LE-18

VDMR No: 1273

Operator: Shell Oil Co.
Farm: L. C. Bales
Well No: 1 (one)
Location: Cumberland Overthrust Area, Lee County
17,911' South of 36°40'
6,077' West of 83°20' approximate
Elevation: 1380 Ground 1391 Kelly bushings
Total Depth: 8020' (driller)
Commenced: December 1964
Completed: January 1965
Results: Dry and Abandoned

Samples examined by
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Virginia Division of
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August 1965

Geologic Rock Cuttings Log

Samples are available from 560' to 8020' (total depth). One core was cut from 5366' to 5390' and samples of this core are available. (Note: The well was drilled by rotary tools. Drilling muds were used in part and air in part, to bring the rock cuttings to the surface. All well measurements were made from the Kelly bushings).

Depth in Feet	Thickness in Feet	Lithology
560-610	50	Limestone, dark gray, coarse crystalline and with light gray to whitish, fine crystalline, dense, slightly argillaceous and slightly siliceous limestone. 580-610 - with some reddish brown tints in the limestone and traces of pyrite.
610-670	60	Limestone, dark gray-brown, medium fine crystalline, dense. 610-620 - with interdisseminated fine sand grains and a few large, frosted, sub-rounded sand grains. 620-630 - with a trace of pyrite. 640-650 - with a few clusters of calcite crystals and some dull whitish calcareous mudstone. 650-660 - with the limestone having a darker color, almost black and with dull whitish calcareous mudstone. 660-670 - with limestone becoming slightly argillaceous.

670-750	80	Limestone, gray to reddish brown to dark reddish brown, medium fine crystalline, dense, fairly argillaceous. 670-690 - with some dark gray to black, argillaceous limestone. 690-750 - with a few interdisseminated sand grains and a fair amount of silicified brown oolites, some having been formed around the sand grains. 720-740 - with a considerable amount of oolites, and a few large calcite crystals.
750-780	30	Limestone, dark gray, dense, fairly argillaceous, with dark gray-brown, fine crystalline, dense limestone and with some dark green, clay, slightly calcareous, lumpy and slickensided shale and a small amount of calcite vein fillings.
780-800	20	Limestone, gray to gray-green, dense, fairly argillaceous, pyritic, fossiliferous, with calcite crystals, and some light gray, coarse crystalline limestone.
800-950	150	Limestone, dark gray, fine crystalline, dense, argillaceous, with some gray-brown, coarse crystalline, fossiliferous, limestone with some interbedded dark gray, thin bedded, calcitic shale and calcite crystals. The section is fairly fossiliferous with an occasional brown oolite in the limestones. 860-870 - with a small amount of gray-brown chert.
950-1060	110	Limestone, light gray-brown, coarse, crystalline, fossiliferous, with calcite crystals, some dull white, fine crystalline, argillaceous limestone, a few dark brown oolites, and a small amount of dark, very calcareous shale, throughout. 950-970 - with considerable smoky chert. 990-1010 - with predominantly dark gray-brown, medium fine crystalline, argillaceous limestone.

		1010-1060 - with mixed dark gray-brown and light gray-brown limestone. The light gray-brown is coarse crystalline, fossiliferous limestone.
1060-1110	50	Limestone, dark gray-brown, medium fine crystalline to dense, argillaceous and with light gray-brown, coarse crystalline, fossiliferous limestone, calcite crystals, a fair amount of dark gray to black, clay, calcareous shale and some light gray-whitish, mottled, medium coarse crystalline and fine granular limestone.
1110-1200	90	Limestone, dark gray, medium fine crystalline, dense, fairly argillaceous, with a fair amount of interbedded dark gray to black, clay, calcareous shale. (There is some but a lesser amount of light gray-brown limestone than in the 1060-1110 interval as well as less light gray-whitish, mottled limestone.) The section is fossiliferous and has calcite crystals.
		1140-1150 - with fewer fossils and the limestone is slightly siliceous.
		1160-1200 - with siliceous limestone and brown chert.
1200-1230	30	Limestone, gray-brown to light gray-brown, medium fine to fine crystalline to dense, with some dark gray to dark gray-brown, fine crystalline, dense, argillaceous limestone, dull white, very fine crystalline to fine granular argillaceous limestone and calcite crystals.
		1200-1210 - with a small amount of brown chert.
1230-1260	30	Limestone, dark gray, dense, argillaceous and with dark gray, coarse crystalline, argillaceous limestone, black, clay, calcareous shale, gray-brown, coarse crystalline, fossiliferous limestone and some light, gray-brown to white coarse crystalline, argillaceous limestone and with some opaque and brown chert.

1260-1520	260	Limestone, gray-brown, fine crystalline, dense and with light gray-brown, coarse crystalline, fossiliferous limestone, some dark gray, dense argillaceous limestone and calcite crystals. 1260-1270 - with a trace of opaque chert. 1330-1360 - with dark gray, dense, argillaceous and dark gray-brown, fairly argillaceous limestone and thin beds of black, clay, shale. 1370-1380 - with some brown chert. 1380-1480 - with a fair amount of black, clay, slightly calcareous shale. 1410-1470 - with dark gray and dark gray-brown limestone. 1450-1480 - with brown and smoky chert. 1480-1520 - with a few clusters of calcite crystals and some imbedded calcite crystals ("birds eye"), and some black, clay, shale and dark gray, dense, argillaceous limestone.
1520-1540	20	Limestone, dark gray and light gray-whitish, mottled with brown tints, coarse crystalline to dense, argillaceous, and with light gray-brown, fine crystalline, dense, fossiliferous limestone, calcite crystals and some brown chert.
1540-1600	60	No samples
1600-1630	30	Limestone, dark gray, medium coarse to fine crystalline, dense, argillaceous and with some light gray-brown, fine crystalline, dense limestone, some light gray-white, mottled, granular, fossiliferous, limestone, calcite crystals, and some dark gray to black, clay, calcareous shale. 1600-1610 - with traces of smoky and brown chert.

