

VDMR Well No: 951

Operator: Tidewater Oil Co. and Wolf's Head
Oil and Refining Co. (South Penn Oil Co.)

Farm: E. D. Smith

Well No: 1 (one)

Location: Scott County, Early Grove Field
6450' S. of 36°40' approximate
4650' E. of 82°20'

Elevation: 1456.3' Ground, 1467.5' Kelly Bushings

Total Depth: 7220' (samples); 7222' (electric log)

Commenced: September 9, 1963

Completed: February, 1964

Result: **Gas well (shut in)**

Geologic Log:

Samples examined
by Warren J. Souder,
Virginia Division of
Mineral Resources
June 1965

Geologic Rock Cuttings Log

Samples are available from 19' to 7220'.

| <u>Depth</u> | <u>Thickness</u> | <u>Lithology</u> |
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| 19'-30' | 11' | Contaminated |
| 30'-130' | 100' | <u>Limestone</u> , gray, very finely crystalline, dense, slightly argillaceous. 50'-80' - contaminated 90'-100' - fossiliferous 100'-110' - no sample |
| 130'-160' | 30' | <u>Limestone</u> , dark gray, very finely crystalline, dense argillaceous. |
| 160'-180' | 20' | <u>Limestone</u> , gray-brown to light-gray to whitish, finely crystalline dense. |
| 180'-270' | 90' | <u>Limestone</u> , dark gray, finely crystalline, dense, argillaceous. 210'-220' - with light gray, mottled, dense, limestone. 250'-270' - with the limestone becoming siliceous. |
| 270'-300' | 30' | <u>Limestone</u> , light gray-brown to white, very finely crystalline, dense, with some reddish mottled, limestone and traces of red shale. |

VDMR Well No: 951

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| 300'-390' | 90' | <u>Limestone</u> , dark gray with some dark brown tints, finely crystalline, dense, argillaceous; with some light gray to white argillaceous limestone. |
| 390'-540' | 150' | <u>Limestone</u> , gray-brown, finely crystalline, dense, argillaceous with small, brown, oolites; with an occasional tan or red, soft, calcareous shale. 460'-490' - with clear, elongate, small delicate calcite crystals; with tan, clay, soft, slightly calcareous shale. 490'-500' - with a very small amount of red shale. 510'-540' - with brown, small, lightly cemented, somewhat flattened oolites. |
| 540'-730' | 190' | <u>Limestone</u> , dark gray, finely crystalline, dense, argillaceous. 560'-570' - with limestone, gray-brown, finely crystalline, dense. 570'-580' - with some limestone, reddish mottled. 580'-590' - with a few brown, small oolites. 590'-600' - with limestone, reddish-brown, medium fine-crystalline, dense argillaceous. 610'-620' - with light gray-brown finely crystalline, dense limestone. 660'-670' - with reddish-brown, limestone, and a small amount of red shale. (Note: Through this section there are fossils that break free from the limestone and shale, and are well preserved.) 680'-690' - with some oolites; red mottled limestone; reddish-orange shale. |

VDMR Well No: 951

700'-710' - with reddish orange and tan interbedded, fossiliferous shales.

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| 730'-750' | 20' | <u>Limestone</u> , reddish-brown, finely crystalline, dense, argillaceous; with interbedded reddish-orange, shale. |
| 750'-840' | 90' | <u>Limestone</u> , gray and reddish-brown, finely crystalline, dense, argillaceous, some oolites, fossils and interbedded reddish-orange shale. |
| 840'-890' | 50' | <u>Limestone</u> , dark gray, finely crystalline, dense, argillaceous. 870'-880' - with bright red and yellow shale, delicate calcite crystals, fossils. 880'-890' - with a few oolites. |
| 890'-1020' | 130' | <u>Limestone</u> , gray to brown, mottled, medium crystalline, dense; with bright red, yellow, and reddish-brown interbedded shale and many delicate calcite crystals and fossils. 940'-1020' - with an increase in reddish-brown, mottled limestone. 970'-980' - with a few oolites. 990'-1020' - with a decrease in shale and calcite crystals. |
| 1020'-1430' | 410' | <u>Limestone</u> , gray to dark gray, medium-to fine-crystalline, dense, slightly argillaceous. 1130'-1170' - with gray-brown, medium-to fine-crystalline, dense, argillaceous limestone, in varying amounts. 1250'-1280' - with some contamination by cement. 1260'-1280' - with granular calcarinites, no visible porosity. |

1330'-1340' - with traces of calcarinites.

