gray sandstone and brown shale.
 5700-5710 Shale as above, common very light gray to white sandy limestone.

5710-5720 Shale and sandy and oolitic limestone as above.
 5720-5730 As above.
 5730-5740 As above, sandy and oolitic limestone.
 5740-5750 As above.
 5750-5760 Shale as above, common pale yellowish brown limestone rare white sandy and oolitic limestone.
 5760-5770 As above, rare grayish brown green limy sandstone rare pink gypsum.
 5770-5780 Shale limestone gypsum as above, rare moderate yellowish green sandy shale.
 5780-5810 Missing.
 5810-5820 Shale as above, and rare yellowish brown limestone and oolitic limestone.

5824 Top of Piper
 5820-5830 As above, rare white gypsum.
 5830-5840 Shale as above with coon limestone as above, rare muscovite flakes and white very slightly limy sandstone.
 5840-5850 Shale and rare limestone as above, rare grayish green sandstone.
 5850-5860 As above, with very rare white gypsum.
 5860-5870 Dark grayish and very abundant coarse quartz sand. Sample very badly caved. Sand probably from Tertiary or Upper Cretaceous.
 5870-5880 Abundant very light gray to white sandy and oolitic limestone, very rare white gypsum.
 5880-5890 Limestone and shale as above, rare white slightly limy sandstone.
 5890-5900 As above, rare pale brown limestone.
 5900-5910 Abundant light gray to white limestone, rare oolitic limestone common dark gray shale.
 5910-5920 Limestone as above, common medium light gray shale rare dark gray shale very rare pale red limestone.
 5920-5930 Abundant light gray shale as above, common limestone as above, rare dark gray shale.
 5930-5940 As above, rare pale red shale.
 5940-5950 Limestone and shale as above.
 5950-5960 As above, with very rare very light pink gypsum.
 5960-5970 Limestone and shale as above, rare slightly limy grayish green sandstone, rare oolitic limestone.
 5970-5980 Limestone and shale as above, rare pinkish white gypsum.
 5980-5990 As above.
 5990-6000 As above rare reddish brown limy shale, white limestone as above.
 6000-6010 Shale and sublithographic white limestone as above.
 6010-6020 As above.
 6020-6040 Missing.
 6040-6050 Abundant light gray and dark gray shale common very light gray to white fine crystalline limestone rare red brown shale rare gray green and green sandstone.
 6050-6060 Shale and limestone as above.
 6060-6070 As above.
 6070-6080 As above, common red brown shale.
 6080-6090 As above with rare white gypsum.

6090 Top of Spearfish
 6090-6100 As above, with rare medium gray sandy shale.

6100-6110 Abundant medium light gray shale, common red brown shale and sandstone common light gray limestone rare white gypsum.

6110-6120 As above rare white gypsum.

6120-6130 As above.

6130-6140 As above.

6140-6150 As above.

6150-6160 As above.

6160-6170 Abundant red-brown sandstone, very common medium light gray shale, rare light gray to white limestone and dark gray shale.

6170-6180 As above.

6180-6190 As above.

6190-6200 As above.

6200-6210 As above, rare white gypsum.

6210-6220 As above.

6220-6230 As above.

6230-6240 As above, very rare pale brown sandy shale

6240-6250 Sandstone light gray and dark gray shale and light gray to white limestone as above.

6250-6260 As above.

6260-6270 As above.

6270-6280 As above.

6280-6290 As above.

6290-6300 Abundant medium light gray and dark gray shale common red brown fine-grained sandstone, very rare light gray to white limestone and white gypsum.

6300-6310 As above.

6310-6320 As above.

6320-6330 As above.

6330-6340 As above rare white limestone.

6340-6350 As above with very rare pale brown shale.

6350-6360 Gray shale red-brown sandstone and white limestone, as above.

6360-6370 As above.

6370-6380 Abundant red sandstone common gray shale as above, rare white limestone and gypsum.

6380-6390 As above, very rare light gray sandstone.

6390-6400 Sandstone shale, limestone, and gypsum as above.

6400-6410 As above.

6410-6420 As above.

6420-6430 As above.

6430-6440 As above, rare red-brown shale.

6443 Top of Kibbey Sand

6440-6450 As above.

6450-6460 As above.

6460-6470 As above, red-brown sandstone very abundant.

6470-6480 As above, very rare pink dolomite.

6480-6490 As above, rare dark red-brown sandstone.

6498 Top of Kibbey Limestone

6490-6500 As above.

6500-6510 Sandstone shale, and limestone as above.

6510-6520 As above.

6520-6530 Abundant medium light gray shale common white limestone common red-brown sandstone.

6530-6540 As above.
 6540-6550 As above, rare white and pink gypsum.
 6550-6560 As above, rare grayish green sandstone.
 6560-6570 Red sandstone gray shale and rare white limestone as above.
 6570-6580 As above, gray shale abundant.
 6580-6590 As above, rare pyrite nodules.
 6590-6600 As above.
 6600-6610 As above, rare anhydrite.
 6610-6620 Sandstone, shale, and very rare anhydrite as above.
 6630-6640 As above.