1630-1895	265	Limestone, dark gray, medium fine crystal dense, fairly argillaceous and with some gray-white mottled, light gray-brown, medium crystalline limestone, and black, clay, calcareous shale in fair amounts (with some alternating shale and limestone beds).

1630-1740 - with a fair amount of black clay, calcareous shale.

1710-1730 - with whitish, gray mottled coarse crystalline to fine granular, fossiliferous limestone and calcite crystals.

1730-1740 - with a considerable amount of black, clay, calcareous shale and black, very argillaceous limestone.

1740-1895 - with alternating limestones and shales.

1740-1760 - with dark gray-whitish mottled, coarse crystalline, fossiliferous limestone.

1760-1770 - with considerable black, clay, calcareous shale and very argillaceous, black limestone.

1770-1780 - with dark gray-whitish mottled, coarse crystalline, fossiliferous, brownish tinted, limestone.

1780-1790 - with an increase in shale.

1790-1800 - with an increase in limestone.

1800-1820 - with the interval being primarily a black, clay, calcareous, shale.

1820-1840 - with gray, light gray brown to white coarse crystalline, fossiliferous limestone and calcite crystals.

1840-1860 - with a fair amount of black clay, calcareous shale.

1850-1860 - with some bluish to brown chert.

1860-1895 - with gray to whitish, coarse crystalline, fossiliferous limestone and calcite crystals (a slight show of oil, 1860-1870), visible porosity appears to be very limited. Some brown chert.

1895-2000	105	Limestone, dark gray-brown and dark reddish-brown, fine crystalline, dense, slightly argillaceous with occasional light green, flaky, micaceous (bronze) bentonites and brown and white cherts.

1895-1910 - with light green, flaky, micaceous (bronze) bentonite and some gray, greenish tinted, very fine crystalline, argillaceous limestone and some dark, reddish brown, fine crystalline, argillaceous limestone.

1910-1920 - with brown and white chert. The bentonite is siliceous.

1920-1930 - with a few pyrite crystals in the limestone and in the bentonite.

1940-1950 - with light green flaky bentonite and considerable white, greenish tinted chert.

1950-1960 - with some flaky, green bentonite and some white and brown chert.

1970-1990 - with a few pieces of dull white soft, limestone. (This type of limestone often called "mudstone" by surface mappers).

1990-2000 - with a few fossils and a few fairly large brown oolites in the limestone.

Note: After the first bentonite was drilled, each sample carries some of it. No great attempt was made to log the bentonites because of the ever present uncertainity as to whether the bentonite in the sample was from a new bed or was from one previously drilled. There is often a marked silicification of the beds above the bentonites and usually a concentration of cherts immediately below.

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2000-2030	30	Limestone, dark gray, fine crystalline, dense slightly argillaceous with some reddish-brown, fine crystalline limestone. 2000-2010 - with considerable brown and white chert, the limestone is silicified.
2030-2090	60	Limestone, dark gray brown, dark reddish brown, fine crystalline, dense, slightly argillaceous. 2030-2040 - with some light green, flaky bentonite, and with some gray green tinted, fine crystalline, argillaceous limestone, with fine bronze mica flakes. (The green tint may be due to bentonitic content.) 2050-2060 - with some slickensided pieces of limestone that are slightly siliceous and have very small pyrite crystals imbedded in them. 2070-2080 - with fossils
2090-2160	70	Limestone, dark reddish brown, fine crystalline, dense to saccharoidal, with some dark brown fine crystalline, sucrosic limestone and some reddish brown, fine crystalline, dense, argillaceous limestone. 2090-2100 - with considerable dark brown chert. 2140-2150 - with very, very fine veins filled with calcite.
2160-2310	250	Limestone, dark gray and dark reddish brown, fine crystalline, dense, slightly argillaceous. (The shade of color is darker than that in the interval 2090-2160.) 2170-2190 - with clear, imbedded calcite crystals ("birdseye"). 2190-2310 - with dull white, very fine crystalline, limestone. (This type limestone often called "mudstone" by surface mappers.)

		2210-2220 - with a few small fractures, some of which are filled with calcite crystals and some of which are not. 2230-2260 - with dark gray brown and reddish brown very fine crystalline, saccharoidal limestone, some slickensided limestone and a fair amount of calcite crystals. 2260-2310 - with predominantly dark gray brown fine crystalline, dense slightly argillaceous limestone. 2280-2290 - with a few pyrite crystals. 2290-2310 - with some slickensided limestone.
2310-2600	290	Limestone, reddish brown, very fine crystalline, occasionally fossiliferous, with some dark gray-brown limestone. 2330-2350 - with fossils and large calcite crystals. Some of the calcite crystals are in veins. 2370-2380 - with fossils. 2450-2560 - with fossils. 2470-2480 - with dark gray brow, medium fine crystalline, dense, saccharoidal limestone. 2530-2570 - with predominantly dark gray and dark gray brown, medium crystalline, limestone. 2570-2580 - with some imbedded calcite crystals ("birdseye").
2600-2620	20	Limestone, dark gray, medium crystalline, dense, argillaceous with a small amount of reddish brown, very fine crystalline limestone with imbedded calcite crystals ("birdseye").

2620-2650	30	Limestone, gray brown with greenish tints, very fine crystalline, dense and with some reddish brown limestone with imbedded calcite crystals ("birdseye"). 2640-2650 - with gray brown, fine crystalline limestone with imbedded calcite crystals ("birdseye").
2650-2750	100	Limestone, gray green, with some reddish tints, fine crystalline, dense. 2670-2700 - with much imbedded calcite crystals ("birdseye").
2750-2910	160	Limestone, gray brown with greenish tints (a lighter shade of color than the above interval.), very fine crystalline, dense. 2760-2770 - with a trace of brown chert. 2760-2820 - with the limestone being slightly siliceous. 2780-2790 - with traces of green, flaky, bentonite. 2800-2920 - with some dark gray, fine crystalline, argillaceous limestone. 2790-2810 - with some brown to light brown, whitish chert. 2800-2810 - with light green, flaky, bentonite with bronze mica flakes. 2810-2820 - with considerable brown chert. 2820-2840 - with the limestone being fairly siliceous and with some light brown to white chert. 2870-2910 - with the limestone being very siliceous (some of it being almost a chert) and with considerable brown chert.

