

Operator: Pennzoil United, Inc.
 Farm: Bertha Smith
 Well No.: 1
 Location: Highland County
 900' S of 38°25')
 1900' W of 79°20') approximate
 Elevation: 2400.7' Ground
 Total Depth: 3980'
 Drilling Commenced: February 8, 1969
 Drilling Completed: March 5, 1969
 Result: Dry hole
 Geologic Log: Charles G. Hagegeorge

Geologic Log

<u>Depth</u>	<u>Interval</u>	<u>Description</u>
0-300	300	No sample
300-390	90	Siltstone, light to dark gray, moderately hard, locally poorly fissile, argillaceous siliceous with abundant mica. Local stringers of fine grained carbonate, and some tan shale
390-400	10	Siltstone, light to dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous with abundant stringers of tan shale
400-410	10	Siltstone, light to dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous with abundant mica. Local stringers of carbonate and some tan shale
410-420	10	Siltstone, dark gray, moderately hard, siliceous, argillaceous with abundant mica
420-430	10	Siltstone, light gray, moderately hard, locally poorly fissile, siliceous, argillaceous with local stringers of calcite
430-470	40	Siltstone, dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous, abundant mica

470-480	10	Siltstone, dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous, abundant mica and local stringers of calcite (fracture fillings?)
480-800	320	Siltstone, light to dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous and micaceous. Carbonate stringers. Some iron staining
800-820	20	Siltstone, medium to dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous and calcareous. Some calcite veinlets
820-840	20	Siltstone, medium gray, moderately hard, locally poorly fissile, siliceous, argillaceous. Some carbonate stringers
840-900	60	Siltstone, dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous. Locally calcareous
900-950	50	Siltstone, medium to dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous and calcareous
950-960	10	Siltstone, medium to dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous. Stringers of calcite
960-970	10	Siltstone, medium to dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous and calcareous
970-980	10	Same as above. Some iron oxide staining (weathering of pyrite?)
980-1000	20	Same as above.
1000-1090	90	Siltstone, medium to dark gray, moderately hard, locally poorly fissile, siliceous, argillaceous and calcareous. Abundant mica, some concentrated in bands. Iron oxide staining
1090-1100	10	Same as above. Calcite veinlets
1100-1150	50	Siltstone, medium to dark gray, moderately hard, locally poorly fissile, siliceous, and argillaceous. Abundant mica and some calcite stringers

1150-1200	50	Same as above. Slightly calcareous. Some dark gray shale
1200-1250	50	Siltstone, medium to dark gray, moderately hard, locally poorly fissile, siliceous and argillaceous. Some calcite veinlets. Shale, medium to dark gray, fairly fissile, argillaceous, pyrite with iron oxide staining
1250-1300	50	Same as above with increase in shale content
1300-1350	50	Shale, medium to dark gray, fairly fissile, argillaceous and siliceous. Pyrite with iron oxide staining. Abundant siltstone as described above.
1350-1360	10	Same as above
1360-1400	40	Shale, silty, medium to dark gray, moderately hard, poorly fissile, argillaceous and siliceous. Pyrite with iron oxide staining. Abundant siltstone, some light to medium gray and calcareous. Some fragments of fossil casts (brachiopod?)
1400-1500	100	Shale, silty, dark gray, moderately hard, fairly fissile, argillaceous and siliceous. Some siltstone. Iron oxide staining
1500-1550	50	Shale, silty, dark gray, moderately hard, siliceous and argillaceous. Becoming more fissile. Some siltstone and iron oxide staining.
1550-1600	50	Same as above
1600-1700	100	Shale, dark gray, moderately soft, moderately fissile, silty and argillaceous
1700-1750	50	Same as above. Abundant pyrite cubes. Black crystals associated with pyrite, possibly siderite
1750-1800	50	Shale, dark gray, moderately soft, moderately fissile, silty and argillaceous