6640 Top of Charles
 6640-6650 Sandstone, shale, and very light gray limestone as above.
 6650-6660 As above, with rare white anhydrite.
 6660-6670 Abundant dark gray shale common red-brown sandstone common white salt rare clear gypsum.
 6670-6680 As above, with white gypsum or anhydrite and rare very light gray limestone.
 6680-6690 Abundant medium light gray shale common red-brown sandstone, rare limestone as above, very rare white anhydrite.
 6690-6700 As above.
 6700-6710 As above, red sandstone less common.
 6710-6720 As above.
 6720-6730 As above.
 6730-6740 As above, rare white anhydrite.
 6740-6750 As above, common anhydrite.
 6750-6760 As above, with very rare white dolomite and very rare white oolitic limestone with dark green oolites.
 6760-6770 Shale sandstone anhydrite and rare limestone and dolomite as above.
 6770-6780 As above with rare dark gray shale.
 6780-6790 As above.
 6790-6800 As above.
 6800-6810 Abundant light medium light gray shale, common red-brown sandstone common white anhydrite rare light gray to white limestone.
 6810-6820 As above, with common white salt.
 6820-6830 Abundant medium light gray shale rare dark gray shale rare red-brown sandstone rare pink and white anhydrite very rare light gray limestone.
 6830-6840 Shale and sandstone and anhydrite as above, with abundant white and clear salt.
 6840-6850 Abundant medium light gray shale, very common pale yellowish orange microcrystalline limestone, common white salt rare anhydrite.
 6850-6860 Shale and limestone as above, rare anhydrite and red sandstone, no salt seen.
 6860-6870 Shale and limestone as above, rare anhydrite and salt and red sandstone.
 6870-6880 Abundant pale yellowish orange to very light gray limestone as above, shale as above, rare white limestone green oolites rare red sandstone anhydrite and salt.
 6880-6890 As above with very rare yellowish brown limestone, no salt seen.
 6890-6900 As above.

6900-6910 Abundant medium light gray shale, common very light gray limestone rare red sandstone.

6910-6920 As above, with common white anhydrite.

6920-6930 As above.

6930-6940 As above.

6940-6950 As above.

6950-6960 As above, rare dark gray shale.

6960-6970 As above.

6970-6980 As above, with common pale yellowish orange limestone.

6980-6990 Shale limestone anhydrite and rare sandstone as above with rare white salt.

6990-7000 Abundant very pale yellowish orange limestone, common medium light gray shale rare white anhydrite and red sandstone.

7000-7010 Abundant medium dark gray shale, rare brownish gray shale and red sandstone, common white anhydrite.

7010-7020 Shale and anhydrite as above, common bluish white fine crystalline anhydrite rare yellowish orange limestone.

7020-7030 As above.

7030-7040 As above with very rare dolomite quartz sandstone.

7040-7050 As above, no dolomitic sandstone seen.

7050-7060 As above.

7060-7070 Abundant medium gray shale, common bluish gray anhydrite, rare white anhydrite light gray to yellowish orange limestone and red sandstone.

7078 Base of Last Salt (El) Caliper

7070-7080 As above.

7080-7090 As above, with very abundant clear and white salt.

7090-7100 Abundant medium gray shale, rare bluish gray anhydrite, light gray and white limestone and anhydrite and red sandstone.

7100-7110 Shale, limestone and anhydrite as above, common very light gray to bluish white fine crystalline limy anhydrite, (note - dolomite may be dolomitic anhydrite).

7110-7120 As above.

7120-7130 As above.

7130-7140 Shale and very rare limestone and sandstone as above, common white anhydrite.

7140-7150 Shale as above, common white and bluish white anhydrite, less common very pale orange limestone.

7150-7160 As above.

7160-7170 Shale as above, common very pale yellowish brown fine-grained subsucrosic limestone rare bluish-white to white anhydrite.

7170-7180 Shale and limestone as above with common bluish white slightly limy anhydrite.

7180-7190 As above, the yellowish brown limestone is slightly oolitic.

7190-7200 As above.

7200-7207 Circulation as above.

Core #1 7207-7235

7207-7209 Limestone shaly, very light gray to white very fine-grained with thin brown laminations.

7209-7211 Dolomite, light gray to dark blueish-gray very fine grained.

7211-7212 Sandy dolomite as above and yellowish-brown shaly limestone.

7212-7213 Anhydrite, slightly limy laminated white and brown.

7213-7215 Clear white and very pale yellowish brown, massive and coarsely crystalline anhydrite.

7215-7217 Dark to pale yellowish brown shaly limestone, fine-grained.

7217-7220 Limestone oil-stained, moderate yellowish brown, very fine-grained, granular, good fluorescence and good porosity.

7220-7221 Dolomite very pale yellowish brown to very light gray slightly anhydritic very good porosity no oil stain and no fluorescence.

7221-7224 Limestone, oil-stained and granular as above, good porosity and fluorescence.

7224-7225 Limestone as above with small porosity and permeability little oil stain and weak fluorescence.

7225-7230 Limestone, very light gray to pale yellowish-brown, very fine-grained, slightly granular. Fair porosity and permeability, no stain slightly shaly contains rare small vugs.

7230-7232 Limestone as above with faint fluorescence.

7232-7234 Limestone as above no fluorescence.

7234-7240 Missing.

7240-7250 Abundant dark gray shale, common limestone as above, rare white limestone and anhydrite rare red-brown shale and sandstone.

7250-7260 Shale and limestone as above, with common pale brown medium crystalline fragmental limestone and rare white anhydrite and red shale and sandstone.

7260-7270 Limestone and shale and anhydrite as above.

7270-7280 Shale and granular limestone as above, rare fragmental limestone as above.

7280-7290 Abundant dark yellowish brown to grayish brown medium crystalline fragmental limestone, common granular pale yellowish brown limestone, common dark gray shale, rare anhydrite.

7290-7320 Abundant medium gray shale; rare limestone and anhydrite as above.

7320 Top of Midale equivalent.

7320-7330 Shale and limestone as above, rare dark gray fragmental limestone.

7330-7340 As above.

Core #2 7341-7357

7341-7350 Limestone, dark yellowish brown to grayish brown to dark gray, medium crystalline, slightly fragmental, fossiliferous (rare crinoid fragments) poor porosity, no fluorescence, a dark gray shaly streak at 7342-43.

7350-7353 Limestone, dark gray, very fine crystalline, fossiliferous.

7353-7357 Medium crystalline fragmental and slightly granular limestone as above.