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2910-3070	160	Limestone, dark gray-brown to dark reddish brown, fine crystalline, dense with some lighter shades of gray brown and reddish brown, fine crystalline argillaceous limestone. The limestones are fairly siliceous. 2930-2940 - with black and brown chert. 2940-2950 - with some imbedded calcite crystals ("birdseye"). 2940-2980 - with a fair to a considerable amount of brown, black and white chert. 2980-2990 - with a considerable amount of imbedded calcite crystals ("birdseye"). 3000-3010 - no sample 3010-3030 - samples contaminated with drilling mud and clays. Note: Cuttings from 3010 to approx. 4400 are very small; changed to drilling by air. 3030-3070 - with calcite crystals and traces of light gray to white, brown and black chert.
3070-3120	50	No samples
3120-3250	130	Limestone, a light shade of dark gray brown, green tinted, dense, slightly argillaceous, containing traces of brown and smoky chert. 3120-3170 - with calcite crystals and some imbedded calcite crystals ("birdseye"). Note: Air type of drilling may cause the imbedded calcite crystals to break out from the small rock chips of carbonates. 3170-3180 - no sample

		3190-3200 - with thin interbedded, black, clay, shale and some imbedded calcite crystals in the limestone.
3250-3380	130	Limestone, dark gray brown, fine crystalline dense, fairly argillaceous with some interbedded black, clay, shale.
		3280-3300 - with some limestone that is a light shade of dark gray brown.
		3300-3310 - with the limestone being fairly argillaceous and containing dull white, fine grained limestone.
		3310-3340 - with an increase in black, clay, calcareous shale and with traces of dark green shale.
		3340-3360 - with dark gray brown, reddish tinted, medium crystalline, dense, very argillaceous, limestone and dark green, (bentonitic ?) slightly calcareous, clay shale. (This interval is almost a shale.)
		3360-3380 - with the limestones and shales of the interval being fairly siliceous and containing pyrite crystals.
		3374 circulated - with gray brown, fine crystalline, dense, slightly argillaceous, fairly siliceous, pyritic limestone.
3380-3390	10	No sample
		(Note: In the no sample interval the electric log indicates a change.
3390-3570	180	Limestone, light gray brown, fine crystalline, dense, fairly argillaceous, with some light gray brown, fine granular, dolomite with imbedded, coarse grained, sub-rounded, sand grains.
		3390-3410 - with a very considerable amount of white, milky chert.
		3400-3490 - with thin dark gray and and dark green, clay, shale, and varying amounts of silt.

		3430-3460 - with whitish, light gray brown tinted, fine crystalline, dense, dolomite.
		3460-3480 - with a considerable amount of silt and very fine grained sand.
		3500-3520 - with traces of glauconite.
		3530-3570 - with a slight amount of silt, a few fine grained, rounded, sand grains and some white chert.
		3540-3550 - with a thin dark green, clay shale.
3570-3600	30	Sandstone, white, coarse to fine grained to silt, some sub-rounded and frosted, slightly calcareous.
3600-3800	200	Dolomite, very light gray brown, white, fine crystalline, dense to sucrosic, calcareous, with fine sand and silt (some larger grains are sub-rounded and frosted) and with milky and white chert.
		3610-3620 - with traces of dark gray and dark gray green, clay, calcareous shale.
		3650-3670 - with a considerable amount of milky chert and a fair amount of fine grained sand and silt.
		3660-3670 - with dark gray, medium coarse dolomite and dark gray, black, clay, calcareous shale.
		3700-3720 - with some gray, dense, sucrosic dolomite.
3800-4080	280	Dolomite, white and very, very light brown, medium to fine crystalline with a few scattered sand grains throughout the interval.
		3810-3850 - with traces of green, dark gray green, waxy, clay, shale.

		3840-3870 - with traces of white, milky chert. 3870-3880 - with a few clear and frosted, sub-rounded, fine grained sand. 4030-4060 - with some sub-rounded, frosted sand grains ranging in size from pebble to very fine grained sand to silt and with a fair amount of milky chert.
4080-4120	40	Sandstone, white, silt to coarse grained with white, medium crystalline dolomite. 4080-4090 - with milky chert.
4120-4150	30	Dolomite, white to very light gray, medium crystalline with some silt and a few large sub-rounded, frosted, sand grains.
4150-4210	60	Dolomite, gray brown to light gray brown, medium coarse crystalline to medium fine crystalline.
4210-4230	20	Dolomite, gray brown to light gray brown, medium to medium fine crystalline with dark gray, medium fine crystalline, argillaceous dolomite and gray brown, fine crystalline to fine granular dolomite and traces of milky chert.
4230-4310	80	Dolomite, white to light gray brown, fine crystalline to fine granular with traces of milky chert. 4260-4270 - with black, very argillaceous dolomite, grades to shaly dolomite. 4280-4290 - with a thin dark gray, argillaceous dolomite.
4310-4330	20	Dolomite, gray brown, fine crystalline to fine granular, with dark gray, black, finely crystalline, argillaceous dolomite.
4330-4340	10	Dolomite, white to light gray brown, fine crystalline to fine granular.

4340-4370	30	Dolomite, gray brown, fine crystalline to fine granular, with dark gray, black, very argillaceous to shaly dolomite. 4360-4370 - with considerable white and milky chert.
4370-4400	30	Dolomite, white to light gray brown, fine crystalline. 4380-4390 - with a fair amount of white and milky chert.
4400-4430	30	Dolomite, medium light gray, brownish tinted, medium fine crystalline, slightly argillaceous. 4410-4430 - with the color of the dolomite being gray brown.
4430-4470	40	No samples
4470-4480	10	Dolomite, gray brown, medium to fine crystalline to medium granular and with dark gray, fine crystalline, argillaceous dolomite with white and milky chert that contains oolites.
4480-4560	80	Dolomite, light gray brown, medium fine crystalline, dense, sucrosic, with light gray brown coarse crystalline, dense dolomite containing white and brown cherts and silicified dolomite beds. 4490-4500 - with dark gray brown, medium fine crystalline, sucrosic, dense dolomite with considerable light brown and milky chert that contains oolites, and an occasional pyrite crystal. 4510-4560 - with the light gray brown coarse crystalline dolomite containing a few vugs, with brownish-white, coarse crystalline dolomite with white silicified clay matrix. The whole interval is silicified and has white and light brown chert. 4520-4560 - with an increase in dark gray brown dolomite.

