

W. M. Ritter No. 2-V (1481) Well

Keen Mountain Field, Buchanan County, Virginia

United Producing Company

Located 2,500 ft S. of 37° 15'; 15,500 ft W. of 81° 55'

Elevation, 1,726.26 ft, Gr.

Total Depth, 4,275 ft (filled back to 2480 ft)

Drilling commenced April 9, 1948; completed February 16, 1949

Gas at 458, 2460 ft; oil shows at 3871, 3880 ft.

Coal at 2336-2343, 2381-2398 ft

Samples examined by Allen D. Williamson, 2555-4262, January 1950; and

Mary Beth McFarlan, 2238-2555 ft, August 1950

Sample Library Reference: Virginia Geological Survey

Depth

Thickness

Carboniferous System, Mississippian Series, Bluestone formation

2238-2245

7

Siltstone grading into sandstone 75%, shale 25%:  
siltstone grading into very fine grained sandstone, light-gray (N7) to medium-gray (N5), nonargillaceous to argillaceous, few slightly calcareous, few black minerals; shale, medium-gray (N5) to medium dark-gray (N4), two or three pieces with reddish tint, mostly silty, few pieces medium dark-gray (N4) not silty.

2245-2250

5

Sandstone 90%, shale 10%: sandstone, very light gray (N8) to some medium-gray (N5), very fine grained, noncalcareous to some slightly calcareous, slightly micaceous, some argillaceous, few black minerals: shale, medium-gray (N5), silty to very few nonsilty.

Depth (feet)	Thickness (feet)	
2250-2260	10	Shale 85%, sandstone 15%: shale, medium-gray (N5) to medium dark-gray (N4), silty to nonsilty, few pieces slightly micaceous; sandstone, like 2245-2250.
2260-2268	8	Sandstone 90%, shale 10%: sandstone, very light gray (N8) to medium light-gray (N6), very fine grained, few pieces argillaceous, some with calcareous cement, very few black minerals; shale, medium-gray (N5) to medium dark-gray (N4), nonsilty to silty, slightly micaceous.
2268-2278	10	No samples.
2278-2290	12	Sandstone 85%, shale 15%: sandstone, light-gray (N7) to medium-gray (N5), nonargillaceous to argillaceous, very few pieces slightly calcareous, slightly micaceous, few black minerals; shale, medium-gray (N5) to medium dark-gray (N4), silty to some nonsilty, mostly micaceous.
2290-2300	10	Sandstone 60%, shale 40%: sandstone, very light gray (N8) to medium-gray (N5), very fine grained; nonargillaceous to argillaceous, few black minerals; shale, medium-gray (N5) to black (N1), some silty and micaceous.
2300-2307	7	Like 2290-2300.
2307-2318	11	No samples.

Depth (feet)	Thickness (feet)	
2318-2327*	9	Shale 85%, sandstone 15%: shale, medium-gray (N5) to medium dark-gray (N4); sandstone, very light gray (N8) to medium light-gray (N6), very fine grained, slightly calcareous to calcareous, slightly iron stained.
2327-2336	9	Shale: medium dark-gray (N4) to medium-gray (N5), nonsilty to silty, some slightly micaceous.
2336-2343	7	Shale 99%, coal 1%: shale, medium dark-gray (N4) to dark-gray (N3); some shale, silty, medium-gray (N5); some shale, carbonaceous; coal.
2343-2358	15	Shale: medium-gray (N5) to medium dark-gray (N4), nonsilty to some silty, few pieces carbonaceous, trace pyrite.
2358-2373	15	Shale: medium dark-gray (N4), nonsilty to some silty, some carbonaceous, trace pyrite.
2373-2381	8	Shale 75%, siltstone 25%: shale, medium-gray (N5) to black (N1), black shale is very carbonaceous, several pieces coal; siltstone, very light gray (N8) to medium-gray (N5), some very calcareous, some slightly micaceous.
2381-2389	8	Shale 78%, coal 10%, siltstone 10%, limestone 2%: shale, medium-gray (N5) to black (N1) to some medium-gray (N5) with brownish tint, noncalcareous to calcareous, some silty slightly micaceous, black is very carbonaceous; siltstone, very light gray (N8) to medium-gray (N5) noncalcareous to very calcareous, some argillaceous; limestone, medium light-gray (N6); trace pyrite.

Depth (feet)	Thickness (feet)	
2389-2398	9	Like 2381-2389 except more siltstone, less shale, no limestone.
2398-2400	2	Shale 90%, sandstone 10%: shale, medium dark-gray (N4) to some medium-gray (N5), noncalcareous to some slightly calcareous, few silty; sandstone, calcareous, white (N9) to light-gray (N7), very fine grained, little iron stain.  Princeton sandstone
2401-2403	2	Sandstone 85%, shale 15%: sandstone, white (N9) to light-gray (N7) to yellowish-gray (5Y 8/1), very fine grained, some medium-grained pieces, calcareous cement, some limonite stain; shale, like 2398-2400; trace pyrite; several pieces siltstone, pale grayish-orange (10YR 7/4).
2400-2406?	6	Sandstone 55%, shale 45%: sandstone, white (N9) to medium light-gray (N6), very fine grained, few pieces argillaceous, calcareous cement, few black minerals, little limonite stain; shale, medium dark-gray (N4), to some medium-gray (N5), few pieces slightly micaceous, trace pyrite.
2403-2404	1	Sandstone 90%, shale 10%: sandstone, dark yellowish-orange (10YR 6/6) to white (N9), very fine grained, noncalcareous to calcareous, much limonite stain; shale, like 2400-2406.

