

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 247

Summary of the Amerada Petroleum Corporation

H. H. Shelvick, Tract 1, No. 1
McKenzie County, North Dakota
Well No. 1606 - Permit No. 1618

By Clarence Carlson
February, 1961

The Amerada Petroleum Corporation - H. H. Shelvik, Tract 1, No. 1 well is located in the NE, SW, Section 35, T. 150N., R. 97W., McKenzie County, North Dakota. Elevations: G.L. 2321, K.B. 2334.

The Amerada Petroleum Corporation - H. H. Shelvick Tract 1, No. 1, well was spudded October 24, 1957, drilled to a total depth of 13,305 and completed as a discovery well in the North Fork - Silurian pool on March 7, 1958.

Logs Run:

Laterolog - Gamma Ray
Microlaterolog
Radioactivity

Core Record:

10,945 - 11,003
12,670 - 12,923
13,190 - 13,305

Tests:

DST #1: 7540-7641; 5 hour test; tool opened with weak blow increasing to strong blow in 7 minutes; strong blow for 3 hours then gradually decreasing to fair blow, no gas or fluid to surface. Recovered 500 feet of slightly mud cut water cushion, 450 feet of slightly mud cut very slightly gas cut salt water with scum of brown oil, 4,386 feet of very slightly mud cut salt water, 150 feet of salt crystals. Pressures: IHP 4114, IFP 442, FFP 3209, 30 minute SIP 3462, FHP 4086.

DST #2: 8470-8516; 4 hour test; tool opened with weak blow, decreasing and died in 55 minutes, dead for 1 hour, by-passed fluid, very weak blow for 2 minutes and died, dead for 1 hour, by-passed fluid, no blow, dead for remainder of test. Recovered 1,500 feet of water cushion, 60 feet of slightly gas cut drilling mud. Pressures: IHP 4851, IFP 764, FFP 774, 30 minutes SIP 789, FHP 4828.

DST #3: 9364-9427; 4 hour test; tool opened with weak blow gradually decreasing and died in 1 hour and 5 minutes, dead for 1 hour, by-passed fluid, very weak blow for 5 minutes and died, dead for 1 hour, by-passed fluid, no blow, dead for remainder of test. Recovered 2 feet of free oil, 1,440 feet of slightly muddy water cushion, 430 feet of slightly muddy slightly gas cut water cushion, 43 feet of highly gas cut drilling mud. Pressures: IHP 5241, IFP 892, FFP 920, 30 minutes SIP 2096, FHP 5218.

DST #4: 9430-9486; 4 hour test; tool opened with weak blow gradually decreasing and died in 1 hour and 45 minute, dead 30 minutes, by-passed fluid, no blow, dead 1 hour, by-passed fluid, no blow, dead for remainder of test. Recovered 1,760 feet of water cushion 140 feet of slightly muddy, slightly gas cut water cushion, 30 feet of slightly gas cut drilling mud. Pressures: IHP 5224, IFP 938, FFP 962, 30 minute SIP 1586, FHP 5136.

DST #5: 9482-9560; 4 hour test; tool opened with weak blow gradually decreasing and died in 55 minutes, dead 1 hour, by-passed fluid, no blow, dead 1 hour, by-passed fluid, no blow, dead for remainder of test. Recovered 360 feet of slightly muddy gas cut water cushion, 1,640 feet of water cushion, 35 feet of gas cut drilling mud. Pressures: IHP 5281, IFP 918, FFP 933, 30 minute SIP 1456, FHP 5176.

DST #6: 9560-9627; 5 hour test; tool opened with weak blow, increasing to good blow in 1 hour and 10 minutes, good blow for 2 hours and 20 minutes increasing to strong blow for remainder of test, no fluid or gas to surface. Recovered: 380 feet of water cushion, 720 feet of slightly muddy, highly gas cut water cushion with scum of oil, 900 feet of black sulphurous highly gas cut water cushion, 1350 of black sulphurous highly gas cut salt water. Pressures: IHP 5280, IFP 952, FFP 1541, 30 minute SIP 3789, FHP 5280.

DST #7: 9628-9700; 5 hour test; tool opened with weak blow increasing to strong blow in 10 minutes, strong blow for remainder of test, no fluid or gas to surface. Recovered 810 feet of water cushion, 830 feet of slightly muddy water cushion, 360 feet of black sulphurous, slightly gas cut water cushion, 3670 feet of black sulphurous, highly gas cut salt water. Pressures: IHP 5305, IFP 980, FFP 2685, 30 minute SIP 4090, FHP 5275.

DST #8: 9722-9800; 5 hour test; tool opened with weak blow for 2 hours, gradually decreasing to very weak blow for remainder of test. Recovered 990 feet of water cushion, 650 feet of muddy slightly gas cut water cushion, 660 feet of black sulphurous highly gas cut water cushion, 930 feet of black sulphurous, highly gas cut salt water, 90 feet of black sulphurous, highly gas cut, mud cut salt water. Pressures: IHP 5469, IFP 942, FFP 1456, 30 minute SIP 3909, FHP 5458.

DST #9: 9884-9931; 5 hour test; tool opened with fair blow increasing to strong blow in 3 minutes, strong blow for 3 hours, decreasing to fair blow for 1 hour, weak blow for remainder of test. Recovered 2,000 feet of water cushion with bottom 500 feet slightly gas cut, 7,230 feet of black sulphurous slightly gas cut salt water. Pressures: IHP 5670, IFP 1295, FFP 4655, 30 minute SIP 4680, FHP 5670.

DST #10: 10,940-11,003: 4 hour test; tool opened with weak blow for 50 minutes, died, dead for 1 hour and 10 minutes, by-passed fluid, no blow, dead for 1 hour, by-passed fluid, no blow, dead for remainder of test. Recovered 3,300 feet of water cushion, 200 feet of slightly gas cut water cushion, 40 feet of gas cut drilling mud. Pressures: IHP 6345, IFP 1586, FFP 1606, 30 minute SIP 1761, FHP 6305.

DST #11: 11,212-11,262; 4 hour test; tool opened with weak blow for 1 hour and 45 minutes and died, dead for 1 hour and 15 minutes, by-passed fluid, no blow, dead for 1 hour. Recovered 3,140 feet of water cushion, 360 feet of gas cut water cushion, 95 feet of gas cut drilling mud, 90 feet of gas cut slightly muddy salt water. Pressures: IHP 6600, IFP 1605, FFP 1730, 30 minute SIP 4440, FHP 6480.

