

Operator: United Producing Company, Inc.
 Farm: R. A. Looney, et al
 Well No.: 1-1659
 Location: Buchanan County
 300' N. of 37°20' approximate
 11,800' W. of 82°00'
 Elevation: 2076' Ground
 Total Depth: 4180'
 Drilling Commenced:
 Well Completed: 1950
 Result: Dry hole

Geologic Sample Log
 prepared by A. D. Williamson,
 U. S. Geological Survey,
 Lexington, Kentucky
 1950

GEOLOGIC LOG

<u>Depth (feet)</u>	<u>Lithology</u>
336-343	Siltstone, medium gray (N5), micaceous, with little shale, medium dark gray (N4).
343-353	Siltstone, medium gray (N5), micaceous, sandy with some very fine-grained to medium-grained, sub-angular, quartz grains.
353-362	Shale, medium dark gray (N4), silty.
362-367	Siltstone, medium gray (N5), very micaceous, sandy with some, fine-grained subangular quartz grains; and 10% coal and shale, grayish black, (N2), carbonaceous.
367-373	Like 362-367.
373-377	Sandstone, (graywacke), light gray (N7), very fine-grained to fine-grained, angular, to subangular, slightly calcareous, silty, micaceous (muscovite) with abundant black mineral and little green mineral.
377-383	Shale, medium dark gray (N4), slightly silty, finely micaceous.
383-391	Sandstone (graywacke), medium dark gray (N4) to medium light gray (N6), very fine-grained to medium-grained, subangular, very silty, micaceous, calcareous, abundant black mineral probably interbedded with siltstone, medium dark gray (N4), micaceous.

- 391-399 Sandstone, very light gray (N8), very fine-grained to fine-grained, angular to subangular, fairly porous, little muscovite and little green mineral; with little coal, 5%, and some dark gray (N3) shale.
- 399-407 Sandstone, very light gray (N8), very fine-grained to medium-grained, subangular to subrounded, fairly porous, friable, little muscovite and little green mineral, like 391-399.
- 407-413 Sandstone, very light gray (N8), fine-grained to coarse-grained, subangular to subrounded, abundant black, brown, and green minerals, some muscovite, 50%; and shale, dark gray (N3), carbonaceous, with 20% coal, 50%; also little shale, brownish gray (5YR 4/1), very fine with subconchoidal fracture and little pyrite.
- 413-419 Sandstone, very light gray (N8), fine-grained to medium-grained, angular to subrounded, fairly well sorted, slightly porous, little muscovite, little black mineral, little green mineral and little mica (phlogopite?); some coal and dark gray (N3) shale, like 407-413.
- 419-424 Sandstone, very light gray (N8), like 413-419.
- 424-429 Sandstone, very light gray (N8), fine-grained to medium-grained, angular to subangular, fairly well sorted, slightly porous, silty, abundant black, green, and brown minerals.
- 429-435 Sandstone, like 424-429.
- 435-441 Sandstone, very light gray (N8), very fine-grained to medium-grained, angular to subangular, poorly sorted, very silty with abundant black mineral and muscovite; varies to siltstone, medium light gray (N6), sandy with 30% black and brown minerals and mica (muscovite?).
- 441-447 Sandstone, (graywacke), light gray (N7), very fine-grained to fine-grained, angular to subangular, very silty, abundant black mineral, and mica (muscovite), and little green mineral (chlorite?), and little brown mineral; also some carbonaceous material.
- 447-452 Sandstone, light gray (N7), like 441-447.
- 452-464 Like 447-452.

- 464-470 Like 452-464.
- 470-476 Like 464-470.
- 476-483 Sandstone, light gray (N7), very fine-grained to medium-grained, with few coarse crystals, subangular to subrounded, silty, slightly porous, poorly sorted, little black and green minerals; also some mica (muscovite).
- 483-487 Like 476-483.
- 487-499 Shale, dark gray (N3), silty, micaceous.
- 499-508 Sandstone (graywacke) medium light gray (N6), very fine-grained to fine-grained, angular, to subangular, poorly sorted, silty, micaceous, abundant black material.
- 508-518 Shale, medium dark gray (N4), micaceous, slightly fissile.
- 518-526 Siltstone, medium dark gray (N4), micaceous, few plant fossils.
- 528-537 Siltstone, like 518-526, with 10% coal.
- 537-543 Shale, dark gray (N3), very micaceous, fissile, with little shale, grayish black (N2), fine, carbonaceous.
- 543-549 Like 537-543.
- 549-556 Siltstone, medium gray (N5), sandy.
- * 556-562 Sandstone (subgraywacke) light gray (N7), very fine-grained to medium-grained, subangular to subrounded, poorly sorted, porous, silty, abundant black mineral and little green mineral, 3/4 quartzose.
- * 562-576 Like 556-562.
- * 576-580 Sandstone, very light gray (N8), very fine-grained to fine-grained, subangular to subrounded, well sorted, fairly porous, with little black mineral and little green mineral, 90% quartzose.
- 580-590 Sandstone (graywacke), medium light gray (N6), very fine-grained to medium-grained, angular to subangular, very silty, micaceous (muscovite) with thin partings of coal and carbonaceous shale.

- 590-593 Siltstone, medium dark gray (N4), micaceous, carbonaceous.
- 593-599 Sandstone, (subgraywacke), light gray (N7), very fine-grained to fine-grained, subangular to subrounded, fairly well sorted, silty, calcareous, micaceous (muscovite and biotite?) green mineral (chlorite?) 75% quartzose.
- 599-605 Siltstone, medium gray (N5), very micaceous.
- 605-611 Like 599-605.
- 611-616 Shale, medium dark gray (N4), slightly micaceous, fairly fissile, compact.
- 616-626 Shale, medium dark gray (N4), silty, micaceous.
- 626-636 Siltstone, medium dark gray (N4), micaceous.
- 636-647 Siltstone, like 626-636.
- 647-657 Sandstone, medium light gray (N6), (subgraywacke), very fine-grained to fine-grained, subangular to subrounded, calcareous, slightly porous, fairly well sorted, grades into siltstone, medium dark gray (N4), sandy.
- 657-667 Siltstone, like 647-657.
- 667-677 Like 657-667.
- 677-687 Shale, dark gray (N3), silty to brownish gray (5 YR 4/1), sideritic.
- 687-697 Shale, dark gray (N3), silty, slightly sideritic, micaceous.
- 697-707 Sandstone (subgraywacke), light gray (N7), very fine-grained to fine-grained, subangular to subrounded, fairly porous, silty, slightly calcareous, little black mineral and little mica, also some black shale (carbonaceous?).
- 707-715 Siltstone, medium dark gray (N4), micaceous, with few fossils, (brachiopods).
- 715-725 Missing.
- 725-735 Sample as 707-715.