Depth (feet)	Thickness (feet)	
2404-2408	4	Sandstone 90%, shale 10%: sandstone, white (N9) to medium light-gray (N6) to pale yellowish-orange (10YR 8/6), very fine grained, some pieces fine-grained, slightly calcareous to calcareous, limonite stain, some chert fragments; shale, medium-grained (N5), nonsilty to silty.
2408-2413	5	Sandstone 70%, shale 30%: sandstone, light-gray (N7) to white (N9) to medium light-gray (N6), very fine-grained, some slightly calcareous to calcareous to sandy limestone, argillaceous to nonargillaceous, limonite stain, chert fragments; shale, medium-gray (N5) to medium dark-gray (N4), noncalcareous to slightly calcareous.
2413-2417	4	Sandstone 35%, shale 35%, limestone 30%: sandstone, white (N9) to medium light-gray (N6), very fine grained, argillaceous to nonargillaceous, very calcareous to slightly calcareous; shale, medium dark-gray (N4) to medium-gray (N5), noncalcareous to calcareous; limestone, white (N9) to medium light-gray (N6), dense to crystalline, nonargillaceous to very argillaceous, limonite stain,
2418-2422	4	Sandstone 90%, shale 10%: sandstone, white (N9) to medium light-gray (N6), very fine grained to some fine-grained, slightly calcareous to very calcareous, some pieces with brownish tint, nonargillaceous to

Depth

Thickness

argillaceous; shale, medium-gray (N5) to medium dark-gray (N4), noncalcareous to some calcareous, nonmicaceous to finely micaceous, few pieces silty; few pieces calcite, trace pyrite.

Depth (feet)	Thickness (feet)	
2422-2424	2	Sandstone 75%, shale 25%: sandstone, calcareous, white (N9) to medium light-gray (N6), very fine grained to some fine-grained, much limonite stain, very few green minerals; shale, medium dark-gray (N4) to medium-gray (N5).
2424-2425.5	1.5	Sandstone 85%, shale 15%: sandstone, white (N9) to dark yellowish-orange (10YR 6/6), very fine grained to some fine-grained, calcareous to some noncalcareous, much limonite stain; shale, medium-gray (N5) to medium dark-gray (N4), finely micaceous to nonmicaceous.
2425.5-2426	0.5	Sandstone 85%, shale 15%: sandstone, dark yellowish-orange (10YR 6/6) to pale yellowish-orange (10YR 8/6) to little white (N9), very fine grained, noncalcareous to calcareous, very much limonite stain; shale, like 2424-2425.5.
2426-2428	2	Like 2425.5-2425.
2428-2429	1	Sandstone 90%, shale, 10%: sandstone, white (N9) to pale yellowish-orange (10YR 8/6) to little dark yellowish-orange (10YR 6/6), very fine grained, few pieces calcareous, limonite stain; shale, like 2424-2425.5.
2429-2432	3	Sandstone 85%, shale 15%: sandstone, white (N9) to pale yellowish-orange (10YR 8/6), very fine grained, very few pieces calcareous, limonite stain; shale, medium-gray (N5) to medium dark-gray (N4).

Depth (feet)	Thickness (feet)	
2432-2433	1	Sandstone 80%, shale 20%: sandstone, white (N9) to pale yellowish-orange (10YR 8/6) to dark yellowish-orange (10YR 6/6), very fine grained to some fine-grained, noncalcareous to few calcareous, limonite stain; shale, medium-gray (N5) to black (N1).
2433-2435	2	Sandstone: white (N9) to pale yellowish-orange (10YR 8/6) to few dark yellowish-orange (10YR 6/6), very fine grained, noncalcareous to few calcareous, limonite stain.
2435-2435.5	0.5	Like 2433 to 2435.
2435.5-2436.5	1	Sandstone 90%, shale 10%: sandstone, white (N9) to pale yellowish-orange (10YR 8/6) to few light-gray (N7), very fine grained, few calcareous, some limonite stain; shale, medium-gray (N5) to black (N1), few slightly micaceous.
2436.5 to 2438	1.5	Sandstone 85%, shale 15%: sandstone, white (N9) to dark yellowish-orange (10YR 6/6), very fine grained to few fine-grained, noncalcareous to some calcareous, very few green minerals, much limonite stain; shale, medium-gray (N5) to medium dark-gray (N4), few finely micaceous.
2438-2440	2	Like 2436.5-2438; less fine-grained size, no green minerals, less shale.



Depth (feet)	Thickness (feet)	
2440-2442	2	Sandstone: like 2436.5-2438 except no fine-grained, no green minerals.
2442-2444	2	Sandstone: like 2436.5-2438 except no fine-grained, no green minerals.
2444-2446	2	Like 2436.5-2438; sandstone less calcareous, no fine-grained.
2446-2448	2	Like 2436.5-2438; sandstone less calcareous, no fine-grained.
2448-2449	1	Sandstone 90%, shale 10%: sandstone, white (N9) to yellowish-gray (5Y 8/1) to some pale yellowish-orange (10YR 8/6), very fine grained to few fine-grained, few pieces calcareous, limonite stain; shale, medium dark-gray (N4) to grayish-black (N2).
2449-2450	1	Sandstone 85%, shale 15%: sandstone, like 2448-2449; more limonite stain; shale, medium-gray (N4) to grayish-black (N2).
2450-2455	5	Like 2448-2449 except more pale yellowish-orange (10YR 8/6) sandstone, more limonite stain.
2455-2457	2	Like 2448-2449.
2457-2458	1	Like 2448-2449 except some dark yellowish-orange (10YR 6/6) sandstone, more limonite stain, little more shale.