1340'-1350' - with a few calcite veinings.

1380'-1390' - with limestone, dark gray-brown, mottled, coarsely crystalline, crinoidal and other fossils.

1420'-1430' - with slight silicification and some dark brown chert.

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| 1430'-1460' | 30' | <u>Limestone</u> , dark-gray, light-gray to whitish, mottled, medium-to coarsely crystalline, slightly silicified, very small amount of visible crystalline and vugular porosity, in part argillaceous, some chert that is a complete silicification of the limestone. |
| 1460'-1510' | 50' | <u>Limestone</u> , dark-gray, light-gray, mottled, medium crystalline, dense, argillaceous. |
| 1510'-1550' | 40' | <u>Limestone</u> , gray-brown, coarse-to medium crystalline, fossiliferous, slightly oolitic, argillaceous, with a small amount of visible crystalline porosity. |
| 1550'-1670' | 120' | <u>Limestone</u> , dark-gray, finely crystalline, argillaceous, dense. 1590'-1670' - with an increase in argillaceous materials. |
| 1670'-1700' | 30' | <u>Limestone</u> , gray-brown, light-gray, mottled, coarse-to medium crystalline, fossiliferous, slightly argillaceous, no visible porosity. |
| 1700'-1760' | 60' | <u>Limestone</u> , gray and light-gray, slightly mottled, medium crystalline, granular, dolomitic, in part argillaceous, no visible porosity. |
| 1760'-1800' | 40' | <u>Limestone</u> , dark-gray, medium crystalline, partially granular and dolomitic, argillaceous. |

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| 1800'-1820' | 20' | <u>Limestone</u> , gray-to light-gray and whitish, mottled, with traces of reddish-brown, mottled, coarse-to medium crystalline, slightly oolitic and fossiliferous. |
| 1820'-1840' | 20' | <u>Limestone</u> , gray and reddish-brown, finely crystalline, dense, argillaceous. |
| 1840'-1860' | 20' | <u>Limestone</u> , gray and light-gray, medium-to fine crystalline, dense, argillaceous. |
| 1860'-1900' | 40' | <u>Limestone</u> , gray-brown-to whitish, finely crystalline, dense, argillaceous. 1860'-1900' - with coarsely crystalline limestone, slightly siliceous, with some brown chert and a few pyrite crystals. |
| 1900'-2000' | 100' | <u>Limestone</u> , gray and reddish-brown, finely crystalline, dense, argillaceous, with some brown chert. 1930'-1940' - with more gray-brown than reddish-brown limestone. 1940'-2000' - with predominantly gray limestone. |
| 2000'-2110' | 110' | <u>Limestone</u> , gray-to light gray-brown, medium-to coarsely crystalline, slightly oolitic, fossiliferous, with calcite crystals, some silicification and brown chert. 2030'-2050' - with a trace of glauconite. 2060'-2080' - with dark-gray, finely crystalline, dense, argillaceous limestone. |
| 2110'-2170' | 60' | <u>Limestone</u> , gray-to dark gray, brown, finely crystalline, dense, argillaceous; with light-gray calcareous "mudstone". 2160'-2170' - predominantly dark-gray, dense, argillaceous limestone. |