DST #12: 11,458-11,540; tool opened with very weak blow gradually decreasing and died in 50 minutes, dead for 1 hour, by-passed fluid, no blow, dead for 45 minutes. Recovered 3,080 feet of water cushion, 270 feet of drilling mud and 450 feet of gas cut drilling mud. Pressures: IHP 6633, IFP 1809, FFP 1879, 10 minute BHP 2830, 20 minute BHP 3490, 30 minute BHP 3904, FHP 6697.

DST #13: 11,528-11,576; 4 hour test; tool opened with fair blow increasing to strong blow in 10 minutes, strong blow for 3 hours and 50 minutes, no gas or fluid to surface. Recovered 4,000 feet of muddy water cushion, 108 feet of drilling mud, 4,350 feet of slightly gas cut slightly mud cut salt water. Pressures: IHP 6825, IFP 1864, FFP 4241, 10 minute BHP 5412, 20 minute BHP 5442, 30 minute BHP 5467, FHP 6825.

DST #14: 11,922-11,966; 4 hour test; tool opened with weak blow for 50 minutes, then died, dead for 2 hours and 10 minutes, by-passed fluid, no blow, dead 1 hour. Recovered 4,000 feet of water cushion, 500 feet of slightly gas cut water cushion, 60 feet of drilling mud. Pressures: IHP 6600, IFP 2055, FFP 2060, 10 minute BHP 3000, 20 minute BHP 3445, 30 minute BHP 3735, FHP 6600.

DST #15: 12,622-12,670; 4 hour test, tool opened with weak blow increasing to fair blow in 50 minutes; fair blow for 3 hours and 10 minutes. Recovered 1,530 feet of muddy water cushion, 3,470 feet of highly gas cut water cushion, unloaded 180 feet of gas cut drilling mud, 180 feet of highly gas cut drilling mud, 1,755 feet of free oil, and 15 feet of black sulphurous salt water. Pressures: IHP 7340, IFP 2345, FFP 2620, 10 minute BHP 4685, 20 minute BHP 5615, 30 minute BHP 5760, FHP 7305.

Casing and Completion:

9 5/8 inch casing set at 4,575 feet with 1,525 sacks of cement.

5 1/2 inch casing set at 13,303 feet with 1,975 sacks of cement.

Perforated interval from 13,152 to 13,232 feet with 4 shots per foot. Acidized with 2,000 gallons of acid. Swabbed 102 barrels of salt water in 16 hours. Set bridge plug at 12,950 feet.

Perforated interval from 12,776 to 12,846 feet with 4 shots per foot. Acidized with 2,000 gallons. Swabbed 105 barrels of salt water in 16 hours. Squeezed with perforations.

Perforated interval from 12,716 to 12,751 feet with 4 shots per foot. Acidized with 2,000 gallons. Swabbed 24 barrels of oil and 298 barrels of salt water in 22 hours. Squeezed perforations.

Perforated interval from 12,651 to 12,686 feet with 4 shots per foot. Acidized with 2,000 gallons. Flowed 66 barrels of oil and 83 barrels of salt water in 15 hours. Squeezed perforations.

Perforated interval from 12,581 to 12,644 feet with 4 shots per foot. Acidized with 2,500 gallons. Swabbed 31 hours, recovered 3 barrels of oil and 54 barrels of basic sediment and water.

Perforated interval from 12,644 to 12,666 feet with 4 shots per foot. Acidized with 2,000 gallons. Swabbed 8 hours, recovered 15 barrels of oil and 62 barrels of basic sediment and water.

Initial Potential:

33 barrels of oil, 17 barrels of water in 20 hours through 16/64 inch choke, GOR 209, gravity 53.6° API. Shut in pressure 2400. Flowing pressure on tubing 150 lbs./sq. in.

Well History:

This well was produced from March 7, 1958 until November 1, 1958 during which time it produced 3,029 barrels of oil and 2,914 barrels of water. The well was abandoned as uneconomical on March 10, 1959. 3,886 feet of 5 1/2 inch casing was pulled and cement plugs were set at:

12,668 to 12,359

4,858 to 4,564

Formation tops were determined from samples and mechanical logs corrected to the radioactivity log. Not all formation tops were called in the following list. Colors are from the rock color chart distributed by the Geological Society of America.

FORMATION TOPS

Cretaceous System	
Greenhorn formation	4522
Mowry formation	4954
Fall River formation	5355
Jurassic System	5750
Piper Limestone	6540
Triassic System	
Spearfish formation	6758
Permian System	
Minnekahta formation	7170
Opeche formation	7206
Pennsylvanian System	
Amsden formation	7450
Mississippian System	
Madison Group	8619
Poplar Interval	8619
Ratcliffe interval	9181
Frobisher-Alida interval	9476
Bakken formation	10,872
Devonian System	
Three Forks formation	10,960
Birdbear formation	11,194
Duperow formation	11,286
Souris River formation	11,714
Dawson Bay formation	11,990
Prairie Evaporite	12,105
Winnipegosis formation	12,340
Silurian System	
Interlake formation	12,586