Depth (feet)	Thickness (feet)	
2458-2460	2	Sandstone: white (N9) to yellowish-gray (5Y 8/1), fine-grained, subangular to subrounded, little limonite stain.
2460-2463	3	Like 2458-2460; few medium-grained quartz fragments.
2463-2465	2	Sandstone: white (N9) to yellowish-gray (5Y 8/1) to pale yellowish-orange (10YR 8/6), very fine grained to fine-grained, very few pieces calcareous, limonite stain.
2465-2468	3	Sandstone 95%, shale 5%: sandstone, white (N9) to yellowish-gray (5Y 8/1), subangular to subrounded, few pieces slightly calcareous; shale, medium dark-gray (N4), some finely micaceous.
2468-2470	2	Sandstone 90%, shale 10%: sandstone, dark yellowish-orange (10YR 6/6) to pale yellowish-orange (10YR 8/6) to few white (N9), noncalcareous to few calcareous, much limonite stain; shale, medium-gray (N5) to medium dark-gray (N4).
2470-2472	2	Sandstone: white (N9) to pale yellowish-orange (10YR 8/6), fine-grained to very fine grained, angular to subangular, noncalcareous to some calcareous, limonite stain.
2472-2474	2	Sandstone: white (N9) to yellowish-gray (5Y 8/1) to pale yellowish-orange (10YR 8/6), very fine grained to fine-grained, angular to subangular, noncalcareous to few calcareous, limonite stain.

Depth (feet)	Thickness (feet)	
2474-2476	2	Sandstone 80%, shale 20%: sandstone, like 2472-2474; shale, medium-gray (N5) to medium dark-gray (N4), noncalcareous to few slightly calcareous.
2476-2481	5	Shale: medium dark-gray (N4).
2481-2488	7	Shale: medium dark-gray (N4).
2488-2493	5	Shale: medium dark-gray (N4).
2493-2499	6	Shale 90%, siltstone 10%: shale, medium dark-gray (N4), nonsilty to slightly silty; siltstone, argillaceous, light-gray to medium-gray (N4), few pieces calcareous to slightly calcareous, trace pyrite.
2499-2505	6	Like 2493-2499.
2505-2508	3	Sandstone 70%, shale 30%: sandstone, white (N9) to medium light-gray (N6), very fine grained, nonargillaceous to argillaceous, noncalcareous to few calcareous; shale, medium dark-gray (N4), nonsilty to silty, trace limonite stain.
2508-2511	3	Sandstone 75%, shale 25%: sandstone, white (N9) to medium-gray (N5), very fine grained, nonargillaceous to argillaceous, few calcareous to slightly calcareous, limonite stain; shale, medium dark-gray (N4) to medium-gray (N5), some sandy to silty.

Depth (feet)	Thickness (feet)	
2511-2516	5	Sandstone 90%, shale 10%: sandstone, very light gray (N8) to medium light-gray (N6), very fine grained, nonargillaceous to argillaceous, non-calcareous to moderately calcareous, few pieces micaceous, few black minerals, limonite stain; shale, medium-gray (N5), nonsilty to silty to sandy, nonmicaceous to micaceous.
2516-2523	7	Siltstone 80%, shale 20%: siltstone, light-gray (N7) to medium-gray (N5), nonargillaceous to argillaceous, noncalcareous to calcareous; shale, medium-gray (N5) to medium dark-gray (N4), few silty.
2523-2531	8	Like 2516-2523.
2531-2535	4	Like 2516-2523.
Hinton formation		
2535-2545	10	Shale: medium dark-gray (N4), slightly calcareous to very calcareous, several chert fragments.
2545-2555	10	Shale: medium dark-gray (N4), slightly calcareous to very calcareous.

UNITED PRODUCING COMPANY

W. M. Ritter Lumber Company

Location: 2,500' South of 37° 15'; 15,500' West of 81° 55'.

Garden District, Buchanan County, Virginia.

Elevation (ground): 1726.26'.

Total Depth: 4275' (filled back to 2480').

Number: 2V-1481

Interval

- 2555-2560 Shale, medium gray (N5), slightly calcareous 50%, very calcareous, 40%; fissile, few medium-grained, rounded clear, to slightly frosted quartz grains, little white finely crystalline limestone, trace light gray (N7), sandy siltstone, 1 crinoidal stem and 1 foraminifera (?) noted.
- 2560-2567 Shale, medium gray (N5), non-calcareous, fissile, 70%, with shale, very calcareous, blocky 30% little white finely crystalline limestone, trace sandy siltstone.
- 2567-2574 Shale, medium gray (N5), calcareous, blocky, little limestone medium blackish gray (5B 5/1), little white finely crystalline limestone, trace very light gray (N7), very fine-grained limestone, little calcite.
- 2574-2581 Shale, medium dark gray (N4), fissile, calcareous, little very light gray (N7), very fine-grained limestone, trace magnetite, little white very finely crystalline limestone, few crinoid stems, 1 pyritized plant fossil.
- 2581-2587 Shale, medium dark gray (N4), calcareous to very calcareous, some medium blackish gray (5B 5/4), limestone, little very light gray (N7), very fine-grained limestone, little pyrite, few crinoid stems, 1 fossil crustacean (?).