7350-7360 Abundant medium gray shale; common dark gray fine crystalline limestone; rare white limestone and red shale.

7360-7370 As above with rare white anhydrite.

7378 Top of Nesson equivalent

7370-7380 Shale as above, common light gray to white fragmental limestone; rare dark gray limestone as above, very rare white anhydrite.

7380-7390 Abundant pale yellowish brown to light gray to white medium crystalline fragmental limestone; common dark gray limestone and dark gray shale.

7390-7400 Limestone as above; rare dark gray shale.

7400-7410 Limestone as above, fossiliferous (brachiopods?)

7410-7420 As above.
7420-7430 As above with rare dark gray shale.
7430-7440 As above.
7440-7450 As above.
7450-7460 As above.
7460-7470 As above with rare medium gray shale.
7470-7480 Limestone and rare shale as above; with rare pale brown granular limestone.
7480-7490 As above.
7490-7500 As above.
7500-7510 Abundant pale yellow-brown fragmental limestone; common dark gray fragments limestone, rare dark gray shale.
7510-7518 As above.
7518 As above circulation.
7510-7520 Abundant pale yellow-brown to white fragmental limestone, common dark yellow brown to dark gray limestone; common medium gray to dark gray shale, rare red sandstone (cave?).
7520-7530 As above, rare white anhydrite, very rare light brown sub-lithographic limestone.
7530-7540 Yellowish brown limestone and rare shale as above.
7540-7550 As above.
7550-7560 Limestone as above.
7560-7570 As above.
7570-7580 As above.
7580-7590 As above.
7590-7600 Missing.
7600-7610 As above with rare white limy anhydrite.
7610-7620 Limestone and rare anhydrite as above.
7620-7630 Limestone and anhydrite as above; rare white dolomite.
7630-7640 As above.
7640-7650 Very pale yellowish brown fragmental limestone as above; rare white anhydrite; very rare white dolomite and medium gray calcareous sandstone.
7650-7660 As above.
7660-7670 As above with rare medium gray shale.
7670-7680 As above.
7680-7690 Limestone and rare dolomite as above.
7690-7700 As above with common dark gray fragmental limestone.
7700-7710 As above, very light gray to white limestone predominates.
7710-7720 As above.
7720-7730 As above, rare white anhydrite.
7730-7740 Limestone, slightly dolomitic, as above.
7740-7750 As above.
7750-7760 As above.
7760-7770 Very pale yellowish brown fragmental dolomitic limestone, slightly fossiliferous.
7770-7780 As above.
7780-7790 As above.
7790-7800 As above.
7800-7810 As above with very common dark gray limestone and medium gray shale (cave?).
7810-7820 As above with rare white anhydrite.
7820-7830 Missing.
7830-7840 Missing.

7840-7850 Abundant very pale yellowish-brown fragmental dolomitic limestone as above, with common shale cavings.

7850-7860 As above.

7860-7870 As above.

7870-7880 Abundant medium to pale yellowish-brown fragmental and granular dolomitic limestone.

7880-7890 As above.

7890-7900 As above.

7900-7910 As above.

7910-7920 As above.

7920-7930 As above.

7930-7940 As above.

7940-7950 As above.

7950-7960 As above with rare very light gray chert.

7960-7970 As above.

7970-7980 Dolomitic limestone and rare chert as above with rare very pale yellow-brown dolomite.

7980-7990 As above with common dark yellow-brown and dark gray dolomite.

7990-8000 As above, very rare quartz grains.

8000-8010 As above with light bluish gray chert.

8010-8020 Missing.

8020-8030 As above

8030-8040 Abundant dusky yellowish-brown to dark gray fine crystalline dolomite, common pale yellowish brown fragmental dolomitic limestone, rare light bluish gray chert and gray and black shale cavings.

8040-8050 As above.

8050-8060 Abundant dark gray fine-crystalline limy dolomite, rare pale yellow-brown dolomitic limestone, common black and gray shale, rare pale red sandstone.

8060-8070 As above.

8070-8080 As above, rare light bluish-gray chert and white anhydrite.

8080-8090 Very abundant dusky yellowish-brown to dark gray fine crystalline, slightly limy dolomite; rare pale yellowish-brown fragmental limestone, very rare white anhydrite.

8090-8100 As above.

8100-8110 As above.

8110-8120 As above - sample badly caved.

8120-8130 As above but with the yellowish-brown limestone more common.

8130-8140 As above with common light bluish-gray fine-crystalline limestone and very light gray to white fine-crystalline limestone.

8140-8150 Abundant very light gray to white limestone; common yellow-brown sublithographic limestone, rare light bluish gray limestone; rare dark gray dolomite.

8150-8160 As above with abundant dark yellow-brown dolomitic limestone.

8160-8170 As above.

8170-8180 As above with abundant yellow-brown dolomitic limestone and common white limestone.

8180-8190 As above.

8190-8200 As above with very rare pyrite in the dark yellow-brown limestone.

8200-8210 As above with very common yellow-brown to dark gray limestone.

8210-8220 As above.

8220-8230 As above.

8230-8240 Limestone as above; rare white anhydrite.

8240-8250 Missing.
 8250-8260 As above.
 8260-8270 As above.
 8270-8280 As above.
 8280-8290 As above.
 8290-8300 As above.
 8300-8310 As above.
 8310-8320 As above.
 8320-8330 As above.
 8330-8340 Common dark yellow-brown fine crystalline limestone; common dark gray fine crystalline limestone, less common very light gray to white limestone.
 8340-8350 As above.
 8350-8360 Abundant dark yellow-brown limestone as above; very common white limestone as above; rare dark gray limestone.
 8360-8370 As above.
 8370-8380 As above.
 8380-8390 As above with common dark gray limestone.
 8390-8400 As above.
 8400-8410 As above; rare pale green shale.
 8410-8420 As above.
 8420-8430 As above.
 8430-8440 Missing.

