Summary of the Shell Oil Co. & Northern Pacific R.R. Co. - N. P. #42-21
Billings County, North Dakota
Well No. 2294 - Permit No. 2306

by Herbert A. Mendoza
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The Shell Oil - Northern Pacific, N. P. #42-21, located SE 1/4, NE 1/4, Section 21, T. 141N., R. 100W., Billings County, North Dakota. Elevation of K.B. 2668 feet; ground level 2652 ft.

The well was spudded April 30, 1959 and drilled to a depth of 9719 feet, plugged and abandoned as a dry hole on June 18, 1959.

Logs Run:
Laterolog
Microlaterolog
Gamma-ray Neutron

Core Record: None

Tests:
DST #1: 9280-9340 (Mission Canyon). Open 2 1/2 hours. S.I. 1 3/4 hours. Recovered 23.8 barrels mud and 0.2 barrels muddy water. Max. salinity 208,000 ppm. Min. salinity 190,000 ppm. Mud before test 202,000 ppm. FP 155-602, (no ISIP), FSIP 3821, MCP 5143.

DST #2: 9500-9566 (Mission Canyon - straddle test). Open 3 hours. S.I. 1 3/4 hours. Recovered 2.7 barrels mud, and 1.1 barrels slightly mud cut water. Min. salinity 130,000 ppm. Mud before test 185,000 ppm. FP 65-255, ISIP 4200, FSIP 4030, MCP 5255.

Casing Record:
Surface casing at 822' w/550 sacks 1-1 Pozmic and regular cement, 3% CaCl₂

Plugging Record:
#1 9400-9200 with 50 sacks of cement
#2 8620-8530 with 25 sacks of cement
#3 8420-8220 with 50 sacks of cement
#4 6700-6600 with 50 sacks of cement
#5 5670-5470 with 100 sacks of cement
bottom surface casing 825-725 with 50 sacks of cement
top surface casing with 10 sacks of cement

Formation tops were determined by samples and mechanical logs. Color names used are those of the National Research Council Color Chart.
FORMATION TOPS

Cretaceous System

Pierre formation 1885
Niobrara formation 4060
Greenhorn formation 4642
Mowry formation 5165
Fall River formation 5555

Jurassic System

Piper limestone 6619

Triassic System

Spearfish formation 6730

Permian System

Minnekahta formation 7310
Opeche formation 7348

Pennsylvanian System

Minnelusa formation 7701
Amsden formation 7830

Mississippian System

Big Snowy group
Heath formation 8164
Kibbey sandstone 8502
Kibbey “lime” 8552

Madison group
Poplar interval 8705
Ratcliffe interval 9087
Midale sub-interval 9303
Frobisher-Alida interval 9355

0-120 Shale, medium light gray, soft, blocky, silty.
120-240 Shale as above, common lignite, brownish black.
240-450 Shale as above, rare siltstone, medium light gray to light brown (5YR6/4), fine grained, well cemented, common to abundant lignite, vitreous.
450-540 Lignite, grayish black to black, vitreous, partly sub-bituminous.
540-750 Lignite as above, abundant sandstone, medium light gray, fine grained, well cemented.
750-810 Sandstone, medium light gray, medium to coarse grained, loosely cemented, abundant quartz grains, clear to frosted, subrounded, common lignite.
810-1220 Surface casing cement cavings.
1220-1250 Sandstone, light gray, fine grained, well cemented, limy, common clay aggregate.
1250-1370 Sandstone as above, abundant lignite.
1370-1430 Cement cavings.
1430-1520 Sandstone, medium light gray, fine grained, well cemented, calcareous, common shale, medium gray, platy, common lignite.
1520-1700 Sandstone as above, glauconitic, abundant clay aggregates.
1700 Sandstone as above, common shale, medium light gray, silty, common aragonite.
1730-1880 Shale, medium light gray, carbonaceous to silty, common bentonite, light gray, spongy.
Pierre 1885
1880-2000 Same as above, common sandstone, light gray, medium grained, glauconitic, limy.
2000-2030 Sandstone, light gray to pale brown (5YR5/2), fine grained, well cemented.
2030-2090 Shale, medium light gray, spongy, silty, common sandstone, light gray, fine grained, loosely cemented, common quartz grains.
2090-2180 Cavings.
2180-2240 Shale, medium light gray, spongy, common sandstone, light gray, fine grained, calcareous.
2240-2300 Cement cavings.
2300-3410 Shale, medium light gray, silty, common fragments of limestone concretions.
3410-4100 Shale, medium dark gray, platy, rare limestone, olive gray (5Y4/1), fine crystalline, dense, rare calcite prisms, rare bentonite, light gray, soft.
4100-4300 Shale as above, rare white specks and calcite prisms, common shell fragments.
4300-4330 Shale as above, common bentonite, very light gray, shell fragments, rare calcite prisms.
4330-4360 White specks, little shale as above
4360-4540 Shale, medium gray, platy, soft, rare bentonite.
4540-4640 Shale, dark gray to medium gray, platy, rare white specks, common pyrite, euhedral.