- 735-747 * Sandstone, very light gray (N8), silty, very fine-grained to fine-grained, subangular to subrounded, slightly porous, calcareous, slightly micaceous (muscovite), little black mineral, 80% quartzose.
- 747-757 Shale, medium dark gray (N4), micaceous, fissile.
- 757-767 Siltstone, medium dark gray (N4), micaceous, slightly calcareous.
- 767-777 Like 757-767.
- 777-787 Like 767-777.
- 787-797 Siltstone, medium dark gray (N4), micaceous, with some sideritic zones.
- 797-806 Siltstone, as 757-767.
- 806-815 Like 797-806.
- 815-824 Like 806-815.
- 824-834 Siltstone, medium dark gray (N4), argillaceous, micaceous.
- 834-844 Like 824-834.
- * 844-854 Sandstone, light gray (N7), fine-grained to medium-grained, subangular to subrounded, poorly sorted, slightly porous, silty, abundant black mineral, and little green mineral, 90% quartzose.
- * 854-864 Like 844-854.
- + 864-871 Like 854-864.
- * 871-881 Like 864-871.
- + 881-887 Like 871-881.
- * 887-892 Like 881-887.
- * 892-897 Like 887-892.
- 897-902 Shale, medium dark gray (N4), silty, micaceous, lumpy.
- 902-910 Like 897-902.
- 910-927 Siltstone, medium light gray (N6), sandy, micaceous, calcareous.

927-937 Shale, medium dark gray, as 902-910.

937-947 Like 927-937.

947-957 Like 937-947.

957-967 Like 947-957.

967-976 Siltstone, medium gray (N5), sandy, micaceous.

976-983 Like 967-976.

983-990 Shale, medium dark gray (N4), fissile, finely micaceous.

990-1000 Like 983-990.

1000-1010 Like 990-1000.

1010-1016 Shale, grayish black (N2), carbonaceous.

1016-1024 Siltstone, medium gray (N5), sandy, micaceous.

1024-1032 Like 1016-1024.

1032-1041 Siltstone, medium light gray (N6), sandy, slightly calcareous.

1041-1048 Shale, medium dark gray (N4), fissile.

1048-1056 Sandstone, medium light gray (N6), very fine-grained, subangular, poorly sorted, very slightly porous, very silty, slightly calcareous, abundant black mineral, 3/4 quartzose.

1064-1067 Siltstone, medium dark gray (N4), sandy, micaceous.

1067-1080 Shale, dark gray (N3), carbonaceous, silty.

1080-1087 Like 1067-1080.

1087-1095 Like 1080-1087.

1095-1105 Shale, medium dark gray (N4), sandy, calcareous.

1105-1115 Siltstone, medium gray (N5), sandy.

1115-1125 Like 1105-1115.

- 1125-1133 * Sandstone, light gray (N7), conglomeratic, medium-grained to coarse-grained, subangular to subrounded, poorly sorted, slightly porous, silty, micaceous, abundant black mineral, little green mineral, 90% quartzose.
- 1133-1142 Like 1125-1133.
- 1142-1150 Like 1133-1142.
- 1150-1162 Siltstone, medium dark gray (N4), sandy, micaceous.
- 1162-1170 Sandstone, medium gray (N5), very fine-grained to fine-grained, subangular, poorly sorted, very slightly porous, very silty, micaceous, abundant brown mineral, scattered black mineral, 3/4 quartzose.
- 1170-1172 Like 1162-1170.
- 1172-1178 Like 1170-1172, but calcareous.
- 1178-1186 Like 1172-1178.
- 1186-1195 Like 1178-1186.
- 1195-1205 Siltstone, medium light gray (N6), sandy, very micaceous, with abundant brown mineral, little green mineral.
- 1205-1211 Sandstone, like 1186-1195.
- 1211-1221 Like 1205-1211.
- 1221-1233 Like 1211-1221.
- 1233-1241 Siltstone, medium dark gray (N4), micaceous.
- 1241-1247 Like 1233-1241.
- 1247-1252 Siltstone, medium gray (N5), sandy, micaceous, with partings of carbonaceous shale.
- 1252-1259 Like 1247-1252.
- 1259-1280 Like 1252-1259.
- 1280-1289 Siltstone, medium dark gray (N4), argillaceous.
- 1289-1296 Shale, dark gray (N3), silty, micaceous.