 8443 Top of Englewood
 8440-8450 Limestone as above with rare dark gray and medium gray shale.
 8450-8460 Shale dark gray very abundant with common white limestone as above.
 8460-8470 As above with rare dark gray limestone.
 8470-8480 Shale and limestone as above.
 8480-8490 As above.
 8490-8500 As above.
 8500-8510 As above with rare white limy sandstone.
 8510-8520 Common black shale and medium gray shale; common white and yellow-brown limestone as above; rare white limey medium grained sandstone.
 8520-8530 Shale, limestone and sandstone as above.
 8530-8540 As above.
 8540-8550 Very abundant black carbonaceous shale; rare limestone and white sandstone as above.

 8548 Top of Lyleton
 8550-8560 As above.
 8560-8570 Shale and limestone as above, common medium gray sandy shale; very rare pale green shale, rare light pink sucrosic dolomite.
 8570-8580 Shale and limestone as above; common pink dolomite; rare light gray, medium grained sandstone; very rare quartz grains.
 8580-8590 Dolomite, pink, as above; shale and limestone as above, sandstone and green shale as above.
 8590-8600 Dolomite as above with rare pyrite; rest as above.
 8600-8610 Abundant dolomite as above, common light gray granular dolomite, rare light gray medium grained sandstone; common dark gray limestone and shale.
 8610-8620 As above.

8620-8630 As above.
 8630-8640 As above with rare pale green shale.
 8646-8650 As above with red-brown fine grained dolomite.
 8650-8660 As above, very common red-brown dolomite.
 8660-8670 Abundant red-brown dolomite as above; common pink dolomite as above; rare medium gray sandstone; rare pale green sandy shale; common medium gray and dark gray limestone and shale.
 8670-8680 As above.
 8680-8690 As above.
 8690-8700 As above - sample badly contaminated with lost circulation material.
 8700-8710 As above.
 8710-8720 Dolomite, shale, and limestone as above.

 8712 Top of Nisku
 8720-8730 As above.
 8730-8740 Common red-brown sandstone; common pale brown sandstone; common medium gray to dark gray limestone and shale; rare pink dolomite, rare yellow brown limestone; very rare white anhydrite.
 8740-8750 As above.
 8750-8760 As above, sample badly caved.
 8760-8770 As above.
 8770-8780 Dolomite, limestone, sandstone, and shale as above; rare yellowish-brown granular dolomite.
 8780-8790 As above with common yellow-brown granular dolomite.
 8790-8800 Abundant yellowish-brown fine crystalline limestone; rare yellow-brown granular dolomite; common white limestone; rare medium gray shale and dark gray shale and limestone; rare red and pink dolomite.

 8809 Top of "Duperow"
 8800-8810 Missing.
 8810-8820 Yellowish-brown fine-crystalline and granular limestone; rest as above.
 8820-8830 As above.
 8830-8840 As above.
 8840-8850 Very abundant yellow-brown fine-crystalline limestone; rare very pale green or greenish white dolomite; rare white limestone and anhydrite, rare pink dolomite.
 8850-8860 As above with very rare red sandstone and dark gray limestone.
 8860-8870 As above.
 8870-8880 As above but with common dark gray limestone.
 8880-8890 Common dark gray dolomitic limestone; common dark pale brown to pale brown limestone; rare pink dolomite and rare white anhydrite.
 8890-8900 As above.
 8900-8910 Common dark gray and pale brown dolomitic limestone; common very light gray dolomite; rare medium gray and dark gray shale cavings.
 8910-8920 As above with white to very light gray anhydrite.
 8920-8930 Abundant yellow brown limestone and dolomitic limestone, common dark gray limestone; common bluish-white to white anhydrite; rare very dark brown anhydrite.
 8930-8940 As above with rare black shale (cave?).
 8940-8950 Limestone, dolomite, and anhydrite as above with very pale yellow-brown granular limestone.

8950-8960 Abundant pale brown to dark yellow-brown fine crystalline to sub-lithographic limestone; common very pale yellow-brown granular limestone; rare very light gray granular dolomite, rare white and bluish white anhydrite.

8960-8970 As above.

8970-8980 As above with common granular yellow-brown limestone containing rare anhydrite.

8980-8990 As above with very common very pale yellow-brown fine grained limestone.

8990-9000 As above rare white crystalline anhydrite.

9000-9010 As above.

9010-9020 As above.

9020-9030 Limestone, dolomite and anhydrite as above.

9030-9040 Common very dark brown medium crystalline limestone; common pale yellow-brown limestone; common white fine crystalline chalky limestone; rare white crystalline anhydrite; rare dark gray slightly limy sandstone; rare very pale yellow-brown granular dolomite.

9040-9050 As above, rare pale green shaly dolomite and rare dusky blue-green, fine granular dolomite; no dark gray sandstone seen.

9050-9060 Abundant dark brown medium to fine crystalline limestone; common pale yellowish-brown fine-crystalline limestone and very pale yellow-brown to white fine-granular chalky limestone, less common dusky blue green fine-granular dolomite; rare white anhydrite.

9060-9070 As above with less common very pale yellowish brown granular limestone (not the same as the "chalky" limestone above).

9070-9080 As above but with rare dusky blue green dolomite.

9080-9090 Abundant dark yellowish brown fine to medium crystalline limestone; common very pale yellowish brown "chalky" limestone; rare pale yellowish brown granular limestone, very rare dusky blue-green dolomite and white anhydrite.

9090-9100 As above, very rare dark greenish-gray shale.

9100-9110 Dark yellow-brown limestone as above, common pale yellow-brown fine crystalline limestone; common pale yellow-brown granular limestone; rare pale yellow-brown chalky limestone; very rare medium gray limestone and white anhydrite.