Interval

- 2587-2600 Shale, grayish red (5R 3/4), lumpy to fairly fissile, slightly micaceous.
- 2600-2610 Shale, grayish red (5R 3/4), lumpy, slightly micaceous, slightly silty.
- 2610-2620 Shale, very dusky red (10R 2/2), lumpy to platy, slightly micaceous.
- 2620-2630 Shale, very dusky red (10R 2/2), lumpy, slightly micaceous.
- 2630-2640 Ditto.
- 2640-2650 Shale, grayish red (5R 4/2), silty, micaceous, platy to fissile.
- 2650-2660 Shale, grayish red (5R 4/2), very silty, same as above, 50%; shale, greenish gray (5GY 5/1), very calcareous, fissile, very slightly micaceous, 50%; limestone, very light gray (N8), thin bedded, finely crystalline, 20% microfossils abundant, trace pyrite. The preceding are probably interbedded. No gradations of one into another seem to be present. Fossils in limestone are poorly preserved but seem to be foraminifera.
- 2660-2673 Shale, grayish red (5R 4/2), very silty, very micaceous, fissile.
- 2673-2685 Shale, as above, 80%; shale, greenish gray (5 G Y 5/1), calcareous, fissile, 10%, fossiliferous limestone as in 2650-2660.
- 2685-2700 Shale, dark reddish brown (10R 3/4), very silty, lumpy, micaceous.
- 2700-2707 Silstone, medium dark gray (N4), micaceous, lumpy to platy, slightly calcareous, with shale, very dusky red (10 R 2/2), very micaceous, slightly calcareous, fissile.
- 2707-2712 Shale, very dusky red (10 R 2/2), very micaceous, slightly calcareous, fissile, silty, with little limestone, thin bedded, sandy, microfossils.
- 2712-2718 Shale, medium dark gray (N4), calcareous, blocky, slightly micaceous.
- 2718-2726 Shale, grayish red (10 R 4/2), with 10%, thin bedded, finely crystalline limestone, greenish gray (5 GY 6/1),
- 2726-2730 Shale, grayish red (10 R 4/2), 60% shale, dark greenish gray (5GY 4/1), calcareous, little pyrite, 30%; limestone, greenish gray (5GY 6/1), medium crystalline, 10%.

Interval

- 2730-2738 Shale, grayish red (10R 4/2), finely micaceous, platy 70%: siltstone, medium gray (N5), slightly calcareous, 30%: little limestone, light gray (N7), finely crystalline.
- 2738-2745 Missing.
- 2745-2750 Shale, grayish red, as above, 80%; siltstone, as above, 10%; shale, medium dark gray (N4), silty, micaceous, 5%; sandstone, quartzose, light gray (N7), fine-grained to medium-grained, fairly well sorted, subrounded to rounded, fairly porous, calcareous cement, 5% little limestone, light gray (N7), finely crystalline.
- 2750-2757 Interbedded shale, sandstone, and siltstone, as above.
- 2757-2762 Shale, medium dark gray (N4), micaceous, fissile.
- 2762-2775 Interbedded shale, grayish red (10 R 4/2); sandstone, pale crystals brown (10 R 6/2), silty, very poorly sorted, fine-grained to medium-grained, subangular to subrounded, micaceous; shale, greenish gray (5GY 6/1).
- 2775-2785 Shale, medium dark gray (N4), finely micaceous, slightly calcareous, fissile.
- 2785-2790 Siltstone, medium gray (N5), calcareous, trace black, carbonaceous shale.
- 2790-2800 Missing.
- 2800-2805 Sandstone, pale brown (5YR 5/2), fine-grained to medium-grained, friable, silty, poorly sorted, subrounded to subangular, little hard, platy, transparent mineral, possibly glass fragments.
- 2805-2810 Sandstone, very light gray (N8), subangular to subrounded, very fine-grained to medium grained, poorly sorted, slightly silty, micaceous, very slightly porous.
- 2810-2815 Sandstone, as above.
- 2815-2820 Missing.
- 2820-2825 Sandstone, very light gray (N8), very fine-grained, fairly well sorted, slightly porous, angular to subangular, slightly micaceous, majority of glass clear; 10% shale, grayish red (10 R 4/2), probably cavings.
- 2825-2827 Sandstone, as above.
- 2827-2834 Graywacke, medium gray (N5), very micaceous.
- 2837-2838 Graywacke, as above, with 10% shale, medium dark gray (N4), very silty, very micaceous.

