

NORTH DAKOTA GEOLOGICAL SURVEY CIRCULAR NO. 227

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  
February 1960

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 muddy 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% Ca Cl<sub>2</sub>

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	5972
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.

6550-6560 Shale and sandstone as above, rare limestone, very light gray with black streaks, fine to medium crystalline, dense to grainy.

6560-6630 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.

6630-6690 Shale and sandstone as above, common limestone, yellowish gray (5Y7/2), to light brownish gray (5YR6/1), fine grained, dense to vuggy.

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, petroliferous, 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.