3500-3650 Shale, medium gray, fissile, soft.
 3650-4070 Shale, medium light gray to medium gray, fissile in part, platy to lumpy in part.
 4070-4100 Shale, medium dark gray, fissile to platy, calcareous, contains "white specks."
 4100-4130 Shale, medium dark gray, fissile.
 4130-4160 Shale, medium dark gray, fissile, calcareous, contains "white specks".
 4160-4190 Shale, as above and shale, medium dark gray, fissile.
 4190-4520 Shale, medium dark gray, fissile.
 4520-4550 Shale, medium dark gray, platy, calcareous, contains "white specks".
 4550-4610 Shale as above, some Inoceramus fragments; some shale, medium dark gray, fissile.
 4610-4640 Shale, medium dark gray, fissile to platy.
 4700-4910 Shale, medium dark gray, platy in part, fissile in part.
 5000-5030 Shale, medium dark gray, platy.
 5030-5040 Shale, medium dark gray, fissile.
 5060-5340 Shale, medium dark gray, fissile, soft.
 5340-5390 Shale, medium dark gray, platy to fissile.
 5390-5470 Sandstone, colorless to white, fine to medium grained, subangular to subrounded, clean quartzose, some siltstone, light gray.
 5470-5480 Shale, light brownish gray, lumpy.
 5480-5510 Shale, light gray to light brownish gray and pale red, lumpy; some sandstone, colorless to white, fine grained, subangular, clean, quartzose.
 5510-5540 Sandstone, colorless to white, fine grained, subangular to subrounded, clean, quartzose, much shale cavings.
 5540-5560 Sandstone, as above; traces of mudstone, very light gray to light brownish gray, lumpy; much medium dark gray shale cavings.
 5560-5650 Some loose fine to medium grained, subangular quartz grains; traces of mudstone and sandstone, as above; much medium dark gray shale cavings.
 5650-5690 Mudstone, light gray to light brownish gray, lumpy; much medium dark gray, fissile shale cavings.
 5690-5810 Mudstone, as above, traces of sandstone, light gray, fine grained, silty; much medium dark gray shale cavings.
 5810-5840 Mudstone, light brownish gray, light gray and dusky yellow 5Y6/4, lumpy, silty in part; traces of light greenish gray, very slightly calcareous siltstone.
 5840-5890 Mudstone, light brownish gray, very light to light gray, light olive gray, 5Y6/1, lumpy; some siltstone, very light gray, calcareous.
 5890-5910 Mudstone, light gray to very light greenish gray, silty, sandy glauconitic, calcareous; a little limestone, very light gray, argillaceous.
 5910-5930 Mudstone, very light gray to light gray and light olive gray, silty, sandy, calcareous.
 5930-5950 Mudstone, as above; some shale, greenish gray 5G6/1, soft, platy to fissile, calcareous.
 5950-5960 Shale, greenish gray 5G6/1, fissile to platy, calcareous.
 5960-5980 Shale, as above; siltstone, very light gray to light greenish gray, calcareous.
 5980-6000 Shale, as above; some sandstone, very light gray, very fine grained, silty, calcareous.

6000-6050 Siltstone, very light greenish gray, calcareous; some shale, greenish gray, 5G6/1, fissile, calcareous.

6050-6110 Sandstone, white to very light gray, very fine to fine grained, calcareous; some shale, as above.

6110-6140 Sandstone, white to very light gray, very fine to fine grained, calcareous, micaceous; siltstone, very light gray, calcareous.

6140-6160 Shale, greenish gray to light greenish gray, fissile, calcareous; siltstone, very light gray, calcareous.

6160-6170 Shale, as above; some sandstone, white to very light gray, very fine grained, grading to siltstone, calcareous; a little limestone, very light gray, very finely crystalline.

6170-6190 Limestone, very light gray, very finely crystalline, cherty, silty; some sandstone and siltstone, as above.

6190-6200 Sandstone, white to very light gray, very fine grained, calcareous, grading to siltstone; shale, olive gray, 5Y4/1, fissile to platy.

6200-6220 Shale, brownish gray, 5YR4/1, to olive gray, 5Y4/1, platy; some sandstone and siltstone, as above.

6220-6250 Siltstone, very light greenish gray to very light gray, calcareous, micaceous; some shale, as above.

6310-6330 Limestone, medium light gray, very finely crystalline, slightly argillaceous.

6330-6340 Limestone, medium light gray to light brownish gray, very finely crystalline, dense, slightly argillaceous.

6340-6350 Limestone, pale red, 5R6/2 to moderate red 5R5/4 and grayish pink, very finely crystalline, dense, argillaceous in part.

6350-6360 Limestone, medium light gray to light brownish gray, very finely crystalline dense, argillaceous; some siltstone, very light gray, calcareous.

6360-6420 Shale, grayish red, 10R4/2, lumpy to platy, brittle, calcareous.

6420-6430 Shale, as above; some limestone medium light gray to light gray, very fine to finely crystalline, dense; some shale, light greenish gray, fissile, calcareous.

6430-6440 Shale, light greenish gray, platy to fissile, calcareous; some limestone, as above.

6440-6450 Limestone, pale red, 5R6/2, finely crystalline, slightly argillaceous, some shale, pale reddish brown, 10R5/4 to moderate red, 5R5/4, platy, calcareous.

6450-6480 Limestone, light gray, very fine to finely crystalline, fragmental; some limestone, light brownish gray, fine grained, granular.

6480-6500 Limestone, grayish pink, finely crystalline, fragmental, some limestone, as above.

6500-6510 Limestone, grayish pink to pale red, very finely crystalline.

6510-6520 Limestone, as above; traces of sandstone, grayish pink, fine to medium grained, rounded, calcareous; some siltstone, very light greenish gray, calcareous.

6520-6530 Sandstone, very light gray, very fine grained, calcareous grading to siltstone.

6530-6540 Sandstone, grayish pink, very fine to fine grained, clean, quartzose, slightly calcareous; some siltstone, very light greenish gray, calcareous.

6540-6550 Shale, pale red, 5R6/2 to moderate red 5R5/4, platy to fissile, calcareous; some limestone, pale red, 5R6/2, finely crystalline, argillaceous.

6550-6560 Limestone, pale red, 5R6/2, very finely crystalline, argillaceous.

6560-6570 Limestone, brownish gray, 5YR4/1, very finely crystalline, dolomitic, very argillaceous.

6570-6590 Limestone, very light gray, finely crystalline, microgranular texture, dolomitic, cherty; some limestone, pale red, as above.

6590-6600 Limestone, very light gray very finely crystalline, dense.

6600-6610 Limestone, pale red to moderate red, very finely crystalline, slightly argillaceous.

6610-6630 Limestone, grayish pink to pale red and moderate red, very finely crystalline, slightly argillaceous.

6630-6660 Limestone, very light gray, very finely crystalline, dense; some limestone, grayish pink, very finely crystalline.

6660-6670 Limestone, as above; siltstone, very light gray and moderate reddish orange, sandy, calcareous.

6670-6690 Shale, pale reddish brown, 10R5/4, fissile to platy, slightly calcareous; some siltstone, pale reddish brown, slightly calcareous.

6690-6700 Shale and siltstone, as above; some dolomite, grayish pink, fine grained, granular, silty.

6700-6710 Shale, pale reddish brown to grayish red, platy, slightly calcareous; traces of colorless to white anhydrite inclusions.

6710-6760 Shale and siltstone, as above; increasing amounts of colorless to white anhydrite.