- 1414-1420 * Sandstone, very light gray (N8), very fine-grained, sub-angular to subrounded, well sorted, fairly porous, scattered black mineral, 90% quartzose.
- 1420-1426 * Like 1414-1420.
- 1426-1440 Siltstone, medium gray (N5), micaceous.
- 1446-1449 Siltstone, medium light gray (N6) to medium gray (N5), sandy, micaceous, sideritic.
- 1448-1457 Siltstone, medium light gray (N6), finely micaceous.
- 1457-1464 Siltstone, medium dark gray (N4), micaceous.
- 1464-1473 Shale, dark gray (N3), carbonaceous, lumpy; with some impure coal.
- 1473-1476 * Sandstone, very light gray (N8) to light gray (N7), very fine-grained, subangular, fairly well sorted, slightly porous, scattered black mineral, 90% quartzose.
- 1478-1484 Like 1473-1476.
- 1484-1490 * Sandstone, very light gray (N8), very fine-grained, sub-angular, poorly sorted, very slightly porous, silty, slightly calcareous, micaceous, 90% quartzose.
- 1490-1497 Like 1484-1490.
- 1497-1503 Sandstone, medium light gray (N6), very fine-grained, sub-angular, poorly sorted, very slightly porous, silty, micaceous, sideritic, scattered black mineral, 3/4 quartzose.
- 1503-1509 Like 1497-1503.
- 1513-1518 * Sandstone, very light gray (N8), very fine-grained, angular to subangular, fairly well sorted, slightly porous, silty, scattered black mineral, 90% quartzose.
- 1518-1524 Siltstone, medium dark gray (N4), sandy, micaceous; and shale, grayish black, very carbonaceous, some showing woody structure.
- 1524-1529 * Sandstone, very light gray (N8), fine-grained, subangular, well-sorted, slightly porous, slightly micaceous, 90% quartzose.

- 1529-1538 * Sandstone, very light gray (N8), fine-grained to medium-grained, subangular, well sorted, fairly porous, 90% quartzose.
- 1538-1547 * Sandstone, very light gray (N8), very fine-grained, angular to subangular, fairly silty, scattered black mineral, 90% quartzose.
- 1547-1552 Like 1538-1547 with partings of shale, dark gray (N3), carbonaceous, micaceous.
- 1552-1559 Coal, pure, bright.
- 1559-1566 Sandstone, very light gray (N8), fine-grained to medium-grained, subangular to subrounded, well sorted, very porous, sideritic, some black mineral, 30% quartzose.
- 1566-1576 Like 1559-1566.
- 1576-1586 Sandstone, very light gray (N8), fine-grained, subangular, fairly well sorted, fairly porous, scattered black mineral, slightly micaceous, 90% quartzose.
- 1586-1594 Sandstone, very light gray (N8), like 1566-1576.
- 1594-1601 Sandstone, medium light gray (N6) to medium gray (N5), fine-grained to medium-grained, subangular, poorly sorted, slightly porous, silty, micaceous, sideritic, abundant black mineral, small amount of green mineral, partings of shale, grayish black (N2), carbonaceous, micaceous, 3/4 quartzose.
- 1601-1612 Shale, grayish black (N2), carbonaceous, and coal.
- 1612-1621 Siltstone, medium dark gray (N4), slightly sandy, micaceous.
- 1621-1631 Sandstone, light gray (N7), very fine-grained, angular to subangular, poorly sorted, very slightly porous, silty, micaceous, abundant siderite nodules, scattered black mineral, 3/4 quartzose.
- 1631-1643 No sample.
- 1643-1653 Siltstone, medium dark gray (N4), sandy, slightly micaceous.

- 1653-1664 Shale, medium dark gray (N4), fissile.
- 1664-1674 Like 1653-1664.
- 1674-1683 Like 1664-1674.
- 1683-1691 Siltstone, medium gray (N5), very sandy, micaceous.
- 1691-1696 Sandstone, light gray (N7), very fine-grained to medium-grained, subangular to subrounded, very poorly sorted, very slightly porous, very silty, slightly calcareous, sideritic, scattered black mineral, 3/4 quartzose.
- 1696-1703 Like 1691-1696.
- 1703-1712 Like 1696-1703.
- 1712-1721 Sandstone, very light gray (N8), medium-grained, subangular, poorly sorted, slightly porous, silty, slightly calcareous, scattered black mineral, 90% quartzose.
- 1721-1729 Sandstone, light gray (N7), very fine-grained to fine-grained, subangular to subrounded, poorly sorted, slightly porous, silty, scattered black mineral, sideritic, some green mineral, 3/4 quartzose.
- 1729-1737 Sandstone, very light gray (N8), fine-grained to medium-grained, subangular, poorly sorted, slightly porous, silty, scattered black mineral, 90% quartzose.
- 1737-1746 Sandstone, very light gray (N8), medium-grained, subangular to subrounded, fairly well sorted, slightly porous, calcareous, sideritic, scattered black mineral, 90% quartzose.
- 1746-1754 Sandstone, light gray (N7), fine-grained to medium-grained, subangular, poorly sorted, slightly porous, silty, micaceous, sideritic, scattered black mineral, some green mineral, 3/4 quartzose.
- 1754-1762 Like 1746-1754.
- 1762-1771 Like 1754-1762.
- 1771-1780 Like 1762-1771.
- 1780-1790 Sandstone, light gray (N7) to medium gray (N5), fine-grained to medium-grained, angular to subrounded, very poorly sorted, very slightly porous, very silty, calcareous, scattered black mineral, 3/4 quartzose.

- 1790-1798 Like 1780-1790 with partings of shale, medium dark gray (N4), fissile.
- 1798-1806 Shale, brownish gray (5YR 4/1), sideritic; and sandstone, like 1790-1798.
- 1806-1814 Sandstone, very light gray (N8), fine-grained to medium-grained, subangular to subrounded, fairly well sorted, fairly porous, calcareous, scattered black mineral, some green mineral, 90% quartzose.
- 1814-1824 Sandstone, brownish gray (5YR 4/1), fine-grained to medium-grained, subangular to subrounded, very poorly sorted, very silty, calcareous, sideritic, micaceous, 3/4 quartzose.
- 1824-1834 Shale, dark gray (N3), silty, carbonaceous.
- 1834-1846 Like 1824-1834.
- 1846-1860 Siltstone, medium light gray (N6) to medium dark gray (N4), sandy, micaceous.
- 1860-1867 Like 1846-1860.
- 1870-1878 Shale, medium dark gray (N4), silty, with little pyrite.
- 1878-1886 Like 1870-1878.
- 1886-1895 Sandstone, light gray (N7), very fine-grained, angular to subangular, poorly sorted, very slightly porous, calcareous, silty, micaceous, 90% quartzose.
- 1895-1902 Like 1886-1895 with partings of shale, dark gray (N3), fissile, micaceous.
- 1902-1909 Like 1895-1902.
- 1909-1914 Siltstone, medium gray (N5), to medium dark gray (N4), argillaceous.
- 1914-1920 Shale, medium dark gray (N4), silty.
- 1920-1926 Sandstone, light gray (N7), very fine-grained, subangular, poorly sorted, slightly porous, silty, 90% quartzose.
- 1926-1930 Like 1920-1926.