4560-4600	40	Dolomite, gray brown, coarse crystalline and dark gray brown, coarse crystalline dolomite with traces of milky chert containing a few oolites. 4580-4590 - with light gray brown, whitish, medium fine crystalline, dolomite. 4590-4600 - with a few sub-rounded, frosted, and coarse grained sand grains, and a fair amount of milky and light brown tinted chert.
4600-4720	120	Dolomite, light gray brown, fine crystalline to medium coarse crystalline, partly silicified, with considerable chert. 4600-4620 - with gray brown, coarse crystalline dolomite which contains a few small vugs, and with a fair amount of milky and light blue tinted chert that contains a few oolites and with some pyrite. 4630-4680 - with considerable silicification of the dolomite and considerable coarse to fine grained, frosted, sand grains and with considerable milky chert that has imbedded sand grains. 4680-4690 - with light gray brown, whitish, medium coarse dolomite and with considerable milky chert and some bluish tinted chert. 4710-4720 - with impregnations of pyrite in the dolomite.
4720-4780	60	Dolomite, light gray brown, whitish, fine crystalline to medium coarse crystalline and with some gray brown, coarse to fine crystalline dolomite, fairly silicified, with a few sand grains and pyritic inclusions imbedded in the dolomite, with considerable milky, and light blue chert. There are sand grains imbedded in the chert.

		4750-4760 - with light brown oolites in milky chert. 4760-4770 - with an increase in gray brown, coarse crystalline, dolomite. 4770-4780 - with an abundance of chert. This interval appears to have been a sandy zone, having a calcareous or dolomitic matrix that was silicified into a chert. The sand grains, in the chert, are medium coarse to fine grained. There are some oolites in a blue chert.
4780-4920	140	Dolomite, gray brown, coarse to fine crystalline, with light gray brown, coarse to fine crystalline dolomite and a fair amount of silicification and chert. 4780-4820 - with considerable white and milky chert. 4840-4850 - with light gray, medium fine granular dolomite and a very few fine sand grains, and a few bright pyrite crystals. 4860-4870 - with sand in chert that appears to have been a silicification of a sand having a calcareous to dolomitic matrix. There is also considerable blue chert and white chert that contains oolites. 4870-4880 - with dark green and light green, flaky, bronze mica flaked, bentonitic shale and considerable blue and white chert. 4880-4890 - with silicified greenish bentonite and a fair amount of chert (but less than in the above intervals). 4900-4910 - with light green, bronze mica flaked bentonite and a fair amount of chert.

4920-4980	60	Dolomite, gray brown, coarse to fine crystalline to some medium granular with light gray brown, whitish, fine crystalline dolomite, a fair amount of silicification and a fair amount of white and milky chert with some oolites in the chert. 4960-4980 - with light gray brown, whitish, fine crystalline to fine granular, dolomite having a fair amount of silicification and a fair amount of milky chert.
4980-5080	100	Dolomite, light gray brown, whitish, fine crystalline to fine granular with gray brown and dark gray brown, medium to fine crystalline, dense to fine granular, argillaceous dolomite and some milky to white chert in the bottom half of the interval. The dark gray and light gray colored beds are probably alternating interbedded. 4990-5010 - with thin veins of pyrite. 5010-5080 - with some very small vugs and with visible porosity (but possibly poor permability). 5020-5080 - with white to milky chert containing a few oolites. 5060-5080 - with an addition of blue chert containing a few small oolites.
5080-5170	90	Dolomite, dark gray and dark gray brown, medium to fine crystalline with a few vugs (the gray brown is slightly argillaceous and the dark gray brown is argillaceous), with light gray brown, fine crystalline, dense, sucrosic dolomite with some smoky and white chert containing a few oolites. In the dark gray brown dolomite there is some open spaces, porosity between the medium coarse crystals. 5120-5130 - with an increase in light gray to whitish, fine crystalline dolomite.

		5150-5170 - with an increase in light gray brown, medium fine crystalline dolomite. There is no visible porosity in this interval. 5140-5170 - with silicified, white, "calcareous mudstone" and white chert.
5170-5210	40	Dolomite, dull white to brownish tinted, medium coarse to fine crystalline and medium granular with dark gray, fine crystalline, dense, argillaceous dolomite and a slight amount of white and gray chert containing a few oolites.
5210-5260	50	Dolomite, light gray brown, medium fine crystalline to fine granular with dark gray brown, coarse to fine crystalline, slightly argillaceous dolomite, with a fair amount of white, blue tinted and light brown chert containing a few oolites. 5210-5220 - with considerable oolites in chert. 5240-5250 - with large dolomite crystals in clusters and with an increase in the dark gray brown, slightly argillaceous, dolomite.
5260-5366	106	Dolomite, dark gray, fine crystalline, argillaceous, with gray brown, medium fine to coarse crystalline dolomite, with slight amounts of white, gray and smoky chert. 5260-5270 - with considerable white and gray chert. 5260-5340 - with light gray brown medium fine to fine granular dolomite. 5310-5320 - with the gray brown dolomite being coarse crystalline and slightly argillaceous and containing a few oolites. 5360-5366 - with interbedded black, clay, shale. Core No. 1: 5366-5390

Core No. 1: 5366-5390 VDMR Well No: 1273

Note: The core, prior to this examination had been sawed in half vertically, so that only half of the core could be examined. Originally the core was $3\frac{1}{2}$ in diameter. Almost every segment of the core when broken, emitted a petroliferous odor (the core was brought to the surface about seven months ago). The vugular, porous parts of the core apparently lacked permeability.