Interval

2828-2843	Shale, as above, 50%; sandstone, very light gray (N8), fine-grained to medium-grained, angular to subangular, slightly porous, friable, 90% quartzose.
2843-2850	Sandstone, as above, slightly calcareous, interbedded with graywacke, medium gray (N5), very micaceous.
2850-2858	Sandstone, as above.
2858-2861	Sandstone, as above.
2861-2869	Siltstone, medium gray (N5), sandy, micaceous.
2869-2875	Siltstone, as above.
2875-2880	Shale, dusky red (5R 3/4), fissile, calcareous.
2880-2891	Shale, dark gray (N3), fissile, finely micaceous, with little thinbedded calcareous shale.
2891-2894	Shale, medium gray (N5), very calcareous, silty.
2894-2900	Sample dirty, probably same as above.
2900-2904	Siltstone, medium dark gray (N4), slightly calcareous, with little sandstone, medium gray (N5), very fine-grained to fine-grained, calcareous cement.
2904-2908	Sandstone, very light gray (N8), very fine-grained to fine-grained, silty, angular to subangular, very slightly porous, little black mineral, little pyrite.
2908-2912	Sandstone, as above with interbedded (?) shale, medium gray (N5), micaceous, fissile.
2912-2915	Sandstone, as above, with interbedded (?) shale as above.
2915-2920	Sandstone, very light gray (N8), very fine-grained to fine-grained, angular to subrounded, very poorly sorted, friable, slightly porous, clear glass, 90% quartzose.
2920-2923	Sandstone, as above, with little calcareous cement.
2923-2926	Sandstone, as above.
2926-2930	Sandstone, as in 2920-2923.
2930-2935	Shale, dark gray (N3), fissile, slightly calcareous 80%, shale, medium dark gray (N4), lumpy, calcareous 20%.
2935-2941	Shale, greenish gray (5GY 6/1), lumpy, slightly calcareous.



Interval

2941-2948	Shale, medium dark gray (N4), fissile, finely micaceous, shale, as above; shale, grayish red (10 R 4/2), very calcareous, micaceous, slightly silty, little pyrite.
2948-2954	Shale, grayish red (10R 4/2), as above.
2954-2960	Shale, medium gray (N5), blocky, silty, little pyrite.
2960-2967	Shale, medium dark gray (N4), fissile, finely micaceous.
2967-2973	Shale, as above, 60%; siltstone, medium light gray (N6), fossiliferous, 10%; limestone, medium dark gray (N4), very fossiliferous, silty, medium crystalline, 20%; limestone, medium dark gray (N4), silty, very pyritic 10%.
2973-2980	Sample as above.
2980-2992	Shale, medium dark gray (N4), carbonaceous (?), slightly fissile.
2992-2998	Shale, as above, with pyrite.
2998-3005	Shale, medium dark gray (N4), slightly fissile, cherty, detrital, with 20% shale, grayish red (10R 4/2), lumpy, and little limestone, light oolitic gray (5Y 6/1), finely clastic, silty.
3005-3012	Sample as above, with little coal and 5% detrital chert.
3012-3016	Sample as 2998-3005.
3016-3021	Shale, medium dark gray (N4), slightly fissile, cherty, carbonaceous material, 50%; shale, grayish red (5R 4/2), very calcareous with possible slickensided (?), 50%.
3021-3026	Sample dirty, similar to above.
3026-3032	Siltstone, light gray (N7), very friable, little pyrite.
3030-3034	Shale, dark greenish gray (5GY 4/1), calcareous, lumpy, little carbonaceous, matter, 70%; shale, grayish red (5R 4/2), very calcareous, 30%.
3034-3038	Shale, medium dark gray (N4), fissile, little pyrite, with little siltstone, little gray (N7), calcareous.
3038-3041	Siltstone, very light gray (N8), friable, slightly calcareous, slightly cherty, with siltstone, medium light gray (N6), compact.
3041-3047	Siltstone, very light gray (N8), as above.

Interval

- 3047-3053 Siltstone, medium gray (N5), calcareous with thin seams of calcite and abundant detrital cherts.
- 3053-3057 Sample dirty probably similar to above.
- 3057-3070 Sample as above.
- 3070-3084 Siltstone, very light gray, as above, with interbedded shale, grayish red (10R 4/2), and shale, dark gray (N3).
- 3084-3093 Sample as above.
- 3093-3100 Shale, medium dark gray (N4), with little limestone, medium gray (N5), finely clastic.
- 3100-3110 Shale, medium dark gray, as above, 50%; siltstone, light gray (N7), sandy, 3/4 quartzose.
- 3110-3113 Siltstone, light gray, as above.
- 3113-3117 Shale, medium dark gray (N4), carbonaceous (?), finely micaceous.
- 3117-3120 Sandstone, very light gray (N8), very fine-grained, sub-angular to subrounded, clear glass, 95% quartzose.
- 3120-3125 Sandstone, very light gray, as above, 50%; shale, dark gray (N3), fissile, with little pyrite and carbonaceous material 50%.
- 3125-3130 Shale, medium gray (N5), fissile, micaceous, little pyrite.
- 3130-3136 Shale, medium dark gray (N4), fissile, micaceous, slightly cherty (detrital), little pyrite.
- 3136-3144 Shale, medium dark gray, as above.
- 3144-3150 Shale, medium dark gray, as above.
- 3150-3156 Shale, medium dark gray, as above.
- 3156-3164 Shale, medium gray (N5), fissile, very calcareous.  
Sample for interval 3156-3167 is medium gray (N5), very crinoidal limestone (probably out of place).
- 3164-3172 Shale, medium dark gray (N4), fissile, slightly silty, micaceous, little pyrite.
- 3172-3177 Sample dirty, probably shale, medium gray (N5), or medium dark gray (N4), calcareous, slightly micaceous.