1930-1934	Siltstone, medium dark gray (N4), micaceous; and sand, grayish black (N2), carbonaceous, fissile.
1934-1939	Sandstone, very light gray (N8), very fine-grained to fine-grained, subangular, fairly well sorted, slightly porous, slightly silty, 90% quartzose.
1939-1943	Like 1934-1939.
1943-1946	Like 1939-1943.
1946-1950	Sandstone, very light gray (N8), fine-grained, subangular, well sorted, porous, 90% quartzose.
1950-1953	Like 1946-1950.
1953-1955	Like 1950-1953.
1955-1960	Like 1953-1955 with some medium grains.
1960-1965	Sandstone, as 1953-1955.
1965-1968	Like 1960-1965.
1968-1971	Like 1965-1968.
1973-1976	Like 1968-1971.
1976-1980	Shale, dark gray (N3), carbonaceous, with some impure coal.
1980-1987	Sandstone, very light gray (N8), fine-grained to medium-grained, subangular to subrounded, well sorted, fairly porous, 95% quartzose.
1987-1990	Like 1980-1987.
1990-1993	Sandstone, very light gray (N8), conglomeratic, medium-grained to coarse-grained, with some pebble chips, subangular to subrounded, well sorted, very porous, 95% quartzose.
1993-1997	Like 1990-1993.
1997-2001	Like 1993-1997.

2001-2004	Sandstone, very light gray (N8), conglomeratic, very fine-grained to coarse-grained, angular to subrounded, poorly sorted, slightly porous, 90% quartzose.
2004-2006	Like 2001-2004.
2006-2015	Like 2004-2006.
2015-2022	Sandstone, very fine-grained to fine-grained, otherwise like 2006-2015.
2022-2029	Sandstone, very light gray (N8), very fine-grained to granules, angular to rounded, poorly sorted, slightly porous, 95% quartzose.
2029-2033	Like 2022-2029.
2036-2043	Like 2029-2033.
2043-2049	Like 2036-2043.
2049-2057	Siltstone, dark gray (N3), carbonaceous, micaceous.
2057-2062	Sandstone, like 2043-2049.
2062-2066	Like 2057-2062.
2066-2076	Sandstone, very light gray (N8), very fine-grained to fine-grained, angular to subangular, well sorted, slightly porous, 95% quartzose.
2076-2083	Sandstone, like 2062-2066.
2083-2088	Like 2076-2083.
2088-2092	Sandstone, very light gray (N8), conglomeratic, medium-grained to granules, subangular to subrounded, well sorted, fairly porous, 95% quartzose.
2092-2095	Like 2088-2092.
2095-2101	Sandstone, very light gray (N8), very fine-grained to fine-grained, angular to subangular, fairly well sorted, slightly porous, 95% quartzose.
2101-2107	Like 2095-2101.

- 2107-2110 Sandstone, very light gray (N8), fine-grained to medium-grained, subangular to subrounded, well sorted, fairly porous, 95% quartzose.
- 2110-2121 Sandstone, very light gray (N8), fine-grained, angular to subangular, well sorted, slightly porous, 95% quartzose.
- 2121-2124 Like 2110-2121.
- 2124-2127 Like 2121-2124.
- 2127-2129 Sandstone, very light gray (N8), like 2107-2110.
- 2129-2135 Like 2127-2129.
- 2135-2140 Like 2129-2135.
- 2140-2143 Like 2135-2140.
- 2143-2146 Sandstone, like 2110-2121.
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- 2146-2150 Shale, dark gray (N3), silty, micaceous.
- 2150-2155 Sandstone, medium light gray (N6), very fine-grained to fine-grained, subangular to subrounded, poorly sorted, very slightly porous, silty, calcareous, abundant black argillaceous material, micaceous, sideritic, 3/4 quartzose.
- 2155-2162 Like 2150-2155.
- 2162-2170 Shale, medium dark gray (N4), slightly silty, to grayish black (N2), carbonaceous with some impure coal.
- 2170-2178 Sandstone, light gray (N7) to medium light gray (N6), very fine-grained, angular to subangular, poorly sorted, very slightly porous, silty, sideritic, micaceous, 3/4 quartzose.
- 2178-2183 Shale, dark gray (N3), carbonaceous; and coal.
- 2183-2189 Shale, medium dark gray (N4), silty, fairly fissile, micaceous.
- 2189-2195 Siltstone, medium dark gray (N4), sandy, micaceous.

- 2195-2198 Coal, with small amount of shale, dark gray (N3), carbonaceous, lumpy.
- 2198-2206 Coal, impure; and some shale, dark gray (N3), very carbonaceous.
- 2206-2212 Coal; shale, dark gray (N3), carbonaceous; and sandstone, very light gray (N8), very fine-grained, angular to subangular, well sorted, slightly porous, 95% quartzose.
- 2212-2215 Like 2206-2212.
- 2215-2218 Shale, dark gray (N3), carbonaceous, fissile, with thin coal partings; shale, light brownish gray (5YR 6/1), sideritic; sandstone, like 2212-2215; and some coal.
- 2218-2224 Like 2215-2218.
- 2224-2229 Like 2218-2224 with more sandstone than above, (about 50%).
- 2229-2234 Sandstone, very light gray (N8), very fine-grained to fine-grained, angular to subangular, well sorted, slightly porous, 95% quartzose.
- 2234-2240 Like 2229-2234.
- 2240-2246 Like 2234-2240.
- 2246-2252 Like 2240-2246.
- 2252-2256 Like 2246-2252.
- 2256-2263 Sandstone, very light gray (N8), very fine-grained to fine-grained, angular to subangular, fairly well sorted, very slightly porous, silty, 90% quartzose.
- 2263-2268 Like 2256-2263.
- 2268-2273 Sandstone, very light gray (N8), very fine-grained to medium-grained, angular to subangular, fairly well sorted, slightly porous, silty, 90% quartzose.
- 2273-2278 Like 2268-2273.
- 2278-2283 Like 2273-2278.
- 2283-2288 Like 2278-2283.