9110-9120 As above.

9120-9130 Abundant pale yellow-brown granular dolomitic limestone and pale yellow-brown fine crystalline limestone; common very pale yellow-brown to white chalky limestone; rare dusky yellow-brown fine to medium crystalline limestone; very rare pale yellow-brown fine granular dolomitic limestone; very rare dusky blue-green dolomite.

9130-9140 Missing.

9140-9150 As above.

9150-9160 As above; rare, white anhydrite.

9160-9170 As above.

9170-9180 Abundant pale yellow-brown granular (pseudo-oolitic) dolomitic limestone; common yellow-brown fine crystalline limestone; common very pale yellow-brown fine-granular dolomite; rare light gray to white anhydrite; rare dark gray limestone.

9180-9190 As above.

9190-9200 As above with medium coarse crystalline limy dolomite, vuggy.

9200-9210 As above.

9210-9220 As above with common dark yellowish-brown fine crystalline limestone and common medium gray and dark gray limestone.
 9220-9230 Abundant dark yellow-brown fine crystalline limestone; common granular and "chalky" limestone as above; rare vuggy limy dolomite as above.
 9230-9240 As above.

 9248 Top of Souris River
 9240-9250 As above.
 9250-9260 Abundant pale yellowish brown granular dolomitic limestone; common dark yellow-brown fine crystalline limestone; rare yellow-brown granular dolomite rare white anhydrite.
 9260-9270 As above with rare white vuggy dolomite and rare blue-green dolomite.
 9270-9280 As above.
 9280-9290 As above with common dark gray fine crystalline limestone; no white vuggy dolomite seen.
 9290-9300 Abundant yellowish-brown granular dolomite; common dark gray fine-crystalline limestone; rare very light gray to white "chalky" limestone, rare white anhydrite.
 9300-9310 As above with dark yellowish-brown limestone.
 9310-9320 As above with rare yellowish-brown coarse crystalline limy dolomite.
 9320-9330 As above.
 9330-9340 Common very light gray dolomitic limestone, rest as above.
 9340-9350 Common pale yellow-brown granular limy dolomite; common yellow-brown and dark gray limestone.
 9350-9360 As above.
 9360-9370 Yellowish brown fine crystalline limestone; yellow-brown granular limy dolomite, common dark gray and dark brown limestone; rare white "chalky" limestone, rare bluish white anhydrite.
 9370-9380 As above.
 9380-9390 Abundant dark yellowish-brown fine crystalline limestone; common white chalky limestone, coon yellowish brown granular dolomitic limestone.
 9390-9400 As above.
 9400-9410 As above with common chalky white limestone and common pale yellowish-brown granular dolomitic limestone.
 9410-9420 As above.
 9420-9430 As above; rare chalky limestone.
 9430-9440 As above; very common granular dolomitic limestone, as above; rare medium bluish-gray dolomite.
 9440-9450 As above.
 9450-9460 As above with rare granular dolomitic limestone as above; common medium crystalline yellow-brown limy dolomite.
 9460-9470 Abundant dark yellowish-brown dolomitic limestone; common medium crystalline yellow-brown dolomite with rare vugs filled with white anhydrite; rare white anhydrite.
 9470-9480 As above.
 9480-9490 As above.
 9490-9500 As above; rare medium bluish-gray dolomite.
 9500-9510 As above, common brown granular dolomite.
 9503 As above; common white anhydrite circulation 2 1/2 hours.

9510-9520 Common yellow-brown granular dolomitic limestone, common dark yellow-brown fine crystalline limestone; rare pale yellow-brown dolomite; rare light gray granular limestone; rare white anhydrite.

9520-9530 As above.

9530-9540 As above with common very dark yellow-brown limestone.

9540-9550 As above.

9550-9560 Abundant pale yellow-brown granular limy dolomite, common dark yellowish-brown limestone; very rare white limestone, very rare red-brown dolomite.

9560-9570 Missing.

9570-9580 As above with common white limestone.

9580-9590 Common pale yellow-brown granular limy dolomite; common dark yellow-brown fine crystalline limestone; rare yellowish brown limestone, rare white limestone and white crystalline anhydrite.

9590-9600 Common very pale yellowish-brown finely granular dolomite; common dark yellowish brown medium crystalline dolomitic limestone, common dark gray dolomite; very rare white medium crystalline limestone, very rare white anhydrite.

9598 Top of Dawson Bay

9600-9610 As above, rare iron-staining.

9610-9620 As above.

9620-9630 Abundant dark yellowish-brown medium crystalline limestone; common yellow-brown granular and medium crystalline dolomite and limestone as above; rare white medium crystalline limestone as above, rare white and bluish white anhydrite.

9630-9640 As above.

9640-9650 As above.

9650-9660 As above with white, bluish white; light pink and pale yellowish brown anhydrite.

9660-9670 Limestone and dolomite as above; rare anhydrite.

9670-9680 As above with very rare medium gray dolomite.

9680-9690 As above with much anhydrite.

9690-9700 As above.

9700-9710 Limestone and dolomite as above; rare anhydrite

9710-9720 Abundant dark brown to dark gray limestone; common yellow-brown to medium crystalline limestone; rare white anhydrite.

9720-9730 As above.

9730 Top of Prairie Evaporites

9730-9740 As above with much dark gray limestone some of which is iron-stained.

9740-9750 As above.

9742 Circulation - as above.

9750-9760 Abundant dark yellowish-brown limestone; common yellowish brown medium crystalline limestone; common white anhydrite.

9760-9770 As above.

9770-9780 Abundant yellow-brown fine crystalline limestone; common dark yellowish-brown medium crystalline limestone; rare anhydrite.

9780-9790 As above.

9790-9800 As above.

9800-9810 As above.