Greenhorn 4642
4640-4680 Shale, dark gray, platy to splintery, common white specks and calcite prisms.
4680-4800 Shale as above, abundant white and calcite prisms.
4800-4880 Shale, dark gray, platy, common calcite prisms and white specks.
4880-5150 Shale, black, platy, rare calcite prisms.
5150-5300 Shale as above, rare bentonite, light bluish gray (5B7/1), soft.
5300-5350 Same as above, rare sandstone, medium light gray, fine grained, well cemented.
5350-5720 Shale, black, platy to splintery, common pyrite, amorphous to euhedral, common sandstone, light to medium light gray, fine to medium grained, well cemented, quartzose.
5720-5780 Shale, black, platy, soft, common sandstone, greenish gray (5GY6/1), fine to medium grained, loosely to well cemented, glauconitic.
5780-5820 Shale, black to moderate red (5R4/6), platy to blocky, soft, common sandstone as above, common siderite pellets.
5820-5930 Shale, black, platy, abundant sandstone, very light gray to greenish gray (5GY6/1), fine grained, well cemented, common siderite pellets.
5930-5950 Sandstone, light greenish gray (5G8/1), fine grained, glauconitic, well cemented, common shale, black, splintery.
5950-6030 Shale, black to variegated, soft, common sandstone as above.
6030-6050 Shale, grayish black to medium dark gray, soft, rare sandstone as above.
6050-6150 Shale, dark gray to variegated, soft to soapy, common sandstone, light gray, fine grained, well cemented.
6150-6180 Shale, greenish gray (5G6/1) to dark gray, soft, platy, rare sandstone as above.
6180-6220  Shale as above, abundant sandstone, greenish gray (5GY6/1) to light gray, fine grained, well cemented, quartzose.
6220-6240  Sandstone and shale as above.
6240-6350  Shale, black to greenish gray (5G6/1), soft, soapy, sandstone, light grained, fine grained, quartzose, well cemented.
6350-6400  Cavings.
6400-6520  Shale, dark gray to greenish gray (5G6/1), soft, platy, rare sandstone as above.
6520-6550  Shale, greenish gray (5G6/1) to dark gray, soft, common sandstone, white to very light gray, fine grained, limy.
6550-6630  Shale and sandstone as above, rare limestone, very light gray with black streaks, fine to medium crystalline, dense to grainy.
6630-6690  Shale, greenish gray (5G6/1), platy, rare sandstone, greenish gray (5GY6/1), fine grained rare limestone, light brownish gray (5YR6/1), fine crystalline, calcitic to dense.
6690-6730  Shale dark greenish gray (5GY4/1) to dark gray to moderate red (5R4/6), soft, common limestone as above.

Spearfish 6730
6730-6750  Same as above, rare anhydrite, white, grainy.
6750-7270  Siltstone, moderate red (5R4/6), fine grained, argillaceous, calcareous, common shale, greenish gray to dark gray as above, rare anhydrite, white, rare quartz grains, rounded, clear, rare to common selenite, clear euhedral.
7270-7310  Shale, greenish gray (5G6/1) to medium gray, soft, rare siltstone as above, rare bentonite, light bluish gray (5B7/1), soft, spongy.

Minnekahta 7310
7310-7320  Same as above.
7320-7350  Limestone, grayish pink (5R8/2), fine crystalline, grainy.

Opeche 7348
7350-7380  Limestone as above.
7380-7405  Limestone as above, common siltstone, moderate red (5R4/6), fine grained, argillaceous, anhydritic, slightly calcareous.
7405-7440  Cavings.
7440-7700  Siltstone, moderate red (5R4/6), fine grained, common shale, medium dark gray, platy, common anhydrite, white, grainy, common limestone, cavings.

Minnelusa 7701
7700-7760  Same as above.
7760-7790  Siltstone as above, common anhydrite and selenite, common sandstone, grayish pink (5R8/2), fine grained, well cemented, quartzose, rare limestone, pale yellowish brown (10YR6/2) to pale red (5R6/2), fine crystalline, dense.
7790-7805  Siltstone as above, cavings (?), anhydrite, white, rare limestone as above rare dolomite, pale red (5R6/2), fine crystalline, dense, common sandstone as above.
7805-7830  Siltstone cavings (?), common limestone, pale red (5R6/2), fine crystalline, dense, common sandstone, grayish pink (5R8/2) to white, fine grained, quartzose.
Amsden 7830

7830-7935 Siltstone cavings (?), common limestone mottled pale red (5R6/2) to grayish pink (5R8/2), finely crystalline, dense, rare sandstone as above.