- 2288-2293 Sandstone, very light gray (N8), very fine-grained to medium-grained, subangular to subrounded, well sorted, fairly porous, very slightly silty, 95% quartzose.
- 2293-2298 Like 2288-2293.
- 2298-2303 Like 2293-2298.
- 2303-2307 Sandstone, very light gray (N8), very fine-grained to fine-grained, angular to subangular, well sorted, slightly porous, very slightly silty, 95% quartzose.
- 2307-2310 Like 2303-2307.
- 2310-2315 Like 2307-2310.
- 2315-2320 Sandstone, light gray (N7), fine-grained to medium-grained, subangular to subrounded, fairly well sorted, slightly porous, abundant inclusions of dark gray (N3) argillaceous material, 90% quartzose; and some shale, dark gray (N3), carbonaceous, micaceous, sandy in part, with small amount of pyrite.
- 2320-2324 Sandstone, very light gray (N8), very fine-grained to fine-grained, subangular to subrounded, well sorted, slightly porous, scattered black mineral, 95% quartzose.
- 2324-2330 Like 2320-2324.
- 2330-2335 Sandstone, very light gray (N8), fine-grained, subangular to subrounded, well sorted, slightly porous, slightly silty, slightly calcareous, 90% quartzose.
- 2335-2343 Siltstone, medium gray (N5); and shale, light brownish gray (5YR 6/1), sideritic, lumpy.
- 2343-2351 Shale, medium gray (N5) to medium dark gray (N4), calcareous; and shale, grayish red (10 R 4/2), slightly calcareous.
- 2351-2357 Shale, medium dark gray (N4), slightly calcareous, with reddish streaks; and shale, grayish red, like 2343-2351.
- 2357-2365 Shale, grayish red (10 R 4/2) silty, micaceous, non-calcareous; and shale, medium gray (N5), silty with greenish tint.

- 2365-2371 Shale, grayish red, like 2357-2365; and siltstone, greenish gray (5G 6/1), sandy, very calcareous.
- 2371-2376 Like 2365-2371.
- 2412-2417 Siltstone, very light gray (N8) to light gray (N7), very sandy; and siltstone, grayish red (5R 4/2), sandy to argillaceous.
- 2417-2422 Siltstone, medium gray (N5) to medium dark gray (N4), sandy, calcareous.
- 2422-2426 Siltstone, medium dark gray (N4), slightly calcareous; shale, grayish red (5R 4/2), silty, and small amount of coal (cavings?).
- 2426-2433 Shale, medium dark gray (N4), silty, lumpy, with calcareous lense; and shale, dark gray (N3), carbonaceous, fissile.
- 2433-2440 Like 2426-2433.
- 2444-2447 Siltstone, medium dark gray (N4), calcareous.
- 2447-2452 Shale, medium dark gray (N4) to dark gray (N3), calcareous; and limestone, dark gray (N3), dense, silty.
- 2452-2453 Limestone, light gray (N7), silty; and sandstone, light gray (N7), fine-grained to medium-grained, subangular, calcareous, 90% quartzose.
- 2453-2460 Sandstone, light gray (N7) to medium light gray (N6), very fine-grained, subangular, poorly sorted, slightly porous, silty, non-calcareous, 90% quartzose, interbedded with siltstone, light brownish gray (5YR 6/1), very calcareous.
- 2460-2468 Like 2454-2460, with shale, medium dark gray (N4), silty; and shale, grayish red (5R 3/2).
- 2468-2475 Like 2460-2468.
- 2475-2481 Sandstone, light gray (N7), very fine-grained, subangular, moderately well sorted, slightly porous, silty, 95% quartzose.
- 2481-2490 Like 2475-2481.

- 2490-2501 Like 2481-2490.
- 2501-2509 Like 2490-2501 with lenses of siltstone, medium dark gray (N4), carbonaceous, micaceous.
- 2509-2517 Sandstone, very light gray (N8), very fine-grained, sub-angular, moderately well sorted, slightly porous, slightly silty, calcareous, 90% quartzose, interbedded with siltstone, medium gray (N5) to medium dark gray (N4), sandy; and shale, medium dark gray (N4), micaceous.
- 2517-2522 Shale, medium dark gray (N4) to dark gray (N3), silty, carbonaceous, micaceous, abundant pyrite.
- 2522-2527 Sandstone, light gray (N7), very fine-grained to fine-grained, subangular, poorly sorted, slightly porous, silty, scattered carbonaceous material, few medium to coarse, subangular to subrounded, grains, 90% quartzose.
- 2527-2533 Like 2522-2527; and shale, dark gray (N3), carbonaceous, micaceous.
- 2533-2540 Shale, medium dark gray (N4), fissile, micaceous.
- 2540-2552 Like 2533-2540.
- 2552-2564 Like 2540-2552.
- 2564-2576 Like 2552-2564.
- 2576-2588 Like 2564-2576.
- 2588-2600 Shale, medium dark gray (N4), silty, abundant pyrite; and limestone, dark gray (N3), dense, slightly silty, thin-bedded.
- 2600-2612 Shale, medium dark gray (N4), fissile, micaceous.
- 2612-2620 Like 2600-2612; and sandstone, very light gray (N8), fine-grained, subangular, well sorted, slightly porous, calcareous, 95% quartzose.
- 2620-2624 Sandstone, like 2612-2620.
- 2624-2626 Like 2620-2624.