6760-6780 Siltstone, moderate reddish orange to moderate orange pink, slightly calcareous, micaceous.

6780-6790 Shale, pale reddish brown to moderate reddish orange, lumpy to fissile, very slightly calcareous; some siltstone, as above.

6790-6800 Siltstone, moderate reddish orange to moderate orange pink, slightly calcareous.

6800-6850 Siltstone, as above with scattered medium sand grains.

6850-6870 Siltstone, as above with traces of moderate reddish orange, sandy, siltstone.

6870-6910 Siltstone, moderate, reddish orange, sandy, slightly calcareous; some sandstone, moderate reddish orange, fine to medium grained, rounded, frosted grains, silty, calcareous.

6910-6970 Siltstone, as above; traces of sandstone, as above.

6970-6980 Siltstone, as above, some salt, white to colorless.

6980-6990 Salt, colorless to white, some siltstone, as above.

6990-7020 Salt, white to colorless.

7020-7030 Salt, colorless.

7030-7050 Shale, pale reddish brown, lumpy, silty, calcareous with some salt inclusions grading into argillaceous siltstone.

7050-7180 Siltstone, pale reddish brown, 10R5/4, calcareous, scattered medium, rounded frosted sand grains and traces of white anhydrite.

7180-7190 Limestone, pinkish gray, very fine to finely crystalline, granular in part, dense in part.

7190-7220 Limestone, pale red, 10R6/2, fine to medium, crystalline, granular, slightly silty.

7220-7230 Limestone, pinkish gray to pale red, very fine to fine and medium crystalline, silty.

7230-7250 Siltstone, pale red, 10R6/2, calcareous, some limestone, as above.

7250-7260 Siltstone, moderate reddish orange to pale red, calcareous, traces of colorless salt.

7260-7280 Salt, colorless to pinkish gray; siltstone, moderate, reddish orange, calcareous.

7280-7350 Salt, colorless to pinkish gray.

7350-7400 Salt, some siltstone, moderate reddish orange, calcareous.

7400-7410 Siltstone, pale reddish brown, 10R6/2, calcareous, some salt.

7410-7430 Shale pale reddish brown, 10R6/2, lumpy, calcareous.

7430-7470 Shale, as above, some siltstone, pale reddish brown to moderate reddish orange, calcareous.

7470-7490 Limestone, pinkish gray, finely crystalline, siltstone, as above.

7490-7530 Siltstone, as above; shale, pale reddish brown, 10R6/2, lumpy, calcareous.

7530-7550 Siltstone, moderate, reddish orange, calcareous, with scattered medium, rounded, frosted sand grains.

7550-7590 Siltstone, as above; traces of limestone, very light gray, fine grained, dolomitic; traces of shale, moderate red to pale red and pale reddish brown, lumpy, slightly calcareous.

7590-7600 Sandstone, colorless to pinkish gray, very fine to fine grained, clean, quartzose; much siltstone and shale, as above.

7600-7620 Dolomite, pinkish gray, fine grained, granular, silty, micaceous; traces of sandstone, as above.

7620-7630 Dolomite, pinkish gray, fine to medium grained, granular, silty, micaceous.

7630-7650 Dolomite, pinkish gray to very light gray, fine grained, granular, silty in part, very finely crystalline in part; some sandstone pinkish gray to very light gray, very fine grained, calcareous.

7650-7660 Dolomite, pinkish gray, fine to medium grained, granular, silty, micaceous.

7660-7670 Dolomite, as above; a little shale, moderate pink, 5R7/2 to pale red 10R6/2, fissile.

7670-7700 Dolomite, very light gray to white, finely crystalline; some white chert, traces of shale, pale red 10R6/2, platy, very slightly calcareous.

7700-7720 Shale, moderate red, moderate pink and pale red, platy, very slightly calcareous; some sandstone, white, very fine to fine grained, clean, quartzose.

7720-7740 Dolomite, very light gray to pinkish gray, fine grained, granular, silty; some sandstone, as above.

7740-7750 Sandstone, white, to pinkish gray, very fine to fine grained, clean, quartzose.

7750-7770 Sandstone, as above; some dolomite, white, finely crystalline, with a few "floating" sand grains.

7770-7780 Dolomite, white, very finely crystalline; some shale, pale red, 10R6/2, lumpy, mottled, slightly calcareous.

7780-7810 Dolomite, as above, traces of very light gray chert.

7810-7820 Dolomite, grayish pink to pale red, 5R6/2, very finely crystalline, dense; some shale, moderate red, 5R5/4, lumpy to platy, very slightly calcareous.

7820-7860 Dolomite, very light gray and grayish pink, very finely crystalline, microgranular; traces of shale, as above.

7860-7870 Dolomite, grayish pink, fine grained, granular, silty; some dolomite, as above; some shale, moderate red to pale red, lumpy to platy, slightly calcareous.

7870-7910 Shale, pale red, 5R6/2, dark gray; some limestone, pale reddish brown to grayish red, 10R4/2, fine grained to finely crystalline silty.

7910-7930 Shale, very light gray, light greenish gray, moderate red, fissile, waxy.

7930-7960 Shale, variegated, mostly moderate red, 5R5/4 to pale reddish brown, 10R5/4, platy to fissile.

7960-7990 Shale, mostly dark gray, fissile to platy, some variegated as above.

8000-8010 Limestone, light brownish gray, fine grained, granular, slightly argillaceous; some shale, as above.

8010-8050 Shale, dark gray, fissile.

8050-8060 Limestone, light brownish gray, fine grained, granular to very finely crystalline.

8060-8080 Shale, dark gray to grayish black, fissile to platy.

8080-8120 Shale, mostly dark gray some variegated.

8120-8130 Limestone, very light gray, finely crystalline, silty.

8130-8140 Shale, variegated; limestone, very light gray, fine grained, granular.

8140-8170 Shale, light greenish gray, 5G8/1 to greenish gray, 5G6/1, lumpy to platy, calcareous; some shale, as above; traces of limestone, light gray to light brownish gray, very finely crystalline.

8170-8180 Shale, light greenish gray to greenish gray and pale red, lumpy to platy calcareous.

8180-8190 Shale, variegated, mostly dark gray to grayish black, platy to fissile.

8190-8200 Limestone, very light gray, fine grained, argillaceous; some shale, dark gray, lumpy to platy, very calcareous grading to a shaly limestone.