The bedding planes were indistinct but where observed they were dipping at a 10^{o} angle. The dipmeter log indicates the same amount of inclination at this interval.

5366-5388	22	Dolomite, dark gray brown, fine crystalline, slightly argillaceous with very thin, often discontinuous, often lumpy, black shale.

5366-5368 - with a trace of pyrite crystals and a few imbedded dolomite crystals.

5368-5369 - with dolomite crystals imbedded.

5369-5370 - with a slight vertical fracture.

5370-5371 - with about a 6 inch zone of pinpoint sized vugs.

5371-5372 - lined with very small crystals.

5372-5373 - with thin dark colored bedding planes, pyritic.

5375.7-5375.9 - $1\frac{1}{2}$ inches of oolites, fairly small, imbedded in silicified white matrix. Some chert pellets.

5376.0-5376.3 - with small dolomite crystals in small vugs.

5377.3-5377.4 - with thumb sized, imbedded gray chert nodule. Scattered pyrite inclusions.

		5381-5382 - with several thin, black shale breaks. 5386-5387 - with a few imbedded dolomite crystals. 5386.6-5387 - with a few very small vugs, encrusted by dolomite crystals. One small fracture filled by dolomite crystals.
5388-5389	1	Dolomite, gray with tints of gray green, scattered pyrite.
5389-5390	1	Dolomite, gray brown, fine crystalline with inclusions of large dolomite crystals and pyrite.
5390-5640	50	Dolomite, dark gray, fine crystalline, argillaceous, with gray brown, medium fine to coarse crystalline dolomite, with slight amounts of white, gray, and smoky chert. 5390-5410 - contaminated by rusted iron and iron stains. 5410-5440 - with an increase in argillaceous content in the dolomite. 5430-5460 - with a slight silicification of the dolomite and considerable gray and white chert. 5460-5530 - with predominantly gray brown dolomite and slight amounts of gray brown, white and blue chert. 5530-5640 - with predominantly dark gray brown dolomite with some increase in argillaceous content. 5570-5600 - with some light gray, white, medium granular, dolomite. (End of Core Description)
5640-5790	150	Dolomite, gray brown, coarse crystalline with thin bedded dark gray, fine crystalline argillaceous dolomite. 5650-5660 - with white mottling due to fine dolomite crystals, and a few small scattered vugs.

		5720-5730 - with dark gray and gray brown dolomite mottled by small white dolomite crystals and with a trace of black chert.
		5760-5770 - no sample
		5780-5790 - with a trace of dark brown chert.
5790-5870	80	Dolomite, dark gray, brown, fine crystalline, argillaceous, and with gray brown, medium crystalline to fine crystalline, dense, slightly siliceous dolomite with traces of gray and black chert.
		5820-5870 - with dark gray brown, coarse crystalline, argillaceous dolomite, thin black clay shale, dolomitic shale, and some gray and black chert.
		5860-5870 - with oolites in black chert.
5870-6030	160	Dolomite, dark gray and gray brown, fine crystalline, dense, argillaceous with light gray, fine crystalline, dense, fairly argillaceous dolomite, with thin black shale. (Note: The whole section appears to be thin bedded and fairly argillaceous.) There are scattered black and brown cherts containing a few oolites.
		5970-5990 - with dark gray brown, coarse crystalline, dolomite containing a few pinpoint sized vugs and with a thin light gray, whitish, fine crystalline dense dolomite.
6030-6070	40	Dolomite, dark gray brown and gray brown, medium coarse crystalline, slightly argillaceous with thin bedded light gray, fine crystalline, dense, argillaceous dolomite.
		6040-6050 - with dolomite crystals imbedded in the dolomite and some dolomite crystals are encrusted on bedding planes.
		6060-6070 - with a few pinpoint sized vugs in the dolomite.

6070-6110	40	Dolomite, dark gray brown, coarse to medium crystalline, with imbedded dolomite crystals (some of which are in clusters which gives the appearance of being mottled) and small sized vugs.
6110-6430	320	Limestone, dark gray, fine crystalline, dense, fairly argillaceous, thin bedded with gray brown, mottled white to light gray, fine crystalline, limestone, with a few, small, brown oolites, with argillaceous, thin bedded limestone and traces of dark, green, clay, shale (possibly bentonitic) and some black shale that is slightly calcareous. 6110-6180 - with traces of light green, bentonitic shale containing bronze mica flakes and with an increase in dark gray, black, very argillaceous limestone and black, slightly calcareous shale. 6180-6220 - with very argillaceous, dark gray, black, limestone and black shale. 6220-6370 - with gray brown, fine crystalline, fairly argillaceous limestone with less black shale, and with an occasional light gray, whitish, very argillaceous limestone. 6370-6410 - with an increase in argillaceous content in the limestone. 6390-6410 - with a considerable amount of black, clay, calcareous, shale. 6410-6430 - with the interval being almost a shale.
6430-6470	40	Limestone, gray brown and light gray brown, fine crystalline, dense, fairly argillaceous with dark gray, fine crystalline, very argillaceous limestone and black, clay, calcareous shale.

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6470-6510	40	Dolomite, dark gray, slightly vitreous, medium crystalline, argillaceous, very silicified (almost a chert). 6500-6510 - with black chert.
6510-6830	320	Dolomite, light gray, blue tinted to light blue, fine crystalline, dense, argillaceous, siliceous to silty and sandy and with considerable chert. 6560-6580 - with a slight amount of silt, increasing silicification, and a fair amount of white, milky, blue chert. 6580-6780 - with sands and silts (often quartzitic) and much white, blue and vari-colored chert with oolites. 6590-6640 - with dark blue, medium crystalline, very siliceous dolomite with thin beds of medium fine quartzitic sand, and large amounts of blue chert often oolitic. 6640-6830 - with the section being predominantly, light gray blue, coarse to medium fine crystalline, siliceous dolomite silty and cherty. 6670-6680 - with an increase in sand ranging in size from medium grained to silt, some sub-rounded, frosted, and having a matrix that may have been fine grained limestone that is now silicified into almost a quartzite. 6680-6690 - with some thin dark gray green, clay, shale. 6690-6700 - with considerable coarse grained to silt, semi quartzitic sand. 6730-6780 - with very considerable silicification in the dolomite (almost a chert). 6730-6780 - with dark gray, medium to fine crystalline, argillaceous, silicified limestone.