- 2626-2629 Like 2624-2626.
- 2629-2632 Sandstone, white (N9), very fine-grained to fine-grained, subangular, well sorted, slightly porous, calcareous, scattered carbonaceous material, abundant clusters of pyrite crystals.
- 2632-2638 Like 2629-2632.
- 2638-2641 Like 2632-2638.
- 2641-2646 Like 2638-2641.
- 2646-2656 Siltstone, medium dark gray (N4), sandy, micaceous; and shale, medium dark gray (N4), fissile.
- 2656-2666 Shale, medium dark gray (N4), slightly calcareous.
- 2666-2673 Like 2656-2666; and sandstone, light gray (N7) to medium gray (N5), fine-grained to medium-grained, very poorly sorted, slightly porous, calcareous, argillaceous, scattered pyrite crystals, 3/4 quartzose.
- 2673-2678 Sandstone, very light gray (N8), fine-grained to medium-grained, subangular, poorly sorted, slightly porous, silty, calcareous, abundant argillaceous material, 90% quartzose; interbedded with shale, dark gray (N3), fissile, carbonaceous.
- 2678-2682 Like 2672-2678.
- 2682-2686 Like 2678-2682.
- 2686-2690 Like 2682-2686.
- 2690-2696 Shale, medium dark gray (N4).
- 2696-2702 Like 2690-2696; and sandstone, white (N9), to medium light gray (N6), very fine-grained to medium-grained, poorly sorted, slightly porous, silty, calcareous, abundant carbonaceous material, 90% quartzose.
- 2702-2713 Like 2696-2702.
- 2713-2715 Like 2702-2713.
- 2715-2718 Like 2713-2715.

- 2718-2721 Like 2715-2718.
- 2721-2724 Like 2718-2721.
- 2724-2727 Like 2721-2724.
- 2727-2731 Like 2724-2727.
- 2731-2733 Like 2727-2731.
- 2733-2737 Sandstone, white (N9), very fine-grained to fine-grained, subangular, well sorted, slightly porous, slightly silty, non-calcareous, with lenses of shale, dark gray (N3), carbonaceous, fissile.
- 2737-2740 Like 2733-2737.
- 2740-2752 Sandstone, white (N9), fine-grained to medium-grained, subangular to subrounded, moderately well sorted, slightly porous, slightly silty, slightly calcareous, scattered carbonaceous material, and pyrite crystals, 90% quartzose.
- 2752-2755 Like 2740-2752.
- 2755-2759 Sandstone, like 2752-2755; and shale, medium dark gray (N4), moderately fissile.
- 2759-2764 Shale, dark gray (N3), carbonaceous, fissile, abundant pyrite, (abundant ostracods), fossiliferous.
- 2764-2769 Sandstone, white (N9), fine-grained, subangular, well sorted, moderately porous, slightly silty, abundant carbonaceous material, 95% quartzose.
- 2769-2776 Like 2764-2769.
- 2776-2784 Sandstone, light gray (N7), very fine-grained to medium-grained, subangular to rounded, poorly sorted, slightly porous, silty, abundant pyrite with lenses of siltstone, medium dark gray (N4), sandy, and shale, dark gray (N3), carbonaceous, 90% quartzose.
- 2784-2792 Siltstone, medium gray (N5), sandy, micaceous; and shale, dark gray (N3), fissile.

- 2792-2800 Shale, medium dark gray (N4), silty to dark gray (N3), carbonaceous, with few ostracods; and sandstone, very light gray (N8), very fine-grained to fine-grained, subangular to subrounded, moderately well sorted, slightly porous, slightly silty, calcareous, scattered clusters of pyrite crystals, with partings of carbonaceous shale, 90% quartzose.
- 2800-2803 Sandstone, white (N9), fine-grained to medium-grained, subangular to subrounded, very well sorted, moderately porous, calcareous, scattered pyrite crystals, 95% quartzose.
- 2803-2808 Like 2800-2803.
- 2808-2814 Like 2803-2808.
- 2814-2817 Sandstone, white (N9), fine-grained to medium-grained, with few coarse grains, subangular to subrounded, well sorted, moderately porous, slightly silty, 95% quartzose.
- 2817-2822 Sandstone, like 2814-2817; and shale, dark gray (N3), fissile.
- 2822-2831 No sample.
- 2831-2837 Like 2817-2822.
- 2837-2839 Shale, medium dark gray (N4), fissile, scattered pyrite crystals, with thin lens of limestone, brownish gray (5YR 4/1), dense to medium crystalline.
- 2839-2843 Sandstone, white (N9), fine-grained to medium-grained, subangular, well sorted, slightly porous, calcareous, 95% quartzose.
- 2843-2847 Sandstone, like 2839-2843; and shale, medium dark gray (N4), fissile, some beds calcareous.
- 2847-2853 Sandstone, like 2843-2847 with some coarse grains; and shale, medium gray (N5), calcareous.
- 2853-2858 Like 2847-2853.
- 2858-2862 Like 2853-2858 with small amount of chert (?).
- 2862-2866 Sandstone, like 2858-2862; and shale, medium dark gray (N4), calcareous; also small amount of chert (?) as 2858-2862.

- 2866-2870 Sandstone, like 2862-2866.
- 2870-2874 Sandstone, white (N9), conglomeratic, medium-grained to very coarse-grained, subangular to rounded, well sorted, porous, calcareous, 95% quartzose.
- 2874-2879 Like 2870-2874, but more conglomeratic.
- 2879-2881 Shale, medium dark gray (N4), calcareous; and dark gray (N3), fissile; non-calcareous; interbedded.
- 2881-2882 Like 2879-2881.
- 2882-2884 Shale, medium dark gray (N4), calcareous.
- 2884-2888 Sandstone, white (N9), fine-grained to medium-grained, subangular to subrounded, slightly porous, slightly calcareous, .95% quartzose.
- 2888-2894 Like 2884-2888.
- 2894-2900 Like 2888-2894 with scattered pyrite crystals, slight iron oxide staining on grains.
- 2900-2905 Like 2894-2900.
- 2905-2910 Like 2900-2905.
- 2910-2915 Like 2905-2910.
- 2915-2919 Like 2910-2915.
- 2919-2924 Like 2915-2919.
- 2924-2929 Limestone, medium gray (N5), dense, slightly argillaceous; and shale, grayish red (5R 4/2).
- 2929-2937 Shale, grayish red (5R 4/2), slightly silty, scattered mica, calcareous.
- 2937-2946 Like 2929-2937.
- 2946-2955 Like 2937-2946; and siltstone, pale red (5R 6/2), sandy, calcareous, micaceous.
- 2955-2963 Shale, grayish red (5R 4/2), silty, lumpy; and shale, medium dark gray (N4), calcareous, moderately fissile.
- 2963-2971 Shale, medium dark gray (N4), slightly calcareous, lumpy.