8200-8220 Shale, dark gray, as above.

8220-8240 Shale, as above; some limestone, light gray, finely crystalline, argillaceous.

8240-8250 Shale, greenish gray, 5G6/1, dark gray, fissile to platy, slightly calcareous; some limestone, light gray, finely crystalline, argillaceous.

8250-8270 Shale, dark gray, greenish gray, and traces of moderate red, platy and splintery.

8270-8290 Sandstone, white to pale red, 5R6/2 very fine to fine grained, slightly calcareous; some shale, pale grayish red, lumpy, compact. Shale, as above.

8290-8300 Shale, variegated, platy and splintery; a little sandstone, as above; traces of lumpy shale, as above.

8300-8320 Shale, variegated, mostly dark gray, platy and splintery.

8320-8330 Sandstone, moderate orange pink, very fine grained, silty, calcareous, some variegated shale.

8330-8340 Siltstone, moderate orange pink, calcareous, some sandstone, as above.

8340-8350 Sandstone, grayish pink, very fine to medium grained, rounded frosted, poorly sorted, firmly cemented, calcareous.

8350-8400 Sandstone, as above; a little siltstone, moderate orange pink, calcareous.

8400-8410 Sample contains colorless salt, probably a misplaced sample.

8410-8450 Sandstone, grayish pink, very fine to medium grained, rounded, poorly sorted, well cemented, calcareous; some siltstone, moderate orange pink, calcareous.

8450-8470 Limestone, very light gray, fine grained, silty; some siltstone, as above.

8470-8516 Limestone, light brownish gray to light gray, fine grained, granular and very finely crystalline, dense; samples generally poor from 8480-8516.

8540-8630 Siltstone, moderate reddish orange, calcareous.
 8630-8780 Salt, colorless; traces of moderate reddish orange siltstone, calcareous.
 8780-8800 Salt, colorless; some siltstone, moderate reddish orange.
 8800-8820 Limestone, very light gray to moderate reddish orange, fine grained, granular, argillaceous.
 8820-8830 Salt.
 8830-8840 Salt; siltstone, pale reddish brown, calcareous.
 8840-8850 Limestone, light brownish gray to light gray, fine grained, granular, argillaceous.
 8850-8860 Salt; traces of limestone, as above with slight oil stain and fair cut with Ccl_4 .
 8860-8870 Salt.
 8870-8880 Salt; traces of limestone, light brownish gray, fine to medium grained, granular, oil stained fair cut with Ccl_4 .
 8880-8890 Siltstone, light gray, calcareous; some limestone, light gray, fine grained, argillaceous.
 8890-8900 Limestone, very light gray, fine grained to oolitic with some inclusions of white anhydrite.
 8900-8940 Salt; some limestone, light brownish gray, fine grained, granular, argillaceous, fair cut with Ccl_4 .
 8940-9010 Salt.
 9050-9070 Limestone, light brownish gray, very finely crystalline.
 9070-9080 Anhydrite, white; traces of shale, brownish gray, lumpy, calcareous.
 9080-9090 Salt.
 9090-9100 Salt; some limestone, light brownish gray, fine grained, granular.
 9100-9110 Anhydrite, white; some dolomite, light gray, very finely crystalline, limy, argillaceous.
 9110-9120 Limestone, light brownish gray, fine grained, granular; a little dolomite, as above.
 9120-9140 Limestone, brownish gray, very finely crystalline, dense.
 9140-9170 Limestone, light brownish gray, fine to medium grained, granular, slightly anhydrite, some very finely crystalline, dense limestone, as above.
 9170-9180 Anhydrite, white; some limestone, as above.
 9180-9190 Anhydrite, white; some limestone, very light gray, finely crystalline, sandy, anhydritic.
 9190-9200 Limestone, light brownish gray, fine grained, granular.
 9200-9210 Salt; some limestone, as above.
 9210-9220 Limestone, light gray to light brownish gray, fine grained, fragmental to finely crystalline, slightly argillaceous.
 9220-9240 Logs indicate salt section; samples contain some limestone, as above, traces of white anhydrite and much variegated shale.
 9240-9270 Salt; some limestone, light brownish gray, fine grained, granular, some oil stain and cut with Ccl_4 .
 9270-928 Limestone, brownish gray, very finely crystalline, slightly anhydritic.
 9280-9300 Limestone, very light gray, very finely crystalline, anhydritic; some limestone, brownish gray, very finely crystalline.
 9300-9315 Limestone, brownish gray to light brownish gray, very finely crystalline.
 9315-9325 Anhydrite, very light gray, dense.
 9325-9340 Limestone, brownish gray to light brownish gray, very finely crystalline dense to fine grained, granular.

9340-9355 Limestone, light brownish gray, fine grained, fragmental.
 9355-9370 Anhydrite, very light gray, dense; some limestone, as above.
 9370-9450 Limestone, light brownish gray to brownish gray, fine grained to finely crystalline, fragmental.
 9450-9485 Limestone, light brownish gray, fine grained, fragmental, slightly argillaceous.
 9485-9505 Limestone, light brownish gray, fine to medium crystalline, fragmental.
 9505-9520 Anhydrite, very light gray; some limestone, as above.
 9520-9525 Limestone, light brownish gray to brownish gray, fine to medium crystalline, fragmental, granular, in part.
 9525-9530 Anhydrite, white to very light gray, slightly calcareous; some limestone as above.
 9530-9540 Limestone, brownish gray, very finely crystalline, dense.
 9540-9550 Anhydrite, very light gray, very slightly calcareous.
 9550-9555 Limestone, light brownish gray, microsucrosic, slightly argillaceous.
 9555-9560 Anhydrite, very light gray; some limestone, as above.
 9560-9575 Limestone, brownish gray, fine to medium crystalline, fragmental, dense.
 9575-9580 Limestone, as above; some anhydrite, very light gray.
 9580-9605 Limestone, light brownish gray, fine to medium crystalline, fragmental, granular, in part.
 9605-9610 Limestone, light brownish gray, fine to medium crystalline, sucrosic in part with good porosity, fragmental in part with fair porosity.
 9610-9615 Limestone, light brownish gray to very light brownish gray, microsucrosic
 9615-9625 Limestone, light brownish gray to very light brownish gray, fine grained, fragmental.
 9625-9635 Limestone, as above; some limestone, light brownish gray, micro-sucrosic slightly argillaceous.
 9635-9650 Limestone, light brownish gray to light gray, fine grained, fragmental, slightly argillaceous.
 9650-9655 Limestone, very light gray, fine grained, fragmental, chalky in part.
 9655-9680 Limestone, light brownish gray, microsucrosic, slightly argillaceous.
 9680-9695 Limestone, light brownish gray, fine grained, fragmental, slightly argillaceous.
 9700-9725 Limestone, very light brownish gray, fine to medium crystalline, fragmental, slightly argillaceous.
 9725-9745 Limestone, light brownish gray, microsucrosic, dolomitic, argillaceous.
 9745-9750 Limestone, light brownish gray, fine grained, fragmental, fossiliferous.
 9750-9790 Limestone, very light gray, fine to medium grained, fragmental, fossiliferous, cherty becoming very cherty from 9775-9790, chert is very light gray, fossiliferous, calcareous.
 9790-9835 Limestone, very light gray, fine to medium grained, fragmental, fossiliferous, very cherty; some limestone, light brownish gray, microsucrosic, slightly argillaceous.
 9835-9850 Limestone, light brownish gray, microsucrosic, dolomitic, argillaceous.