		6740-6760 - with some light gray brown, fine crystalline, sucrosic, silicified, limestone.
		6780-6830 - with dark gray, fine crystalline, argillaceous limestone. (There is considerably less chert and no sand in this interval but there is some silicification of the limestone.)
6830-6940	110	Dolomite, gray, medium fine crystalline, with dark gray medium fine to fine crystalline dolomite, and light gray, whitish, blue tinted, medium fine to fine, slightly argillaceous dolomite some chert.
		6850-6860 - with a fair amount of blue and white chert.
		6880-6890 - with blue and black chert with oolites.
		6890-6900 - with thin veins filled with dolomite.
6940-7010	70	Dolomite, gray brown, medium coarse crystalline, slightly argillaceous, with dark gray, medium fine crystalline, argillaceous dolomite and traces of black and blue chert.
		6990-7010 - with some blue chert.
7010-7220	210	Dolomite, gray blue to light gray blue, medium crystalline, slightly argillaceous with traces to fair amounts of white, blue, and black chert, and with imbedded, scattered sand grains (with some local silicification).
		7040-7080 - with predominantly light gray brown, bluish tinted dolomite with fair amounts of chert.
		7050-7060 - with many brown oolites in the chert.
		7100-7130 - with thin silts and a few sand grains, and considerable white, blue, chert and some silicification of the dolomites.

		7150-7190 - with dark gray, medium crystalline, argillaceous dolomite with fair to considerable silicification, very cherty and with traces of pyrite.
		7190-7210 - with light gray, whitish, medium crystalline to medium granular, silicified and cherty dolomite.
7220-7320	100	Dolomite, dark gray, fine crystalline, argillaceous with light gray, blue tinted, medium fine to fine crystalline dolomite and gray brown, medium granular dolomite.
		7220-7250 - with silicification in the dolomite (considerable at 7220 and becoming progressively less at 7250). There are vari colored cherts but not so much when considering the amount of silicification.
		7270-7320 - with an increase in light gray, blue, brown tinted, medium to fine crystalline dolomite with traces of white, blue chert.
		7290-7320 - with thin interbedded, clay, gray blue shale.
7320-7430	110	Dolomite, dark gray and gray brown, medium fine crystalline, argillaceous, with a few imbedded fine sand grains and some white, blue, oolitic chert.
		7340-7350 - with very fine veins filled with dolomite.
		7350-7360 - with silicification of the dolomite and a small amount of chert.
		7360-7370 - with predominantly dark gray brown dolomite.
		7370-7430 - with some to fair amounts of white, blue, light brown, cherts containing some oolites.
		7400-7430 - with an increase in light gray blue, with brown tints, medium fine crystalline dolomite.

7430-7460	30	Dolomite, dark gray and gray brown, medium fine crystalline, slightly argillaceous and slightly siliceous with traces of blue, black chert. 7440-7460 - with traces of black, clay, brittle shale that has some slickensidedness.
7460-7490	30	Dolomite, light gray blue and light brown, medium fine crystalline, having some slickensidedness. 7480-7490 - with some whitish, fine granular dolomite and traces of gray, brown chert.
7490-7530	40	Dolomite, dark gray, medium fine crystalline, slightly argillaceous, and with gray brown, medium fine crystalline to fine granular dolomite with white, black, milky, blue, vari-colored chert containing some oolites.
7530-7580	50	Dolomite, light gray blue, medium to fine crystalline, silicified and with considerable to large amounts of white, milky, blue and vari-colored chert. 7530-7550 - with great silicification (dolomite is almost a chert) and with green bentonite and large amounts of vari-colored chert. 7550-7560 - with dark gray and gray brown dolomite. 7570-7580 - with large amounts of blue and varicolored chert.
7580-7600	20	Dolomite, dark gray and gray brown, medium to fine crystalline, slightly argillaceous, with some light gray brown blue tinted, fine crystalline to fine granular or dolomite and with some blue, black, and varicolored chert containing a few oolites.

7600-7700	100	Dolomite, light gray, whitish, blue tinted, fine crystalline to fine granular, with dark gray brown, fine crystalline dolomite with very small amounts of chert. 7630-7650 - with white medium coarse crystalline, dolomite. 7650-7670 - with thin interbedded, blue, fine crystalline dolomite and traces of milky, oolitic chert. 7680-7700 - with dark gray, medium fine crystalline dolomite, a few pyrite crystals and milky, white, chert.
7700-7770	70	Dolomite, light gray brown, medium coarse and with dark gray brown medium crystalline dolomite, bright pyrite crystals, and opaque to milky chert. 7710-7720 - with light gray, whitish, brown tinted medium crystalline dolomite. 7740-7750 - with predominantly gray brown and light gray brown dolomite.
7770-8020 TD	250	Dolomite, dark gray, medium crystalline, slightly argillaceous, with some gray brown medium crystalline to medium granular dolomite, with traces of gray, black, and milky chert. (For the most part the rocks are thin bedded.) 7800-7820 - with black, platy, thin bedded, very argillaceous to shaly dolomite. 7840-7850 - with a few sand grains imbedded in the dolomite, some green bentonitic shale, and a few chips of blue dolomite. 7850-8020 - with increased argillaceous content in the dolomite. 7870-7890 - with traces of dark, green, calcareous shale, a few rounded, frosted, medium grains of sand, and with blue chert containing oolites.

7910-7930 - with oolites in black, smoky, blue chert.

7950-8020 TD - with a few dolomite crystals, possibly from vein fillings.

Definition of Terms Used

Crystals, their size: The terms such as coarse, medium and fine crystalline are relative terms and used to convey a general relationship about the size of crystals in consolidated limestones and dolomites.