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| 2170'-2190' | 20' | <u>Limestone</u> , light gray, light brown, whitish, medium crystalline, with calcite crystals, slightly silicified, with milky and brown chert. 2180'-2190' - with a very slight amount of discolored reddish limestone. |
| 2190'-2200' | 10' | <u>Limestone</u> , dark-gray, fine-to medium crystalline, dense, argillaceous. |
| 2200'-2250' | 50' | <u>Limestone</u> , light gray-brown, whitish, with some reddish tinted, medium crystalline, oolitic, fossiliferous, argillaceous in part with scattered brown chert. |
| 2250'-2330' | 80' | <u>Limestone</u> , dark gray and light gray, dense, argillaceous with dark gray chert. |
| 2330'-2360' | 30' | <u>Limestone</u> , dark gray-black, medium-to fine crystalline, dense, very argillaceous. |
| 2360'-2390' | 30' | <u>Limestone</u> , gray, gray-brown, and light gray, medium fine crystalline, slightly silicified, some brown and white chert, argillaceous. |
| 2390'-2440' | 50' | <u>Limestone</u> , gray to dark-gray, finely crystalline, dense argillaceous. 2420'-2440' - with light gray-brown and whitish, finely crystalline, argillaceous, limestone, some calcite veining. |
| 2440'-2590' | 150' | <u>Limestone</u> , dark gray to black, some light gray, finely crystalline, very argillaceous, dense. |
| 2590'-2630' | 40' | <u>Shale</u> , dull black, clay, calcareous, soft, "greasy". 2620'-2630' - with light gray interbedded limestone. |

VDMR Well No: 951

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| 2630'-2640' | 10' | <u>Limestone</u> , dull light gray, calcarenitic; some argillaceous materials, many fine-grained clusters of white to clear dolomite crystals that are very friable (those that can be examined possess porosity). |
| 2640'-2650' | 10' | <u>Limestone</u> , black, very fine-crystalline, dense, very argillaceous (almost a shale). |
| 2650'-2660' | 10' | <u>Limestone</u> , dull light gray, calcarenitic and argillaceous in part with white dolomite crystals. There is porosity in the dolomite crystals but not so many crystals as at 2640'-2650'. |
| 2660'-2690' | 30' | <u>Shale</u> , dull black, slightly calcareous, soft. |
| 2690'-2710' | 20' | <u>Limestone</u> , dull black, finely crystalline with traces of anhydrite crystals, dense, very argillaceous. |
| 2710'-2820' | 110' | <u>Limestone</u> , gray-black, medium crystalline, slightly granular, argillaceous. 2720'-2730' - with limestone, dull reddish brown, slightly granular, argillaceous. 2750'-2790' - with dull light gray "mudstone" and finely crystalline limestone. 2790'-2820' - with dull reddish-brown, argillaceous limestone. 2810'-2820' - with a small amount of white and brown chert. |
| 2820'-2990' | 170' | <u>Limestone</u> , gray-black, finely crystalline, dense, argillaceous, with some dull light gray "mudstone", and traces of anhydrite, some chert. |

2840'-2850' - with granular, crystalline limestone. There is a gradual increase in granular, crystalline limestone and a decrease in argillaceous materials. This is progressive with no distinct separation.

2940'-2990' - with some dull reddish-brown limestone.

2990'-3020' 30' Limestone, dark gray, very argillaceous, dense, with some anhydrite crystals.

3020'-3090' 70' Limestone, gray, finely crystalline, somewhat granular, argillaceous.

3060'-3070' - with calcite crystals.

3070'-3090' - with dull reddish-brown argillaceous limestone.

3090'-3110' 20' Limestone, light gray, finely crystalline, very argillaceous, some granularity, considerable anhydrite crystals.

3110'-3200' 90' Limestone, dark gray to gray, finely crystalline, dense, argillaceous.

3150' circulated: - limestone, dolomitic, gray, finely crystalline, argillaceous.

3170'-3200' - with much anhydrite.

3200'-3250' 50' Limestone, gray, finely crystalline, somewhat granular, argillaceous.

3230'-3240' - with shale, dark gray, calcareous, light gray "mudstone" and some anhydrite.