Interval

- 3177-3183 Shale, medium dark gray (N4), calcareous, little pyrite.
- 3183-3186 Shale, medium dark gray as above, 50%; and sandstone, very light gray (N8), very fine-grained, angular to subangular, very slightly porous, 95% quartzose, 50%.
- 3186-3188 Sandstone, as above, grading into shale, medium dark gray (N4), very micaceous with little chert and pyrite.
- 3188-3195 Shale, as above.
- 3195-3200 Shale, medium gray (N5), silty, calcareous.
- 3200-3215 Shale, medium gray (N5), calcareous as above, 50%; shale, medium dark gray (N4), fissile, finely micaceous, carbonaceous, little pyrite with little shale, grayish red (10R 4/2), micaceous, lumpy.
- 3215-3222 Siltstone, medium gray (N5), micaceous, abundant black mineral, calcareous, cement.
- 3222-3227 Siltstone, light gray (N7), micaceous, slightly calcareous, black mineral, little pyrite.
- 3227-3234 Shale, medium dark gray (N4), micaceous.
- 3234-3238 Shale, medium dark gray (N4), micaceous, silty, trace chert.
- 3238-3241 Sandstone, light gray (N7), angular to subangular, 70%; graywacke, medium light gray (N6), silty, 70% quartzose.
- 3241-3245 Sample as above.
- 3245-3248 Shale, medium dark gray (N4), micaceous, fairly fissile.
- 3248-3254 Shale, medium dark gray (N4), micaceous, silty, fissile, little pyrite.
- 3254-3262 Sandstone, light gray (N7), fine-grained to medium-grained to very fine-grained, silty, angular to subrounded, glass clear to frosted, friable, very slightly porous 80% quartzose.
- 3262-3268 Shale, medium dark gray (N4), fissile.
- 3268-3272 Shale, as above, and limestone, medium gray (N5), finely crystalline, silty.
- 3272-3281 Shale, medium dark gray (N4), calcareous, crinoidal, with limestone, light gray (N7), medium crystalline.

Interval

- 3281-3290 Limestone, medium gray (N5), finely clastic to medium clastic.
- 3290-3298 Limestone, greenish gray (5GY 6/1), very finely clastic to finely clastic with interbedded shale, grayish red (10 R 4/2), micaceous, silty.
- 3298-3308 Shale, medium gray (N5), calcareous, fissile.
- 3308-3322 No sample.
- 3322-3335 Shale, medium dark gray (N4), calcareous, fissile.
- 3335-3340 Limestone, medium light gray (N6), medium clastic, nodular.
- 3340-3344 Limestone, as above, few oololiths noted.
- 3344-3348 Limestone, medium gray (N5), medium clastic, slightly nodular.
- 3348-3351 Limestone, medium dark gray (N4), medium clastic, thin-bedded, silty.
- 3351-3356 Limestone, medium dark gray (N4), coarsely clastic, oolitic, with little limestone, very light gray (N8), thin-bedded, finely crystalline.
- 3356-3358 Shale, medium dark gray (N4), very slightly calcareous, few quartz chips, plant fossil.
- 3358-3360 Siltstone, medium dark gray (N4), micaceous (muscovite), very slightly calcareous, friable.
- 3360-3380 No sample.
- 3380-3387 Sandstone, light gray (N7), fine-grained to medium-grained, subangular to subrounded, fairly well sorted, silica cement, very slightly porous, 90% quartzose.
- 3387-3395 Sample as above.
- 3395-3400 Sample as above.
- 3400-3404 Shale, medium dark gray (N4), silty, micaceous, 40%; and sandstone, as above, 60%.
- 3404-3406 Sandstone, light gray (N7), medium-grained, well sorted, subangular to subrounded, calcareous cement, fairly porous, 90% quartzose.
- 3406-3412 Sample as above.

Interval

3412-3417 Shale, medium dark gray (N4), very silty, slightly micaceous.

3417-3425 Sample as above.

3425-3432 Shale, medium dark gray (N4), fissile, carbonaceous.

3432-3442 Sample as above.

3442-3448 Ditto.

3448-3456 Ditto.

3456-3467 No sample.

3467-3477 Limestone, dark gray (N3), very silty, sample dirty.

3477-3485 Shale, medium dark gray (N4), micaceous, plant fossil.

3485-3492 Shale, medium dark gray (N4), calcareous, fissile, plant fossil, with thin seams of calcite.

3492-3500 Sample as above.

3500-3508 Limestone, medium gray (N5), silty, finely clastic, with some medium crystalline.

3508-3518 Shale, medium dark gray (n4), calcareous with thin seams of calcite.

3518-3523 Limestone, medium gray (N5), finely clastic with abundant medium crystalline, slightly silty, little pyrite.

3523-3528 Limestone, as above.

3528-3531 Sample as above.

3531-3535 Limestone, medium dark gray (N4), finely clastic, slightly oolitic, silty, little pyrite.

3535-3541 Sample missing.

3541-3546 Sample as in 3531-3535.

3546-3555 Sample as above, few coliths.

3555-3563 Ditto.

3563-3568 Limestone, dark gray (N3), very oolitic with finely crystalline to medium crystalline matrix.

3568-3572 Sample as above.