9850-9855 Limestone, very light gray, fine to medium grained, fragmental, fossiliferous.
 9855-9865 Mostly salt cavings; traces of limestone, as above.
 9865-9885 Limestone, light brownish, fine to medium grained, fragmental, fossiliferous; much shale, variegated.
 9885-9900 Limestone, very light gray, fine to medium grained, fragmental fossiliferous.
 9900-9935 Dolomite, light brownish gray, microcrystalline, slightly argillaceous; some limestone, as above.
 9935-9970 Limestone, light gray to light brownish gray, fine to medium crystalline, fragmental, argillaceous.
 9970-10010 Limestone, light gray, fine grained, fragmental, slightly argillaceous.
 10010-10070 Limestone, light gray, fine grained, fragmental, cherty.
 10095-10115 Limestone, light gray, fine grained, fragmental, cherty.
 10115-10140 Limestone, as above; some limestone, medium light gray, very finely crystalline dense, cherty.
 10140-10145 Limestone, light gray, fine grained, granular, cherty.
 10145-10270 Limestone, light gray, fine grained, fragmental, fossiliferous, cherty.
 10270-10285 Limestone, light gray, fine grained and finely crystalline, fragmental, slightly cherty.
 10285-10290 Shale, medium dark gray, lumpy to platy, compact.
 10290-10340 Limestone, light gray, finely crystalline to fine grained, fragmental slightly cherty to very cherty.
 10340-10395 Limestone, brownish gray, very finely crystalline, dense, cherty; some limestone, as above.
 10395-10440 Limestone, light gray, fine grained; fragmental, slightly argillaceous.
 10440-10515 Limestone, light gray to medium gray, finely crystalline, fragmental, cherty.
 10515-10650 Limestone, light gray to medium gray, very finely crystalline, dense, cherty.
 10650-10715 Limestone, light gray, fine grained, fragmental, slightly argillaceous; some limestone, as above.
 10715-10730 Limestone, light gray, fine grained, fragmental, slightly argillaceous; some chert, medium gray to brownish gray.
 10730-10835 Limestone, light gray to medium gray, very finely crystalline, dense, cherty; some chert, medium gray to brownish gray.
 10835-10865 Limestone, light gray, finely crystalline, fragmental, slightly argillaceous.
 10865-10875 Limestone, light gray to medium gray, very finely crystalline, dense.
 10875-10880 Shale, medium dark gray to brownish black, fissile to platy; some limestone, as above.
 10880-10885 Limestone, light gray, finely crystalline, dense, slightly argillaceous.
 10885-10905 Shale, dark gray to brownish black, lumpy to platy.
 10905-10935 Siltstone, light gray to light brownish gray, calcareous.

 Cores 10945-11003
 10945-10965 Shale, dark gray to brownish black, platy (one chip for 20 feet).
 10965-10969 Dolomite, brownish gray, finely crystalline, silty (one chip).

10969-11003 Dolomite, light brownish gray, finely crystalline with thin bands of interbedded greenish gray shale (one chip for 44 feet).

Samples

11010-11045 Dolomite, light brownish gray, finely crystalline, some thin bands of interbedded greenish gray shale, dolomitic.

11045-11055 Siltstone, light brownish gray, calcareous; some greenish gray, calcareous shale.

11085-11110 Shale, greenish gray, calcareous, platy.

11110-11115 Limestone, light brownish gray, medium to coarsely crystalline, sucrosic, dolomitic, silty.

11115-11125 Shale, light greenish gray, platy, dolomitic.

11125-11165 Dolomite, pale reddish brown, fine to medium crystalline, granular, silty; some green shale as above.

11165-11200 Shale, light greenish gray, platy, dolomitic, with some "floating", rounded, frosted sand grains; some grayish red, dolomitic shale.

11200-11205 Limestone, brownish gray, finely crystalline, fragmental, dense.

11205-11240 Limestone light brownish gray, fine grained, granular in part, brownish gray, finely crystalline, fragmental.

11240-11245 Limestone, light brownish gray, fine to medium grained, fragmental.

11245-11260 Limestone, light brownish gray, microsucrosic, silty; some limestone, as above.

11260-11280 Limestone, brownish gray, very finely crystalline, dense.

11280-11305 Limestone, light brownish gray to brownish gray, fine grained, fragmental.

11305-11315 Dolomite, very light gray, finely crystalline; some limestone, as above.

11315-11340 Limestone, light brownish gray to brownish gray, fine grained, fragmental.

11340-11360 Limestone, as above; some limestone, brownish gray, very finely crystalline, dense.

11360-11370 Anhydrite, very light gray, slightly calcareous; some limestone, light brownish gray, fine grained, fragmental.

11370-11380 Limestone, light brownish gray to brownish gray, finely crystalline, fragmental with scattered rounded, "floating" sand grains.

11380-11410 Limestone, very light brownish gray, finely crystalline, fragmental; some limestone, brownish gray, very finely crystalline, dense.

11410-11415 Limestone, brownish gray, very finely crystalline, dense; some limestone, very light brownish gray, finely crystalline, fragmental.

11415-11420 Limestone, very light brownish gray, fine grained, granular.

11420-11465 Limestone, as above; some limestone, brownish gray, very finely crystalline, dense.