Granular: Limestones and particularly dolomites that are composed of rounded to semi-rounded particles. The size of these granules are expressed in relative terms such as coarse medium and fine granular.

Sucrosic: Sucrosic means that whenever it is has the texture of sugar. Actually, as used by many, it has little if any meaning. I have used the term sucrosic to imply the way light is reflected from grains of limestones and dolomites as crystalline, white, granulated sugar reflects light.

Fragmental: The limestone or dolomite is composed of various fragments or pieces of calcareous materials and held together by calcareous cements and finer calcareous particles.

Siliceous: Refers to some small content of silts imbedded, inconspicuously in shale, limestone or dolomite.

Silicification, refers to secondary enrichment of a strata by silica. Often limestones and dolomites are replaced or silicified by silica to form chert. Shale beds are hardened by silica and become silicified.

Slickensided, refers to scratches, groves or polishing due to possible abrasion caused by rubbing rocks together. This slickening is often caused by fault movements.

VDMR Well No: 1273

Operator: Shell Oil Co.
Farm: L. C. Bales
Well No: 1 (one)
Location: Cumberland Overthrust Area, Lee County
17,911' South of 36°40'
6,077' West of 83°20' approximate
Elevation: 1380 Ground 1391 Kelly bushings
Total Depth: 8020' (driller)
Commenced: December 1964
Completed: January 1965
Results: Dry and Abandoned

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

Formation Tops

Rock cutting samples are available from 560' to 8020' (TD)

Depth in Feet	Formation
Surface	In Cambrian Copper Ridge dolomite

The surface formation, at the well site, is the Cambrian Copper Ridge dolomite according to a map in Virginia Geological Survey, Bulletin 71, 1964.

560	In Cambrian Maynardville limestone

The first available samples at 560' and those to 750' are identified as Cambrian Maynardville limestone. (V.G.S. Bull. 71, p. 38, states, "the top of the Maynardville limestone, is taken at the place where the dark-gray crystalline dolomite that is characteristic of the lower Copper Ridge dolomite exceeds in relative amount the light-gray, fine grained dolomite of Chances Branch member (of Maynardville formation) type." (See reason number two.)) Reasons for this identification are:

1. The interval has a lesser amount of dolomite than in the Copper Ridge.

2. There is considerable light gray, fine grained, dense limestone-dolomite that is typical of the Maynardville and is not present in the Copper Ridge.

3. The oolite zone from about 700'-740' are in limestones and not in dolomites.

4. A map in V.G.S. Bull. 71, 1954, indicates that the Maynardville limestone from outcrop data is present beneath the Copper Ridge dolomite in the Pine Mountain thrust fault black.

750 Pine Mountain thrust fault zone

There is a major change in formation sequence at this point from the Cambrian Maynardville limestone above to the Ordovician Trenton limestone below.

750 In Ordovician Trenton limestone-fault contact

The Trenton is identified by the limestone being gray, gray-brown to white mottled, coarse crystalline, often very fossiliferous (coguinal) and by the alternating dark gray, black, platy, calcareous shales.
V.G.S. Bull. 71, pp. 116-119, discusses the Trenton and divides the formation into three sections, 1. lower, 2. middle, 3. copper., with a total thickness of approximately 560' in the Rose Hill district. In this well there is approximately 1145' of the Trenton section which is about twice as thick as expected. Possibly faulting could account for this thickening.
The basal or Lower Trenton is recognized from approximately 1630' to 1895', because of the alternating coarse crystalline, fossiliferous limestones and dark gray to black, clay, calcareous shales.

1895 Ordovician Eggleston limestone

The change in the character of the rocks is abrupt and distinctive. The Eggleston limestone was identified because of the dark reddish brown, fine crystalline, dense limestones. Another identifying feature is the presence of bentonites near the top of the formation.
V.G.S. Bull. 71, pp 109-112 discusses the characteristics of the Eggleston limestone.

2090 Ordovician Moccasin limestone

Identifying characteristics used to top the Moccasin are: the rocks become more red in color than those of overlying or underlying formations,

there is a prominent chert bed near the contact, there are "birdseye", imbedded small calcite crystals and the basal part carries calcareous mudstones and is free of chert.
V.G.S. Bull. 71, pp 103-106 discusses the moccasin and points out some of its identifying features.

2310 Ordovician Lowville limestone ?

At about 2310' the section had no more argillaceous limestones present. (V.G.S. Bull. 71, p. 98, states, "No argillaceous limestones or red beds are present in the platy member.") The platy member is the upper part of the Lowville limestone. (Bull. 71, p 98, further states, "chert is uncommon in most of the platy members....") Chert was not found in this section. The Redbed member of the basal Lowville was not recognized by color but by the presence of several "birdseye", imbedded calcite crystals and some argillaceous limestone. It is present at approximately 2600'.

2750 Ordovician Stones River limestone group ?

The Lowville limestone above and the Stones River limestone group are not separated with accuracy. The identifying features of the Lowville are absent, such as greenish tints in the dolomites, and the absence of "birdseye" imbedded calcite crystals. The Stones River group carries more chert.

3390 Ordovician Beekmantown formation

Identified members are as follows:

3390' Ordovician Mascot dolomite member

The Mascot dolomite is identified by interbedded sandy and silty beds, scattered sand grains, and the interbedded fine crystalline, whitish light brown tinted and dominant light gray brown dolomites. (V.G.S. Bull 71, p. 59, states, "... beds, 1 to 4 feet thick, of fine-crystalline white dolomite with pinkish streaks and patches...and contain scattered sand grains. A few sandy beds, some of which are quartzitic, are also present.")

3600' Ordovician Kingsport dolomite member

The Kingsport dolomite is identified by the light gray, white, fine crystalline to sucrosic color and texture, and by traces of dark gray to dark green shale.

(V.G.S. Bull. 71, p. 58, states, "...the upper part of the formation (Kingsport) is composed mainly of grayish white fine-crystalline dolomite...and a few thin green shale partings are present.")