Interval

- 3572-3575 Limestone, dark gray, as above, with some very coarsely crystalline.
- 3575-3581 Limestone, medium light gray (N6), finely crystalline, silty.
- 3581-3591 Shale, medium gray (N5), very calcareous, fossiliferous, very porous, when acidized.
- 3591-3600 Shale, medium dark gray (N4), slightly calcareous, micaceous.
- 3600-3605 Shale, as 3581-3591 with abundant pyrite.
- 3605-3620 Shale, as above, slightly crinoidal.
- 3620-3633 Shale, medium dark gray (N4), calcareous, crinoidal, few quartz chips, plant fossil.
- 3633-3642 Sample missing.
- 3642-3650 Shale, medium dark gray (N4), calcareous, plant fossil.
- 3650-3655 Limestone, medium dark gray (N4), very oolitic.
- 3655-3660 Sample as above.
- 3660-3665 Shale, medium dark gray (N4), calcareous, fairly fossiliferous, one low spired gastropod, one piece grayish red limestone (5R 4/2).
- 3665-3669 Shale, medium dark gray (N4), calcareous.
- 3669-3673 Sample nearly all cavings, probably shale, dark gray (N3), very calcareous.
- 3673-3677 Limestone, very light gray (N7), very finely clastic, with some abundant dark-gray oolites.
- 3677-3682 Limestone, medium light gray (N6), to white (N9), about 30% thin-bedded, and shale, medium dark gray (N4), very calcareous, 70%, probably interbedded.
- 3682-3689 Limestone, medium light gray (N6), medium crystalline, slightly crinoidal.
- 3689-3693 Siltstone, medium dark gray (N4), very calcareous, slightly fossiliferous.
- 3693-3702 Sample as above.
- 3702-3710 Sample as above.
- 3710-3718 Sample as above, with abundant pyrite crystals and few crinoid stems.

Interval

- 3718-3724 Sample as above.
- 3724-3731 Sample as above.
- 3731-3738 Limestone, medium gray (N5), finely crystalline to medium crystalline, silty, with disseminated pyrite crystals.
- 3738-3745 Limestone, dark gray (N3), medium crystalline, silty, with some limestone, medium light gray (N6), finely clastic, thin-bedded, as few slickensides (?).
- 3745-3750 Limestone, dark gray (N3), as above, 50%; and limestone, medium light gray (N6), as above, 50% with abundant clear calcite seams.
- 3750-3753 Sample dirty.
- 3753-3755 Limestone, medium dark gray (N4), very oolitic.
- 3755-3757 Limestone, light brownish gray (5YR 6/1), to white (N9), medium crystalline.
- 3757-3760 Limestone, as above, nodular (?), little dark gray (N3), silty, shale.
- 3760-3764 Limestone, medium dark gray (N4), finely crystalline to medium crystalline, with little limestone, medium gray (N5), finely clastic.
- 3764-3771 Sample dirty, probably same as above.
- 3771-3775 Limestone, medium gray (N5), finely crystalline to medium crystalline, little limestone white (N9), finely clastic, little chert (frosted?).
- 3775-3778 Limestone, brownish gray (5YR 6/1), oolitic, with predominately crystalline matrix, little limestone, very light gray (N8), finely clastic.
- 3778-3784 Limestone, brownish gray (5YR 6/1), very oolitic, probably finely crystalline matrix.
- 3784-3786 Limestone, as above, with little medium light gray (N6), oolitic limestone with finely clastic matrix.
- 3786-3790 Sample dirty, probably same as above.
- 3790-3794 Limestone, brownish gray (5YR 6/1), slightly oolitic, medium crystalline matrix (?).
- 3794-3800 Limestone, as above, with finely clastic matrix.

Interval

3800-3807	Shale, medium gray (N4), silty, calcareous, cavings of shale, medium gray (N4), slightly calcareous, silty
3807-3814	Limestone, dark gray (N3), medium crystalline, slightly fossiliferous.
3814-3820	Limestone, dark gray (N3), finely crystalline to medium crystalline, fossiliferous.
3820-3826	Limestone, medium gray (N5), very finely clastic, with some finely crystalline to medium crystalline brownish gray (5YR 6/1), limestone.
3826-3830	Sample missing.
3830-3836	Sample as in 3820-3826.
3836-3840	Limestone, medium gray (N5), oolitic with finely clastic matrix (?), little calcareous shale, medium dark gray (N4), probably cavings.
3840-3843	Limestone, light brownish gray (5YR 6/1), finely crystalline to medium crystalline.
3843-3847	Sample as above.
3847-3850	Sample as above, with little white medium crystalline limestone.
3850-3859	Limestone, medium gray (N5), finely crystalline, fossiliferous (brachiopods?), with little limestone, very light gray (N8), medium crystalline.
3859-3863	Limestone, dark gray (N3), finely crystalline to medium crystalline, fossiliferous.
3863-3868	Siltstone, medium gray (N5), very calcareous, micaceous (muscovite?).
3863-3875	Sample dirty, probably limestone, little brownish gray (5YR 6/1), very finely crystalline (?), silty.
3875-3878	Limestone, light brownish gray as above.
3878-3884	Sample as above.
3884-3888	Limestone, light gray (N7) to white (N9), oolitic, with some medium crystalline limestone.
3888-3892	Limestone, light brownish gray (5YR 6/1), finely crystalline.
3892-3896	Limestone, as above.