3243' circulated: - limestone, dolomitic, siliceous and very fine-grained, having limited porosity. Reported show of natural gas.

A core was cut from 3243.5' to 3252.5'.

VDMR Well No: 951

No core samples were saved.
Reported: "recovered 4' wet,
bleeding gas".

3243'-3250' - contaminated

3250'-3760'

510'

Limestone, gray, finely crystalline, somewhat granular, argillaceous, with some thin zones of granular dolomite and thin interbedded, black, calcareous shale.

3320'-3340' - with some anhydrite.

3360'-3370' - with some dull reddish-brown, argillaceous limestone.

3390'-3410' - with an increase in granular fine-grained dolomite, limited porosity, and some anhydrite.

3420'-3470' - with an increase in argillaceous materials.

3470'-3500' - with some granular dolomite and anhydrite.

3500'-3510' - with dull reddish-brown, very argillaceous limestone.

3520'-3540' - with some black, clay, shale, and some anhydrite.

3540'-3570' - with an increase in granular fine-grained, friable, light gray to clear with some greenish tints, dolomite and an occasional dull reddish brown, calcareous, argillaceous "mudstone".

3570'-3610' - with an increase in argillaceous materials.

3610'-3760' - with an increase in granular dolomite with some anhydrite.

Note: Through this section there are alternating shales that are, gray-green and calcareous, reddish-brown to tan and dark-gray. There is also scattered anhydrite.

VDMR Well No: 951

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| 3760'-3770' | 10' | <u>Sandstone</u> , light gray with greenish tints, fine-grained, argillaceous, slightly calcareous; shale, light gray-green, waxy, soft and limestone that is dark gray-to black, argillaceous with considerable anhydrite. |
| 3770'-3900' | 130' | <u>Limestone</u> , dark-gray to black, argillaceous, dense with considerable anhydrite, some pyrite and light gray to greenish, very argillaceous limestone, and waxy light green shale. 3820'-3830' - with less anhydrite. 3830'-3840' - with considerably more anhydrite. 3840'-3850' - with less anhydrite. With granular, calcarenitic dolomite, slightly siliceous. 3860'-3880' - with some brownish-to tan limestone, and granular and siliceous dolomite. 3880'-3890' - with granular and siliceous dolomite. |
| 3900'-3980' | 80' | <u>Limestone</u> , gray, dolomitic, calcarenitic, slightly siliceous and slightly argillaceous. 3920'-3930' - with clay, dark gray (black), carboniferous, platy shale. 3930'-3940' - with granular, reddish-brown limestone, and reddish-to tan shale. 3950'-3960' - with traces of white, milky chert. 3970'-3980' - with dark gray shale. |
| 3980'-4010' | 30' | <u>Shale</u> , dark gray, clay, siliceous. 4000'-4010' - with clay, light gray-green, shale. |

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| 4010'-4050' | 40' | <p><u>Limestone</u>, light gray, granular, calcarenitic, siliceous with a trace of anhydrite.</p> <p>4030'-4040' - with reddish-brown staining and a trace of smoky chert.</p> <p>4040'-4050' - with clay, light gray-green, shale.</p> |
| 4050'-4440' | 390' | <p><u>Shale</u>, clay, dark gray, siliceous, fairly hard.</p> <p>4070'-4100' - with clay, light gray calcareous shale, and traces of anhydrite.</p> <p>4100'-4120' - with glauconite.</p> <p>4130'-4180' - with clay, light gray, calcareous shale.</p> <p>4170'-4180' - with clay, reddish-brown shale.</p> <p>4180'-4200' - with glauconite.</p> <p>4210'-4220' - with an increase of clay, light gray, calcareous shale and some clay, reddish-brown shale.</p> <p>4240'-4260' - with scattered clay, reddish-brown shale, and various amounts of clay, light gray shale.</p> <p>4320'-4330' - with a trace of chert, clear.</p> <p>4340'-4370' - with dark gray, argillaceous silt.</p> <p>4360'-4380' - with scattered shale, reddish-brown clay.</p> <p>4420'-4430' - scattered anhydrite.</p> |
| 4440'-4785' | 345' | <p><u>Shale</u>, clay, dark gray, soft, with occasional small crystals of pyrite.</p> <p>4515' - circulated; no change.</p> |