3800' Ordovician Longview dolomite member

The Longview dolomite is identified by its being nearly white to very light brown, having a few green shales and by its milky chert. (V.G.S. Bull. 71, pp 55-56, states,"The Longview dolomite...is composed of interbedded nearly white fine-crystalline dolomite and white to light brown, medium to coarse crystalline .... On weathering the Longview dolomite forms...blocks of milky to chalky-white chert. A few beds of green shale, with a maximum thickness of 3 inches, are present.")

4080 Ordovician Chepultepec dolomite ?

The contact with the Longview dolomite is not concise. (V.G.S. Bull. 71, p. 52, states "that there are a few interbedded sandstone near the top of the formation and...that the dolomite is normally light colored") with the upper member being argillaceous.
The formation top is here picked at the top of a sandstone, under which for several hundred feet there are argillaceous dolomites. Also, there are but very small amounts of milky chert in the upper portion. However, milky chert is also present in the overlying Longview dolomite. There are less white dolomites in this section as compared to the overlying Longview. Here the dolomites are gray brown with interbedded dark gray to black, argillaceous dolomites.

4080: Upper argillaceous dolomite member of the Chepultepec.

4480: Lower Sandy member of the Chepultepec.

4780 Cambrian Copper Ridge dolomite ?

(V.G.S. Bull. 71, p. 51, states, "The placing of the Copper Ridge-Chepultepec contact is at the base of the first sandstone above the prominent oolitic chert beds in the top of the Copper Ridge dolomite...."

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On page 44 of V.G.S. Bull. 71, it is stated that the upper member of the Copper Ridge dolomite is almost entirely of light colored dolomites, that there are sand grains and sandy lenses in the upper Copper Ridge but that they are thinner and less abundant than in the overlying Chepultepec dolomite.
At 4770'-4780' there is a silicified, cherty sandstone under which there is an abundance of chert some of which contains oolites. Below this interval there is considerably less sand and sandy lenses in the section than above the interval. For these reasons the formation's top is so selected.

5870 Cambrian Maynardsville limestone ?

Chances Branch member at 5870'

(V.G.S. Bull. 71, pp 38-39, states, "...the top of the Maynardsville limestone, is taken at the place where the dark gray crystalline dolomite that is characteristic of the lower Copper Ridge dolomite exceeds in relative amount the light gray, fine-grained dolomite of Chances Branch member type.... The Chances Branch dolomite...consists essentially of light gray, fine grained dolomite, which is interbedded...in the upper part with dolomite like that of the overlying Copper Ridge dolomite.") Above 5870' there is no light gray dolomite but below this point there is interbedded light gray, fine crystalline, dense, fairly argillaceous dolomite and the dark gray and gray brown dolomite of Copper Ridge type (this latter type of dolomite redominantes). On this evidence, which is vague, the formation is identified.
(V.G.S. Bull. 71, p 38 further states, "In the upper half of the member (Chances Branch) beds of dark gray, fine-to medium crystalline dolomite of Copper Ridge type are present and they become increasingly abundant upward.")
The Law Hollow member, is not identified, but probably is represented by the stratigraphic interval 6030'-6110'.

6110 Cambrian Conasauga shale ?

(V.G.S. Bull. 71, p. 39, states, "The upper contact (of the Conasauga) with the Maynardsville limestone is almost everywhere sharp and is drawn at the base of the lowest massive zone of fine crystalline, ribbon limestone.") There is a further discussion of this contact in the same reference on page 39. On page 29 of the same reference it is stated, "Shale forms 80 percent of the exposed part of the Conasauga. Most of the shale is medium to dark green or greenish gray...." There are shaly limestones in the basal overlying Maynardsville according to V.G.S. Bull. 71, p. 39 which states, "...the boundry separating the part of the section below that is mainly shale from the above which is almost entirely limestone." At 6110' there is a distinct separation of the argillaceous, shaly limestones from the massive dolomites above. There are greenish shales present, but for the most part they are dark gray. For these reasons the formation is identified.

6110'-6510' This interval probably represents the Rogerville shale because of the presence of shales and argillaceous limestones, however there are facies changes in this stratigraphic section in the area of Rose Hill and several names could be applied to this interval, none of which are diagnostic.

6510' - ? probably represents the lower half of the Conasauga because there are silts and sandstones present and because of the blue limestone. The interval possibly represents the Rutledge limestone due to the presence of blue limestone. (V.G.S. Bull. 71, p. 29 states, "...that the lower half of the Conasauga formation was not observed on the surface outcrop and was seen only from well cuttings, from this well." There were more interbedded sandstones in the lower half of the Conasauga than in the upper part.
(V.G.S. Bull 52, p. 68, states, "The Rutledge is rather thick bedded, blue to gray, and, in part, somewhat magnesium limestone. Its lower part contains thin partings of siliceous shale."

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6830 to 8020 TD — Tentative Cambrian Shady dolomite ? - Faulted Contact ?

The greatest change at this point from above lithologies is in the lack of silicification, lack of silt and sandy bed and a great reduction in the amount of chert.
Ordinarily, the Rome formation would be expected at this stratigraphic position. The Rome formation, if present, was not identified; however some of the dolomites found could belong to that formation because of their being reddish brown in color. Usually the Rome formation contains shales of considerable thicknesses that are oftimes of reddish colors. No thick shales or shales of reddish colors were found however. The formation identified as Rome in the Virginia Lee Oil Co, E. M. Brooks # 1 gas well, has no equivalent in the Shell, # 1 Bales.
Because there are many blue, to light blue, often thin bedded and whitish dolomites present it is possible and probable that parts, if not all, of this interval are rocks of the Shady dolomite.

Note: In VDMR files are the following electric logs:

1. Induction-Electrical Log
2. Formation Density Log (Gamma-Gamma Log)
3. Gamma Ray - Neutron Log
4. Sonic Log
5. Continuous Dipmeter Log (computed)

The following oil and gas shows were gotten from the A. A. P. G., June 1965 issue.

Show of oil	1850 feet
Show of oil	3150 feet
Show of gas	4400 feet
Show of gas	6050 feet
Show of gas	6440 feet
Show of gas	6850 feet
Water at	6050 feet