7935-8005 Limestone, light brownish gray (5YR6/2) to mottled pale red (10R6/2), fine crystalline, dense, common shale and siltstone cavings (?).

8005-8060 Same as above, common dolomite, grayish orange pink (5YR7/2), cryptocrystalline, cherty.

8062 Circulation.

8060-8065 Cavings.

8065-8080 Limestone and dolomite as above.

8080-8130 Limestone, grayish orange pink (5YR7/2) to mottled pale red (10R6/2), fine crystalline, dense, common dolomite, yellowish gray (5Y7/2), cryptocrystalline, common anhydrite, pale red (10R6/2), calcareous.

8130-8165 Same as above, common dark gray shale.

Heath formation 8164

8165-8190 Same as above.

8190-8225 Limestone, medium light gray, fine crystalline, dense, common shale, black, calcareous, petrolierous, good cut, common ostracods.

8225-8230 Cavings.

8230-8240 Shale, medium dark gray to dark gray, common limestone, medium gray to brownish gray (5YR4/1), fine crystalline, dense, common ostracods, common sandstone, grayish pink (5R8/2), fine grained, well to loosely cemented, quartzose.

8240-8270 Same as above, abundant lost-circulation material.

8270-8320 Sandstone, white to pale red (5R6/2), fine grained, quartzose, common shale, dark gray, common limestone, medium light gray to brownish gray (5YR4/1), fine crystalline to sublithographic, abundant moderate red siltstone, cavings (?).

8320-8375 Limestone, yellowish gray (5Y7/2), fine crystalline, dense calcitic, common shale, dark gray to greenish gray (5G6/1), waxy, and siltstone cavings (?).

8375-8500 Limestone, yellowish gray (5Y7/2) to medium light gray, dense, common shale as above, rare to common sandstone, pale red (5R6/2), to white, fine grained, well cemented, quartzose, common moderate red siltstone cavings (?).

Kibbey sandstone 8502

8500-8550 Sandstone, pale red (5R6/2), fine grained, well cemented, calcareous, shale and siltstone as above, rare limestone as above.

Kibbey 8552

8550-8570 Same as above.

8570-8615 Sandstone, yellowish gray (5Y7/2) to pale red (5R6/2), fine grained, common limestone, pale yellowish brown (10YR6/2), fine crystalline, dense.

8615-8705 Limestone, dark yellowish brown (10YR4/2), finely crystalline, dense to vuggy, common sandstone as above, common anhydrite, white.
Madison Group 8705

8705-8750  Same as above.
8750-8915  Cavings.
8915-8985  Limestone, medium light gray to brownish gray (5YR4/1), fine crystalline, dense to vuggy, abundant red siltstone and dark gray shale cavings (?), common anhydrite, white.
8985-9125  Limestone, yellowish gray (5Y7/2) to pale yellowish brown (10YR6/2), fine crystalline, dense to vuggy to pseudo-oolitic, slightly dry oil-stained, no cut, common anhydrite, white, grainy.
9125-9275  Limestone, pale brown (5YR5/2) to pale yellowish brown (10YR6/2), fine to medium crystalline, dense to vuggy, common anhydrite, white to medium bluish gray (5B5/1), dense to grainy, slightly calcareous, common quartz grains, rounded, clear.
9275-9305  Limestone as above, slightly oil-stained, no cut, anhydrite as above. DST #1 between 9280-9340 no oil recovered.
9305-9325  Limestone as above, weak fluorescence, very weak cut.
9325-9350  Limestone, dark yellowish brown (10YR4/2), fine crystalline, calcitic, dense to vuggy, common dolomite, medium light gray, cryptocrystalline, cherty, common anhydrite, white to medium bluish gray (5B5/1), dense.
9350-9365  Cavings (?).
9365-9445  Limestone, dusty yellowish brown (10YR2/2), fine crystalline, dense, common quartz grains, rounded, clear to frosted, common anhydrite, medium light gray, dense.
9445-9485  Limestone, pale yellowish brown (10YR6/2), finely to medium crystalline, dense to pinpoint porous, common anhydrite, light bluish gray (5B7/1), dense, slightly calcareous.
9485-9625  Limestone, pale yellowish brown (10YR6/2) to dusky yellowish brown (10 YR 2/2), finely crystalline, dense, common anhydrite as above. DST #3 9500-66 no oil recovered.
9625-9715  Limestone as above, slightly oil-stained, no cut, common anhydrite, light bluish gray (5B7/1) to moderate orange pink (5YR8/4), dense, slightly calcareous.
9715-9719  Circulation.
9719  Total depth.