VDMR Well No: 951

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| 4785'-4810' | 25' | <u>Sandstone</u> , fine-to coarse-grained, some sub-rounded and frosted, porous. |
| 4810'-4850' | 40' | <u>Shale</u> , clay, dark gray, slight-to moderately siliceous. |
| 4850'-5860' | 1010' | <u>Shale</u> , clay, dark gray, soft, with an occasional crystal of pyrite. |
| 5860'-6670' | 810' | <u>Shale</u> , clay, very dark gray, soft, platy with occasional thin interbedded of dark reddish-brown, rusty, shale. 6020'-6040' -- with clay, dark, reddish-brown, rusty shale. 6060'-6070' - with clay, light brown shale. 6130'-6170' - no samples 6170'-6190' - with a thin clay, light gray, calcareous shale, and a trace of pyrite. 6200'-6220' - the shales are slightly siliceous. 6240'-6270' - with clay, dark reddish-brown shale. 6280'-6300' - with clay, dark reddish-brown shale. 6350'-6370' - with clay, dark reddish-brown shale. 6420'-6440' - with clay, very dark reddish-brown shale. 6470'-6490' - with clay, dark reddish-brown shale. 6510'-6540' - with trace of pyrite. 6660'-6670' - with pyrite. |
| 6670'-6685' | 15' | <u>Shale</u> , clay, very dark-gray, black, slickensided. |

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| 6685'-6690' | 5' | <u>Limestone</u> , gray-brown, argillaceous, shaley. |
| 6690'-6700' | 10' | <u>Chert, or quartzite</u> , light gray, hard. |
| 6700'-6710' | 10' | <u>Shale</u> , clay, dark gray with reddish tints. |
| 6710'-6720' | 10' | <u>Chert, or quartzite</u> , light gray, some opaque, hard. |
| 6720'-6730' | 10' | <u>Sandstone</u> , medium-fine to fine-grained, sub-rounded, frosted and porous (visible ?). |
| 6730'-6740' | 10' | <u>Shale</u> , clay, light gray-green, slightly siliceous. |
| 6740'-6750' | 10' | <u>Shale</u> , clay, dark gray, with dolomitic, siliceous and cherty limestone. |
| 6750'-6775' | 25' | <u>Shale</u> , clay, dark gray. 6760'-6775' - with clay, gray-green, siliceous shale. |
| 6775'-6790' | 15' | <u>Sandstone</u> , gray-brown to white, medium-fine-to fine, slightly calcareous. |
| 6790'-6960' | 170' | <u>Sandstone</u> , white and reddish-brown, iron stained, fine-to very-fine grained, occasionally sub-rounded, with some interbedded dark gray shales. The sandstones are fairly porous. 6820'-6830' - with dark gray shale. 6850'-6860' - with dark gray shale. 6860'-6890' - with an increase in reddish-brown iron stains. 6890'-6900' - with clay, dark gray, platy, siliceous shale. 6900'-6960' - porosity appears greater. |

VDMR Well No: 951

6960'-7190'

230'

Sandstone, white, medium-fine-grained, sub-rounded, visible porosity with thin interbedded dark gray, platy, splintery shales.

6970'-6975' - no samples

6975'-6980' - with shale, dark gray, siliceous, hard.

6980'-6990' - no samples

6990'-7000' - Reaming sample.
Sandstone, white, medium-fine, friable porous.

7185'-7190' - with dark gray, siliceous, shale.

7190'-TD 7220'

30'

Shale, dark gray, with dark maroon, siliceous and calcareous shale.

7200'-7210' - slightly calcareous.

7210'-7220'TD - increase in calcareous content.