9810-9820 Abundant pale yellow brown medium crystalline limestone; common dark yellow brown medium crystalline limestone as above; rare yellow brown granular limestone; rare anhydrite.

9820-9830 As above.

9830-9840 As above.

9840-9850 As above with white and clear salt.

9850-9860 Salt and gray anhydrite, rest as above.

9860-9870 As above.

9870-9880 As above with some red salt.

9880-9890 As above.

9890-9900 As above.

9900-9910 As above.

9910-9920 Abundant salt as above; common dark gray limestone and dolomite; rare pale yellow brown dolomite; common white anhydrite.

9920-9930 As above.

9930-9940 As above.

9940-9950 As above.

9950-9960 As above.

9960-9970 Salt, anhydrite, and limestone as above.

9970-9980 As above with rare medium crystalline yellow brown dolomite.

9980-9990 As above.

9990-10000 Very abundant salt; rare anhydrite; limestone and dolomite as above.

10000-10010 As above.

10010-10020 As above.

10020-10030 As above.

10031 Top of Winnipegosis (caliper log)

10030-10040 Salt as above, very rare dark gray shale; rare dark gray limestone.

10040-10050 Common dark gray medium grained dolomitic limestone, common yellowish brown fine grained dolomitic limestone, common salt and anhydrite as above.

10050-10060 As above.

10060-10070 As above.

10070-10080 Abundant dark yellowish brown medium grained granular dolomite; common pale yellowish brown medium crystalline dolomite; common dark gray limestone; rare white and bluish white anhydrite.

10080-10090 As above.

10090-10100 Dolomite as above, rare dark gray limestone; rare white limestone.

10094 Circulation, as above, rare bluish green dolomite.

10094-10097 As above.

10097-10098 As above.

10100-10110 Dark yellow brown granular dolomite as above; common dark yellow brown medium crystalline limestone; common very pale yellowish brown limestone; rare dark gray limestone, rare white anhydrite.

10110-10120 As above with white salt (cavings).

10120-10130 Abundant dark yellow brown to dark gray medium crystalline limestone; common very pale yellowish brown limestone, rare granular dolomite as above.

10130-10140 Missing.

10140-10150 As above, brachiopods (?) in pale yellow brown limestone.

10150-10160 As above.

10160-10170 As above.

10170-10180 As above.
 10180-10190 As above with dark brown fine crystalline dolomitic limestone.

10194 Top of Ashern
 10190-10200 As above.
 10200-10210 As above.
 10210-10220 As above.
 10220-10230 As above, rare dark gray shale.
 10230-10240 As above.
 10240-10250 As above.

10255 Top of Interlake
 10250-10260 Limestone and rare shale as above.
 10260-10270 Dark gray limestone and shale as above, common very pale orange to white finely granular dolomite, very rare red sandstone.
 10270-10280 As above, less common dusky blue-green limy dolomite.
 10280-10290 As above.
 10290-10300 Abundant very pale orange dolomite as above, common blue-green limy dolomite as above; rare dark pink dolomite; rare dark gray and yellow-brown limestone as above.
 10300-10310 Very abundant pale orange and pink dolomite as above, rest as above.
 10310-10320 As above.
 10320-10330 As above.
 10330-10340 Abundant pale orange dolomite as above; common dusky blue-green dolomite as above; rare dark gray limestone as above; no pink dolomite seen.
 10340-10350 As above.
 10350-10360 As above with common pink dolomite.
 10360-10366 As above (much lost circulation material.)

Core #3
 10366-10369 Dolomite, very pale orange to white and moderate yellowish brown, very fine crystalline.
 10369-10373 Dolomite, light gray to very light gray, oolitic, small vugs lined with limy dolomite crystals.
 10373-10374 Dolomite, limy, light gray and vugular, no oolites.
 10374-10377 Dolomite, moderate yellowish brown, fine crystalline, vugular. Small fractures filled with white dolomite.
 10377-10379 Dolomite, very light gray to white, fine crystalline, rare small vugs.
 10379-10381 Dolomite, moderate yellowish brown, fine crystalline, vugular. Fractures filled with white dolomite.
 10331-10382 Very light gray vugular dolomite.
 10382-10385 Dolomite, moderate yellowish brown, very fine crystalline, rare small stylolites.
 10385-10386 Dolomite, very light gray to white, slightly oolitic, slightly limy.
 10386-10390 Missing.
 10390-10400 Abundant very pale orange dolomite; common dark gray dolomitic limestone, common moderate yellowish brown dolomitic limestone.
 10400-10410 Abundant dark gray dolomitic limestone; common yellowish-brown granular, dolomite; rare pink dolomite; rare white limestone.