1800-1850	50	Same as above. Some calcite veinlets
1850-1900	50	Same as above, with abundant pyrite veins (fracture fillings?)
1900-1950	50	Shale, dark gray, moderately soft, moderately fissile, silty and argillaceous
1950-2000	50	Same as above. Some pyrite in calcite veins
2000-2010	10	Shale, dark gray, moderately soft, moderately fissile, silty and argillaceous. Abundant pyrite, Limestone, light to medium tan, fine-medium to crystalline
2010-2020	10	Shale, dark gray, silty, moderately soft, moderately fissile and argillaceous. Limestone, tan to dark gray, fine-crystalline. Fossil fragments and abundant pyrite. Some calcareous siltstone
2020-2030	10	Limestone, tan to dark gray, fine-crystalline. Some shale and calcareous siltstone
2030-2050	20	Limestone, tan to dark gray, fine crystalline. Some shale and calcareous siltstone
2050-2100	50	Shale, silty, dark gray, moderately soft, moderately fissile and argillaceous. Very calcareous. Some siltstone and limestone
2100-2150	50	Shale, silty, dark gray, moderately soft, moderately fissile, argillaceous and calcareous. Abundant pyrite; some siltstone
2150-2180	30	Same as above
2180-2570	390	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Abundant pyrite cubes. Some calcite filled fractures
2570-2590	20	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some limestone, light to medium brown and fine crystalline. Abundant pyrite cubes. Some calcite filled fractures

2590-2615	25	Shale, dark gray, moderately soft, moderately fissile, argillaceous and calcareous. Limestone, light to medium brown and fine crystalline. Abundant pyrite cubes
2615-2640	25	Same as above. Shale less calcareous
2640-2650	10	No sample
2650-2655	5	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Abundant pyrite
2655-2660	5	No sample
2660-2670	10	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Abundant pyrite
2670-2750	80	Same as above. Pyrite decreasing
2750-2755	5	No sample
2755-2780	25	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite
2780-2785	5	No sample
2785-2835	50	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite
2835-2845	10	No sample
2845-2870	25	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite
2870-2900	30	Shale, black, very soft, fissile, and argillaceous. Some pyrite
2900-2905	5	No sample
2905-2910	5	Shale, black, very soft, fissile and argillaceous. Some pyrite
2910-2930	20	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite. Some black shale

2930-2955	25	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite and calcite
2955-2960	5	No sample
2960-2980	20	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite and calcite
2980-2985	5	No sample
2985-3000	15	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite and calcite
3000-3005	5	No sample
3005-3010	5	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite and calcite
3010-3015	5	No sample
3015-3020	5	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite and calcite
3020-3025	5	No sample
3025-3030	5	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite and calcite
3030-3035	5	No sample
3035-3045	10	
3045-3050	5	No sample
3050-3125	75	Shale, dark gray, moderately soft, moderately fissile and argillaceous. Some pyrite and calcite
3125-3150	25	Shale, dark gray, moderately soft, moderately fissile, argillaceous and calcareous. Some calcareous siltstone. Abundant calcite and pyrite
3150-3205	55	Shale, dark gray, moderately soft, moderately fissile and argillaceous

3205-3235	30	Shale, dark gray, calcareous, soft, fissile and argillaceous. Some dark brown, fine crystalline limestone
3235-3240	5	No sample
3240-3430	190	Limestone, dark brown, fine crystalline. Shale, dark gray, calcareous, soft and argillaceous. Some calcite filled fractures and pyrite
3430-3510	80	Shale, dark gray, argillaceous, fissile, moderately soft. Abundant pyrite. Some calcite
3510-3720	210	Shale, dark gray, calcareous, argillaceous, soft and fissile. Abundant pyrite and calcite
3720-3730	10	Shale as above. Limestone, siliceous, fine crystalline. Abundant quartz
3730-3750	20	Limestone, light gray, hard, fine to medium grained and poor porosity
3750-3755	5	Sandstone, yellow, hard, brittle, fine grained, poor porosity. Almost quartzitic
3755-3825	70	Sandstone, light to medium gray, very hard, coarse grained, calcareous cemented, poor to moderate sorting, subrounded and poor porosity. Some black specks (phosphate?) Oriskany sandstone
3825-3860	35	Same as above. Sandstone darker gray
3860-3900	40	Same as above. Increase in calcareous cement between sand grains
3900-3930	30	Interbedded sandstone and limestone. Sandstone, medium to dark gray, calcareous, cemented, hard, medium to coarse grained. Poor porosity, Limestone, medium to dark gray, fine crystalline and siliceous
3930-3955	25	Limestone, medium to dark gray, fine crystalline and siliceous. Some sandstone as described above
3955-3980	25	Limestone, medium to dark gray, fine crystalline and siliceous

Total Depth 3980'