Interval

3896-3901	Limestone, light brownish gray (5YR 6/1), finely crystalline as above.
3901-3906	Sample as above.
3906-3912	Limestone, light brownish gray as above.
3912-3915	Limestone, olive gray (5Y 4/1), finely crystalline with limestone, white (N9), finely clastic.
3915-3918	Sample as above.
3918-3925	Limestone, medium gray (N5), finely crystalline (?), with little light gray (N7), medium crystalline limestone.
3925-3930	Sample as above.
3930-3935	Limestone, light gray (N7), few crinoid stems.
3935-3941	Limestone, grayish red (5R 4/2), finely crystalline, very silty.
3941-3948	Sample as above.
3948-3952	Limestone, medium gray (N5), plus black thin-bedded and limestone, very light gray (N8), plus black, thin-bedded.
3952-3956	Sample as above.
3956-3962	Limestone, medium gray (N5), thin-bedded, finely crystalline.
3962-3967	Limestone, medium gray, as above and limestone, white (N9), finely crystalline to medium crystalline.
3967-3971	Limestone, brownish gray (5YR 4/1), finely crystalline to medium crystalline, slightly dolomitic (?).
3971-3975	Limestone, brownish gray (5YR 4/1), finely crystalline.
3975-3980	Limestone, brownish and gray as above, with little white (N9), cherty (?) finely crystalline limestone.
3980-3985	Limestone, medium dark gray (N4), silty, part finely clastic with some medium crystalline.
3985-3990	Limestone, medium dark gray (N4), very silty, micaceous, (?), few quartz chips.
3990-3994	Limestone, medium dark gray (N4), medium crystalline with finely crystalline matrix, few nodules.
3994-4000	Sample as above.

Interval

4000-4003 Limestone, medium dark gray (N4), very finely crystalline with little limestone very light gray (N8), very finely clastic (?).

4003-4008 Sample as above.

4008-4015 Ditto.

4015-4018 Limestone, light brownish gray (5YR 6/1), finely crystalline.

4018-4025 Limestone, medium dark gray (N4), fine-grained sandy texture.

4025-4030 Limestone, medium light gray (N6), finely clastic with some fine crystals.

4030-4036 Sample as above.

4036-4041 Limestone, brownish gray (5YR 4/1), finely crystalline.

4041-4045 Limestone, medium light gray (N6), very silty.

4045-4050 Limestone, dark gray (N3), probably medium clastic, with light gray (N7), medium crystalline matrix.

4050-4055 Limestone, light gray (N7), very finely crystalline.

4055-4068 Missing.

4068-4073 Limestone, medium gray (N5), finely clastic, very silty.

4073-4080 Limestone, medium dark gray (N4), silty, granular texture, little fluorite (?).

4080-4085 Limestone, brownish gray (5YR 4/1). finely crystalline, colitic with thin silty seams.

4095-4088 Limestone, brownish gray (5YR 4/1), medium crystalline, colitic, silty.

4088-4095 Sample as above.

4095-4105 Limestone, brownish gray (5 YR 4/1), finely crystalline.

4105-4111 Sample as above.

4111-4114 Limestone, as in 4085-4088.

4114-4117 Sample as above.

4117-4121 Limestone, medium gray (N5), medium clastic, with some siltstone.

Interval

- 4121-4127 Limestone, grayish brown (5YR 4/1), medium crystalline.
- 4127-4132 Limestone, medium dark gray (N4), finely crystalline to medium crystalline, with abundant white, thin-bedded chert.
- 4132-4138 Limestone, as above, with very little chert.
- 4138-4145 Limestone, light gray (N7), finely crystalline, 60%; siltstone, medium dark gray (N4), shaly, non-calcareous, 40%.
- 4145-4149 Limestone, medium gray (N5), finely crystalline, with white, thin-bedded, platy chert (?).
- 4149-4154 Limestone, medium dark gray (N4), finely crystalline, thin-bedded.
- 4154-4157 Limestone, as above, with little chert.
- 4157-4160 Limestone, medium gray (N5), finely crystalline, slightly silty.
- 4160-4165 Limestone, medium dark gray (N4), finely crystalline to medium crystalline, few quartz chips.
- 4165-4171 Sample dirty, probably limestone, medium gray (N5), finely crystalline.
- 4171-4175 Missing.
- 4175-4180 Siltstone, medium gray (N5), calcareous, fossiliferous (brachiopod).
- 4180-4185 Sandstone, graywacke, medium gray (N5), very fine-grained to medium-grained, angular, calcareous cement, abundant bright green mineral (collophane ?), 60% quartzose.
- 4185-4189 Sandstone, medium gray (N5), silty, very finely grained, subangular, poorly sorted.
- 4189-4192 Siltstone, light gray (N7), quartzose, sandy.
- 4192-4195 Sample as above.
- 4195=4200 Siltstone, medium dark gray (N4), shaly, slightly calcareous; and sandstone, medium gray (N5), calcareous cement, angular to subrounded, very poorly sorted, silty, appears reddish brown under scope.
- 4200-4205 Sandstone, as above.

Interval

4205-4210	Siltstone, medium gray (N5), slightly calcareous, micaceous.
4210-4215	Sample as above.
4215-4220	Shale, dark gray (N3), silty, micaceous.
4220-4225	Sample as above.
4225-4235	Ditto.
4235-4240	Siltstone, medium gray (N5), sandy, green mineral as in 4180-4185.
4240-4245	Siltstone, medium light gray (N6), slightly calcareous, with little chert (cavings?).
4245-4250	Siltstone, light gray (N7), calcareous, sandy.
4250-4254	Ditto.
4254-4257	Ditto.
4257-4262	Ditto.

Samples examined by Allen D. Williamson  
Geologist, U. S. Geological Survey  
Lexington, Kentucky