10410-10420 Abundant pale yellowish brown dolomite; common dark gray dolomitic limestone as above, rare granular dolomitic limestone; rare pink dolomite and white anhydrite.
 10420-10430 Very abundant pale orange dolomite; rare dark gray limestone and moderate yellowish brown dolomitic limestone.
 10430-10440 As above with rare pink dolomite.
 10440-10450 As above with rare very pale yellow brown vugular dolomite.
 10450-10460 As above.
 10460-10470 As above.
 10470-10480 As above with moderate yellowish-brown dolomite.
 10480-10490 As above with common moderate yellowish brown dolomite.
 10490-10500 As above, rare dusky blue-green dolomite.
 10500-10510 Abundant pale yellowish brown dolomite and very pale orange to white dolomite; very rare dark gray dolomitic limestone.
 10510-10520 As above, rare dark gray shale.
 10520-10530 As above.
 10530-10540 Dolomite as above but medium crystalline.
 10540-10550 As above.
 10550-10560 Dolomite, pale yellowish brown, medium crystalline and granular, small vugs.
 10560-10570 As above.
 10570-10580 As above; very rare white dolomite.
 10580-10590 As above.
 10590-10600 As above.
 10600-10610 As above with common white dolomite.
 10610-10620 As above; very rare dark gray limestone.
 10620-10630 Abundant moderate yellowish brown fine to medium crystalline dolomite.
 10630-10640 As above.
 10640-10650 Abundant very light gray to white, fine to medium crystalline dolomite; rare moderate yellowish brown dolomite.
 10650-10660 As above with common moderate yellowish-brown dolomite.
 10660-10670 As above.
 10670-10680 As above; rare moderate yellowish brown dolomite.
 10680-10690 As above.
 10690-10700 As above, sample badly contaminated.
 10700-10710 White dolomite as above; common pale yellowish brown fine-crystalline dolomite; rare moderate yellowish brown dolomite as above.
 10710-10720 As above.
 10720-10730 As above.
 10730-10740 As above.
 10740-10750 As above.
 10750-10760 As above.
 10760-10770 As above; rare medium gray and dark gray shale.
 10770-10780 Dolomite and rare shale as above.
 10780-10790 As above.
 10780-10800 As above.
 10800-10810 White and very pale yellowish brown fine to medium crystalline dolomite as above, rare moderate yellowish brown dolomite as above.
 10810-10820 As above; very rare pale green dolomite.
 10820-10830 As above.
 10830-10840 As above.

10840-10850 As above, rare dark gray shale.
 10850-10860 As above.
 10860-10370 Abundant white dolomite as above; common pale yellowish brown dolomite and light gray medium crystalline dolomite.
 10870-10880 Abundant slightly limy medium crystalline pale yellowish brown and light gray dolomite as above; common white dolomite as above.
 10880-10890 As above; less common white dolomite.
 10890-10900 As above with dark yellowish brown dolomite and very rare dark yellowish brown limestone.
 10990-10910 As above.
 10910-10920 Abundant dark yellowish brown and dark gray dolomite as above; common moderate yellowish brown dolomite; rare white dolomite.
 10920-10930 As above with rare light gray dolomite.
 10930-10940 As above.
 10940-10950 As above; very rare dark gray shale.

10946 Top of upper Stony Mountain
 10950-10960 Slightly limy dolomite as above.
 10960-10970 Abundant moderate yellowish brown fine to medium crystalline dolomite; common medium gray medium grained dolomite, common pale yellowish brown dolomite.
 10970-10980 As above.
 10980-10990 As above; rare pale yellowish brown finely granular limestone.
 10985 Circulation - 2 hours, abundant yellowish brown fine crystalline and granular limy dolomite, common light gray and light bluish gray dolomite.
 10990-11000 Very abundant yellowish brown fine crystalline limy dolomite; rare dark gray fine crystalline limy dolomite.
 11000-11010 As above with very rare pale yellowish brown limestone and pale red dolomite.
 11010-11020 As above with rare white dolomite.
 11020-11030 Dolomite and rare limestone as above.
 11030-11040 As above.
 11032 Circulation as above.
 11040-11050 Common white limy dolomite; common yellowish brown dolomite, rare yellowish brown limestone; rare dark gray dolomite.
 11047 Circulation - 3 1/2 hours. Abundant yellowish brown limy dolomite as above; common dark yellowish brown and dark gray limy dolomite as above.
 11050-11060 Abundant yellowish brown dolomite as above; common dark gray dolomite as above; common white very fine crystalline limy dolomite.
 11060-11070 As above.
 11070-11080 Abundant yellowish brown finely granular limy dolomite; common dark gray limy dolomite.

Core #4 11085-11146
 11085-11089 Limestone, medium crystalline, tight, yellowish brown, algae and rare small brachiopods, rare fractures filled with black bituminous material, very faint fluorescence.
 11089-11090 Limestone, yellowish brown, fine to medium crystalline, slight porosity.
 11090-11092 Limestone, very light gray, very fine crystalline, fair porosity, rare small vugs, rare algae and fossil fragments, fine fractures containing carbonaceous material.

11092-11097 Limestone, yellowish brown to light gray, fine to medium crystalline, fair to poor porosity, rare algal fragments.

11097-11101 Limestone, dark yellowish brown to dark gray, very fine crystalline, dense.

11100 Top of Lower Stony Mountain.

11101-11113 Limestone, dolomitic, dark gray, shaly, very fine grained, rare brachiopod fragments.

11113-11114 Limestone as above but not dolomitic.

11114-11120 Missing.

11120-11124 Limestone, shaly dark gray very fine crystalline, rare brachiopods.

11124-11126 Limestone, dark gray to dark yellowish brown, fine to medium crystalline, fossiliferous, not shaly.

11126-11128 Limestone, shaly, dark gray, rare brachiopod and echinoderm fragments.

11130 Top of Red River.

11128-11137 Limestone, very slightly shaly, medium gray to dark yellowish brown, rare brachiopods.

11137-11143 Limestone, dark yellowish brown, fine crystalline, poor porosity.

11140-11150 Common yellowish brown granular limy dolomite and dark gray limy dolomite, rare medium gray limestone.

11150-11160 As above, sample badly contaminated.

11160-11170 As above.

11168 Circulation 2 hours.

11170-11180 Dolomite as above and very dark yellowish brown limestone.

11180-11190 As above; common dark yellowish brown dolomitic fine crystalline limestone.

11190-11200 As above, with very rare white anhydrite (core?)

11200-11210 As above with very common dark yellowish brown to dark gray fine crystalline limestone.

11210-11220 As above.

11220-11230 As above.

11230-11240 As above.

11240-11250 Limestone as above with rare very dark gray sublithographic limestone; common very light gray limestone and rare yellowish brown limy dolomite.

11250-11260 Abundant fine crystalline yellowish brown dolomite; common dark yellowish-brown to dark gray fine crystalline limestone; less common white anhydrite rare very light gray limestone.