- 2971-2978 Like 2963-2971 with thin bed of limestone, medium light gray (N6), dense, fossiliferous (?).
- 2978-2985 Sandstone, light gray (N7) to medium gray (N5), very fine-grained, subangular, very poorly sorted, slightly porous, silty, calcareous, micaceous, abundant argillaceous material, abundant green mineral, 3/4 quartzose.
- 2985-2990 Like 2978-2985.
- 2990-2995 Like 2985-2990 but very silty, 50% quartzose.
- 2995-2997 Like 2990-2995.
- 2997-3000 Sandstone, greenish gray (5GY 6/1), very fine-grained, angular to subangular, poorly sorted, slightly porous, silty, calcareous, micaceous, abundant green mineral, 3/4 quartzose.
- 3000-3007 Siltstone, medium light gray (N6) to medium gray (N5), very sandy, micaceous, slightly calcareous.
- 3007-3013 Like 3000-3007.
- 3013-3018 Like 3007-3013.
- 3018-3024 Sandstone, very light gray (N8), very fine-grained to subangular, poorly sorted, very slightly porous, silty, calcareous, micaceous, scattered carbonaceous material, 90% quartzose.
- 3024-3031 Siltstone, medium gray (N5), to medium dark gray (N4), sandy, micaceous, slightly calcareous.
- 3031-3040 Shale, medium dark gray (N4), finely micaceous; and greenish gray (5G 6/1), calcareous.
- 3040-3049 Shale, dark gray (N3).
- 3049-3054 Shale, greenish gray (5G 6/1) to dark greenish gray (5G 4/1) and dusky red (5R 3/4) mottled, calcareous.
- 3054-3059 Sandstone, very light gray (N8), very fine-grained, subangular, moderately well sorted, very slightly porous, calcareous, 90% quartzose.
- 3059-3071 Siltstone, medium dark gray (N4), slightly sandy.

- 3071-3077 Sandstone, white (N9), very fine-grained, subangular, moderately well sorted, slightly porous, slightly silty, calcareous, scattered argillaceous material, 90% quartzose.
- 3077-3083 Like 3071-3077 grading into siltstone, medium gray (N5), sandy, calcareous, micaceous.
- 3083-3090 Sandstone, white (N9), very fine-grained, subangular, moderately well sorted, slightly porous, slightly silty, scattered carbonaceous material, 90% quartzose.
- 3090-3094 Shale, dark gray (N3), calcareous.
- 3094-3104 Shale, dark gray (N3), carbonaceous; and siltstone, medium gray (N4), sandy, with abundant pyrite.
- 3104-3108 Like 3094-3104; and sandstone, very light gray (N8), very fine-grained, subangular, poorly sorted, very slightly porous, silty, abundant carbonaceous material, 3/4 quartzose, interbedded.
- 3108-3112 Like 3104-3108.
- 3112-3115 Like 3108-3112.
- 3115-3119 Sandstone, like 3112-3115; and shale, dark gray (N3), carbonaceous, fissile, with abundant pyrite.
- 3119-3122 Like 3115-3119.
- 3122-3126 Like 3119-3122.
- 3126-3130 Like 3122-3126.
- 3130-3135 Like 3126-3130.
- 3135-3138 Sandstone, white (N9), very fine-grained, subangular, well sorted, slightly porous, slightly calcareous, 95% quartzose; and shale, like 3130-3135, interbedded.
- 3138-3142 Sandstone, like 3135-3138.
- 3142-3146 Like 3138-3142.
- 3146-3154 Like 3142-3146.

- 3154-3158 Like 3146-3154.
- 3158-3168 Siltstone, medium gray (N5), sandy, calcareous; and shale, greenish gray (5G 6/1); and grayish red (10R 4/2), mottled.
- 3168-3174 Shale, dark gray (N3), slightly silty, and sandstone, light gray (N7), very fine-grained to fine-grained, subangular to subrounded, poorly sorted, slightly porous, silty, calcareous, abundant pyrite, scattered carbonaceous material, 3/4 quartzose.
- 3174-3181 Siltstone, medium dark gray (N4).
- 3181-3188 Like 3174-3181; shale, greenish gray (5G 5/1), calcareous; and grayish red (5R 4/2), interbedded.
- 3188-3195 Shale, greenish gray and grayish red, like 3181-3188.
- 3195-3201 Like 3188-3195.
- 3201-3210 Shale, medium dark gray (N4), silty.
- 3210-3217 Like 3201-3210; and siltstone, medium gray (N5), sandy, calcareous.
- 3217-3223 Shale, grayish red (10R 4/2); and shale, medium dark gray (N4), with greenish tint, calcareous.
- 3223-3230 Like 3217-3223.
- 3732-3737 Limestone, light brownish gray (5YR 6/1), to medium dark gray (N4), dense, pure, with silty nodules, crinoidal.
- 3737-3744 Limestone, very light gray (N8) to brownish gray (5YR 4/1), dense.
- 3744-3752 Limestone, medium dark gray (N4), dense with medium crystalline limestone, thin-bedded, silty.
- 3752-3759 Siltstone, medium dark gray (N4), calcareous, with thin calcite partings.
- 3759-3768 Like 3752-3759.