11465-11470 Limestone, very light brownish gray, fine grained, fragmental; anhydrite, very light gray.

11470-11485 Limestone, brownish gray, very finely crystalline; some limestone, as above.

11485-11530 Limestone, very light brownish gray to light brownish gray, finely crystalline, dense; some limestone, light brownish gray, microsucrosic.

11530-11545 Dolomite, light brownish gray, microsucrosic, silty slight stain and cut with Ccl_4 in samples from 11540-11545.

11545-11605 Dolomite, light brownish gray, fine to coarsely crystalline, dense in part, sucrosic in part.

11605-11625 Dolomite, as above; some limestone, light brownish gray, to brownish gray, very finely crystalline, dense.

11635-11640 Dolomite, very light brownish gray, fine grained, granular, slightly silty.

11655-11670 Limestone, light brownish gray to brownish gray, very fine to finely crystalline; some anhydrite, very light gray.

11670-11680 Limestone, very light brownish gray, fine grained, granular, silty, dolomitic.

11680-11685 Limestone, very light gray, finely crystalline, granular texture and limestone, as above.

11685-11695 Dolomite, very light brownish gray, fine to medium crystalline, dense in part, sucrosic in part, limy.

11695-11705 Dolomite, as above; some limestone, brownish gray, very finely crystalline, dense.

11705-11740 Limestone, brownish gray, very finely crystalline, dense.

11740-11755 Limestone, light gray to very light brownish gray, fine grained, granular; some limestone, as above.

11755-11780 Dolomite, light brownish gray, fine grained, granular, limy.

11780-11825 Limestone, brownish gray, very finely crystalline, dense; some limestone, very light brownish gray to light brownish gray, fine grained, granular.

11825-11835 Limestone, very light brownish gray, fine grained, granular, dolomitic.

11835-11845 Limestone, brownish gray, very finely crystalline, dense.

11845-11870 Limestone, very light brownish gray to brownish gray, fine grained, dolomitic, granular; some limestone, as above.

11870-11875 Limestone, light gray, finely crystalline, slightly argillaceous.

11875-11885 Limestone, very light brownish gray, fine grained, granular, limy; some limestone, very light gray, finely crystalline.

11885-11895 Limestone, brownish gray, very finely crystalline, dense.

11895-11900 Dolomite, light brownish gray, fine grained, granular, limy; some limestone, as above.

11900-11920 Limestone, brownish gray, very finely crystalline, slightly argillaceous some dolomite, as above.

11920-11925 Limestone, very light brownish gray, fine grained granular, slightly argillaceous; some dolomite, as above.

11925-11935 Limestone, very light brownish gray, finely crystalline, contains a few scattered "floating" medium sand grains.

11935-11945 Limestone, very light brownish gray, very finely crystalline, dense.

11945-11980 Limestone, light gray, fine grained, granular, dolomitic slightly silty.

11980-11995 Dolomite, brownish gray, fine to medium crystalline, granular, silty.

11995-12070 Limestone, brownish gray, very finely crystalline, dense.

12080-12085 Limestone, brownish gray, very finely crystalline, dense.

12085-12100 Limestone, very light brownish gray, fine grained, granular, silty; some limestone, as above.

12100-12165 Salt, colorless; with traces of moderate reddish orange siltstone and shale.

12165-12175 Salt, colorless; some siltstone, moderate reddish orange to pale brown.

12175-12260 Salt, colorless; traces of moderate reddish orange siltstone.

12260-12275 Limestone, medium gray, finely crystalline, anhydritic, slightly argillaceous; a little anhydrite, white, a little shale, medium gray, fissile to platy.

12275-12295 Limestone, light gray, fine grained, slightly argillaceous.

12295-12320 Dolomite, very light brownish gray, fine grained, granular, slightly argillaceous, limy.

12320-12340 Limestone, brownish gray, very finely crystalline, dense; some dolomite as above.

12340-12390 Limestone, light gray to light brownish gray, fine grained, argillaceous, fragmental, fossiliferous.

12390-12445 Limestone, as above; some limestone, brownish gray, very finely crystalline.

12445-12465 Limestone, very light brownish gray, fine grained, granular, silty.

12465-12490 Limestone, medium gray, finely crystalline, argillaceous and fine grained, granular.

12490-12495 Limestone, very light brownish gray, fine grained, granular, silty.

12495-12540 Limestone, medium gray, finely crystalline, argillaceous; some limestone, as above.

12540-12570 Limestone, very light brownish gray, fine grained, granular, argillaceous; some limestone, medium gray, finely crystalline, argillaceous.

12570-12580 Dolomite, pale red, 10R6/2 to moderate orange pink, 10R7/4, fine grained, granular, argillaceous; some limestone, as above.

12580-12585 Dolomite, light gray, fine grained, limy, argillaceous; some reddish dolomite, as above.

12585-12590 Dolomite, light gray, fine grained, granular, limy, argillaceous.

12590-12595 Dolomite, as above; traces of dolomite, pale red to moderate reddish orange, fine grained, argillaceous.

12595-12600 Dolomite, grayish pink, 5R8/2, fine to medium crystalline, granular, silty.

12600-12610 Dolomite, moderate orange pink, fine to medium crystalline, fair pinpoint porosity.

12610-12615 Dolomite, very light gray, very finely crystalline, dense; some dolomite, as above.

12615-12630 Dolomite, very light gray to light brownish gray, very finely crystalline, dense.

12630-12640 Limestone, light brownish gray, very finely crystalline, dense; some limestone, light yellowish gray, finely crystalline.

12640-12650 Dolomite, light yellowish gray, finely crystalline, limy, slight pinpoint porosity.

12650-12655 Dolomite, as above; traces of sandstone, light yellowish gray, fine to medium, rounded, frosted grains, dolomitic cement.

12655-12660 Limestone, light yellowish gray, finely crystalline some vuggy porosity, scattered black staining, slight cut with CCl₄.

12660-12665 Limestone, light yellowish gray, finely crystalline, fragmental with some scattered sand grains, some vuggy porosity, scattered staining, slight cut with CCl₄.

12665-12670 Limestone, light yellowish gray, finely crystalline dolomitic, good oil stain and cut with CCl₄.