11260-11270 As above; rare white anhydrite.

11270-11280 Very abundant limy dolomite as above; rare limestone as above.

11280 Circulation 2 1/2 hours; as above.

11280-11288 Limestone, pale yellowish brown, finely granular, moderate yellowish brown dolomite crystals. Oil in vugs, small pores and fractures, the granular oil-bearing limestone includes masses of moderate yellowish-brown medium crystalline limestone that has little or no oil.

11288-11292 Limestone, medium crystalline, yellowish brown, rare white to pale yellowish brown dolomite bands. Little or no oil.

11292-11300 Limestone, yellowish brown, medium crystalline to finely granular small lenses of pale yellowish brown dolomite limestone. Oil in pores, fractures vugs and stylitic seams.

11300-11310 Abundant yellowish brown medium crystalline dolomitic limestone and limy dolomite, good fluorescence, rare dark gray limestone.

11310-11330 As above.

11330-11357 Abundant light to dark yellowish brown, medium crystalline to granular dolomitic limestone with good fluorescence; rare limestone as above.

11357 Circulation 2 1/2 hours. As above.

Core #6 11,359-11,417

11359-11362 Limestone, pale yellowish brown to moderate yellowish brown, fine to medium crystalline, slightly granular, slightly oil stained, faint glow, low porosity.

11362-11371 Limestone, pale yellowish brown, granular with fair porosity with moderate yellowish brown medium crystalline dolomite limestone that has low porosity. No oil staining and no fluorescence.

11371-11374 Limestone, dolomitic, very fine to medium crystalline, rare brachiopods, no glow.

11374-11377 Limestone, pale yellowish brown, granular with moderate yellowish brown dolomitic limestone.

11377-11378 Limestone, moderate yellowish brown, medium crystalline, fair porosity, through several hairline fractures.

11378-11382 Limestone, pale yellowish brown and granular with moderate yellowish brown dolomitic limestone.

11382-11383 Limestone, moderate yellowish brown, fine crystalline, slightly dolomitic fair porosity.

11383-11388 Limestone, pale yellowish brown and granular as above, good porosity, rare small stylolites.

11388-11392 Limestone, slightly dolomitic, moderate yellowish brown, medium crystalline, poor porosity; carbonaceous material in small fractures.

11392-11398 Limestone, granular, pale to moderate yellowish brown with medium crystalline yellowish brown dolomitic limestone.

11398-11400 Limestone as above, small fractures lined with drusy calcite crystals.

11400-11405 Limestone, moderate to pale yellowish brown as above; small fractures lined with calcite (?) crystals and containing carbonaceous material.

11405-11406 Limestone, moderate yellowish brown, medium crystalline.

11406-11408 Limestone, pale yellowish brown, granular; and moderate yellowish brown dolomitic medium crystalline limestone.

11408-11410 Limestone, pale yellowish brown granular; and moderate yellowish brown dolomitic limestone, rare calcite filled fractures; carbonaceous material in rare thin laminae.

11410-11420 Dark to moderate yellowish brown dolomitic limestone with rare pale yellowish brown finely granular limestone.

11420-11430 Abundant dark yellowish brown medium crystalline dolomite; common yellowish brown fine crystalline dolomite; rare dark yellowish brown medium granular dolomite; rare light gray to white dolomitic limestone; very rare white anhydrite.

11430-11440 As above.

11440-11450 Very abundant dark to pale yellowish brown medium crystalline granular limy, dolomite; common very pale yellowish brown to white limy dolomite; black shale and white anhydrite cavings.

11450-11460 Granular dolomite as above; common white fine crystalline limestone.

11460-11470 Dolomite and limestone as above; rare pale yellowish brown fine crystalline limy dolomite.
 11470-11480 As above.
 11480-11490 Medium coarse crystalline dark yellowish brown limestone, rare granular dolomite as above; rest as above.
 11490-11500 As above.
 11500-11510 As above, rare white anhydrite.
 11510-11520 As above.
 11520-11530 As above.
 11530-11540 As above.
 11540-11550 Limestone and rare dolomite as above.
 11550-11560 As above.
 11560-11570 As above.
 11570-11580 Abundant yellowish brown to pale yellowish brown medium to fine crystalline dolomitic limestone as above; rare very light gray limestone as above; rare dolomite as above.
 11580-11590 As above.

 11595 Top of Winnipeg
 11590-11600 As above with common very pale yellowish brown to white fine crystalline argillaceous dolomitic limestone.
 11600-11610 Very abundant pale yellowish brown to white limestone as above; rest as above, very rare dark gray limestone.
 11610-11620 Limestone, as above; very rare dark gray shale.
 11620-11630 As above with common dusky green shale.
 11630-11640 Shale and limestone as above; rare gray shale and very dark gray limestone.
 11640-11650 As above, common white limestone.
 11650-11660 As above.
 11660-11670 Abundant shale as above, common white and yellowish brown limestone as above.
 11670-11680 As above, rare light gray to white fine grained sandstone.
 11680-11690 Shale, limestone and sandstone as above.
 11690-11700 As above with rare coarse grained quartz sandstone.
 11699 Circulation as above.
 11700-11705 Shale and common coarse grained limestone as above; common limestone as above.
 11705-11710 As above.
 11710-11715 Missing.
 11715-11720 Shale and sandstone as above; rare limestone as above.
 11720-11725 As above.
 11725-11730 As above, sandstone and shale as above.
 11730-11735 As above.
 11735-11740 As above.
 11740-11745 Sandstone, shale and rare limestone as above.
 11745-11750 As above; red sandstone cavings as above.
 11750-11755 As above.
 11755-11760 As above.
 11760-11765 As above.
 11765-11770 As above.
 11770-11775 As above.
 11775 As above with rare large quartz fragments.
 11,775 Total depth.