- 3768-3777 Like 3759-3768 with limestone, very light gray (N8), non-crystalline with some pyrite.
- 3777-3784 Limestone, medium dark gray (N4), dense, slightly silty, with few ooliths.
- 3784-3791 Limestone, medium dark gray (N4), with brownish tint, dense, oolitic in part; and limestone, very light gray (N8) like 3768-3777.
- 3791-3796 Limestone, white (N9); and limestone, brownish gray (5YR 4/1), mottled, dense to medium-crystalline, few scattered pyrite crystals.
- 3796-3801 Limestone, white (N9); and light brownish gray (5YR 6/1), mottled dense.
- 3801-3808 Limestone, white (N9); and light brownish gray (5YR 6/1), dense, very oolitic.
- 3808-3818 Limestone, very light gray (N8), finely clastic; and light brownish gray (5YR 6/1), dense, oolitic.
- 3818-3821 Like 3808-3818.
- 3821-3827 Like 3818-3821.
- 3827-3835 Limestone, brownish gray (5YR 4/1), dense to oolitic.
- 3835-3842 Limestone, medium dark gray (N4) with brownish tint, silty; and limestone, very light gray (N8), dense, with few crinoid stems.
- 3842-3847 Like 3835-3842.
- 3847-3854 Like 3842-3847.
- 3854-3861 Limestone, very light gray (N8), finely clastic, oolitic; and limestone, medium dark gray (N4), dense to medium crystalline, oolitic.
- 3861-3871 Like 3854-3861.
- 3871-3877 Limestone, medium dark gray (N4), very silty, with abundant crinoid stems.

- 3877-3881 Like 3871-3877, with limestone, very light gray (N8), dense; and limestone, brownish gray (5YR 4/1), dense.
- 3881-3891 Limestone, brownish gray (5YR 4/1), dense; and limestone, very light gray (N8), non-crystalline, like 3877-3881.
- 3891-3898 Limestone, medium gray (N5) to medium dark gray (N4), dense, very oolitic.
- 3898-3904 Limestone, white (N9) to medium dark gray (N4), dense, medium crystalline, oolitic.
- 3904-3910 Like 3898-3904.
- 3910-3916 Limestone, very light gray (N8) to light brownish gray (5YR 6/1), dense, medium crystalline, with scattered pyrite crystals.
- 3916-3921 Limestone, medium dark gray (N4), with brownish tint, finely crystalline, very oolitic.
- 3921-3926 Like 3916-3921.
- 3926-3932 Limestone, white (N9); and brownish gray (5YR 4/1), mottled, dense to medium crystalline, oolitic.
- 3932-3941 Like 3926-3932.
- 3941-3948 Limestone, white (N9) to light gray (N7), dense, oolitic.
- 3948-3959 Limestone, brownish gray (5YR 4/1), oolitic in part.
- 3959-3968 Limestone, brownish gray (5YR 5/1) and very light gray (N8), dense, with some ooliths, and a few crinoid buttons.
- 3968-3975 Like 3959-3968.
- 3975-3985 Limestone, brownish gray (5YR 5/1), dense; and limestone, white (N9), non-crystalline; with some white (N9), coarsely crystalline calcite.
- 3985-3996 Limestone, brownish gray (5YR 5/1), dense, with a small amount of pyrite.
- 3996-4008 Like 3985-3996 with pyrite.

- 4008-4010 Like 3996-4008; with 30% limestone, grayish red (5YR 4/2), finely crystalline.
- 4010-4016 Limestone, medium gray (N5), dense to finely crystalline.
- 4016-4020 Like 4010-4016; with abundant white (N9) coarsely crystalline calcite; and a few pieces of limestone, dark gray (N3), dense, with pyrite crystals.
- 4020-4025 Like 4016-4020 with scattered pyrite crystals throughout.
- 4025-4032 Limestone, white (N9) to medium gray (N5) with brownish tint, dense oolitic.
- 4032-4037 Like 4025-4032, but fewer ooliths.
- 4037-4043 Limestone, medium light gray (N6), dense with some fine and medium crystals, fossiliferous (brachiopods and crinoid buttons), with little shale, dark gray (N3), carbonaceous, fossiliferous (ostracods?).
- 4043-4054 Limestone, medium gray (N5), dense.
- 4054-4058 Limestone, medium dark gray (N4) with brownish tint, dense.
- 4058-4066 Limestone, medium gray (N5), dense, very oolitic.
- 4066-4071 Limestone, medium dark gray (N4), dense; and white (N9), non-crystalline.
- 4071-4076 Limestone, medium dark gray (N4), like 4066-4071.
- 4076-4085 Limestone, medium dark gray (N4), very silty, with some quartz grains.
- 4085-4107 Like 4076-4085.
- 4107-4115 Limestone, dark gray (N3), dense, silty; and siltstone, medium gray (N5), with greenish tint, slightly calcareous, with scattered pyrite crystals.
- 4115-4119 Siltstone, medium gray (N5), like 4107-4115; and siltstone, grayish red (5R 4/2), mottled, slightly calcareous.
- 4119-4125 Like 4115-4119.

- 4125-4130 Siltstone, medium gray (N5), micaceous, with abundant nodules of bright green mineral.
- 4130-4135 Siltstone, grayish red (10R 4/2) with scattered mica.
- 4135-4139 Like 4130-4135.
- 4139-4140 Siltstone, grayish red (10YR 4/2), slightly sandy, micaceous, with abundant red mineral (gypsum).
- 4140-4142 Like 4139-4140.
- 4142-4151 Siltstone, medium gray (N5), with greenish tint, micaceous, fine to sandy.
- 4151-4157 Siltstone, dusky red (5R 3/4) to very dusky red (10R 2/2), scattered mica.
- 4157-4161 Like 4151-4157.
- 4161-4165 Like 4157-4161.
- 4165-4173 Siltstone, grayish red (10R 4/2); and siltstone, greenish gray (5G 7/1), interbedded, both micaceous.
- 4173-4175 Shale, grayish red (5R 4/2); and greenish gray (5GY 6/1), mottled, both micaceous and fissile.