Core

12670-12680	Dolomite, light gray, finely crystalline, pinpoint porosity, limy.
12680-12685	Limestone, light gray, finely crystalline, fragmental, to pseudoolitic slight staining and cut with Ccl_4 .
12685-12690	Limestone, light gray, finely crystalline, fragmental, slight staining along fractures, thin bedded.
12690-12695	Dolomite, very light brownish gray, finely crystalline, limy, pinpoint porosity.
12695-12700	Dolomite, light gray, finely crystalline, fair pinpoint porosity.
12700-12705	Limestone, very light brownish gray, very finely crystalline, dense.
12705-12710	Limestone, white, chalky, with scattered medium crystals.
12710-12720	Limestone, light gray, finely crystalline, slight pinpoint porosity.
12720-12725	Limestone, light gray, very finely crystalline, dense.
12725-12730	Limestone, medium light gray, finely crystalline, fragmental, scattered spotty stain.
12730-12735	Limestone, conglomerate, medium light gray, light gray to light brownish gray, very finely crystalline fragments in a finely crystalline matrix.
12735-12740	Limestone, light gray, finely crystalline, fragmental.
12740-12750	Limestone, very light brownish gray, finely crystalline, vuggy, black stain lining vugs.
12750-12755	Limestone, white, finely crystalline; fair pinpoint porosity, slightly dolomitic.
12755-12765	Limestone, light gray, very finely crystalline, dense.
12765-12770	Limestone, medium gray, very finely crystalline, dense.
12770-12773	Limestone, very light brownish gray, very finely crystalline, dense.
12773-12783	Limestone, light brownish gray, very finely crystalline dense with scattered medium to coarse crystals of colorless calcite.
12783-12798	Dolomite, very light brownish gray, very finely crystalline, dense, limy.
12798-12803	Limestone, very light brownish gray, finely crystalline, fragmental fair pinpoint porosity.
12803-12808	Limestone, very light brownish gray, very finely crystalline, dense.
12808-12813	Limestone, very light brownish gray, finely crystalline, micro-granular, some staining and poor to fair cut with Ccl_4 .
12813-12818	Dolomite, light brownish gray, very finely crystalline, limy, vuggy but vugs have been filled with colorless anhydrite.
12818-12823	Limestone, light brownish gray, composed of rounded fragments of finely crystalline limestone in a very finely crystalline matrix; limestone, very light gray to white, finely crystalline, dolomitic good pinpoint porosity.
12823-12828	Limestone, very light gray to white, finely crystalline, dolomitic, pinpoint porosity.
12828-12833	Limestone, light gray, very finely crystalline, dense.
12833-12838	Limestone, brownish gray, very finely crystalline fragments in a fine to medium crystalline matrix, slight vuggy porosity, fair oil stain.

12838-12843 Dolomite, light brownish gray, very finely crystalline, limy, vuggy but vugs are mostly filled with colorless anhydrite; limestone, white to very light gray, finely crystalline fragmental, pinpoint porosity, slight oil stain and cut with CCl_4 .

12843-12868 Limestone, very light gray, finely crystalline, dolomitic, pinpoint porosity.

12868-12873 Limestone, very light brownish gray, very finely crystalline, dense.

12873-12878 Limestone, very light gray to white, finely crystalline, fragmental pinpoint porosity.

12878-12883 Limestone, brownish gray, very fine to finely crystalline, some white to very light gray mottling, dolomitic.

12883-12884 Limestone, very light gray, finely crystalline, dolomitic, pinpoint porosity.

12884-12888 Limestone, light brownish gray, finely crystalline, fragmental.

12888-12898 Limestone, light brownish gray, very finely crystalline, dense.

12898-12903 Limestone, light brownish gray, finely crystalline, fragmental, slightly vuggy.

12903-12908 Limestone, very light gray, finely crystalline, pinpoint porosity.

12908-12918 Limestone, very light gray, finely crystalline, fragmental, good pinpoint porosity.

12918-12923 Limestone, very light gray, finely crystalline, good pinpoint porosity.

Samples

12923-12950 Dolomite, very light gray, finely crystalline, limy; some dolomite, brownish gray, very finely crystalline, slightly vuggy, limy.

12950-12965 Limestone, light gray to very light brownish gray, finely crystalline, fragmental, dolomitic; some dolomite, brownish gray, very finely crystalline, limy.

12965-12980 Dolomite, light brownish gray, very finely crystalline, dense, limy.

12980-12985 Dolomite, very light brownish gray, very finely crystalline, dense.

12985-12990 Dolomite, very light brownish gray to light brownish gray, finely crystalline, limy, oil stained, fair cut with CCl_4 .

12990-13085 Dolomite, light gray to very light brownish gray, very finely crystalline, dense.

13085-13090 Dolomite, very light gray, finely crystalline, slight intergranular porosity; some dolomite, as above.

13090-13095 Dolomite, brownish gray, finely crystalline, silty.

13095-13110 Dolomite, as above and dolomite, light brownish gray, very finely crystalline, dense.

13110-13120 Sandstone, light gray, fine to medium, rounded grains, firmly cemented with dolomitic cement; some dolomite, as above.

13120-13130 Dolomite, very light brownish gray, finely crystalline; some sandstone, as above.

13130-13160 Dolomite, very light brownish gray, finely crystalline, dense.

13160-13190 Dolomite, light yellowish gray, very finely crystalline, dense, a little chert, colorless to light yellowish gray.

Cores

13190-13200	Dolomite, grayish orange, very fine to medium crystalline, slight vuggy porosity, slight oil stain.
13200-13215	Dolomite, light brownish gray, very fine to finely crystalline, dense, scattered light oil stain.
13215-13220	Dolomite, light brownish gray, very fine to medium crystalline, vuggy, good oil stain.
13220-13229	Dolomite, very light brownish gray, very finely crystalline, dense, some slight staining.
13229-13234	Dolomite, light brownish gray, very fine to finely crystalline, tight, some oil stain.
13234-13239	Dolomite, very light brownish gray, finely crystalline, tight.
13239-13243	Dolomite, light brownish gray, very fine to coarsely crystalline, slight vuggy porosity, some oil stain.
13243-13264	Dolomite, very light brownish gray, finely crystalline, tight.
13264-13267	Dolomite, light brownish gray, very fine to medium crystalline, vuggy with most of the vugs having been filled with chert.
13267-13290	Dolomite, grayish orange, very finely crystalline, dense.
13290-13303	Dolomite, light brownish gray, very fine to finely crystalline, dense.