

Operator: Pipe Line Construction and Drilling Co.  
 Farm: R. J. Carlson  
 Well No.: 1  
 Location: Buchanan County  
           750' N. of 37°15'  
           4150' W. of 81°55'  
 Elevation: 2122.62' Ground  
 Total Depth: 4731'  
 Drilling Commenced: June 10, 1948  
 Well Completed: February 23, 1949  
 Result: Gas Well

Geologic Sample Log  
 prepared by E. T. Jacobsen  
 (638'-1065' and 2735'-  
 4712'), P. T. Stafford  
 (1055'-1771'), M. B. McFarlan  
 (1771'-2735'), U. S. Geo-  
 logical Survey, Lexington,  
 Kentucky 1949-1950

## GEOLOGIC LOG

<u>Depth (feet)</u>	<u>Lithology</u>
638- 650	Graywacke, slightly calcareous, light gray (N7), very fine-grained (approaching siltstone), subangular to subrounded, poorly sorted, about 20% quartzose, dark and brownish inclusions, micaceous, moderately poorly sorted, about 50%; shale, silty, medium dark gray (N4), slightly micaceous, about 50%.
650- 657	Shale, slightly silty, medium dark gray (N4), finely micaceous; little grayish black, very carbonaceous shale and coals; slight trace pyrite.
650- 657	(2 samples for same interval) Shale, very silty to slightly silty, medium dark gray (N4), micaceous to finely micaceous, about 75%; graywacke, as 638-650, about 20%.
657- 665	No. sample.
665- 673	Shale, silty to slightly silty, medium gray (N5) micaceous to very slightly micaceous.
673- 680	Shale, slightly to very slightly silty, medium gray (N5), very finely micaceous.
680- 687	Shale, slightly silty, medium gray (N5), slightly micaceous; about 20% shale, very silty, very slightly calcareous to calcareous, medium light gray (N6).
687- 694	Shale, slightly silty, as above, little very carbonaceous shale.
694- 702	Shale, slightly silty to non-silty, medium gray (N5), slightly micaceous; about 20% shale, very silty, slightly calcareous, medium light gray (N6), trace mica.
702- 709	Shale, medium gray (N5), slightly resinous luster, about 70%; graywacke, medium light gray (N6), very fine-grained, subrounded, to subangular, very poorly sorted, about 75% quartzose, dark inclusions, micaceous, much shale and silt cement, about 30%.

- 709- 717 Graywacke, very shaly, as above, about 50%; shale, very carbonaceous, to slightly carbonaceous, dark gray (N3), trace plant fossils; trace coal.
- 717- 725 Shale, slightly silty to part very silty, medium gray (N5), slightly micaceous.
- 725- 735 Shale, slightly silty to non-silty, medium gray (N5), slight trace very finely micaceous material.
- 735- 747 Shale, silty to very silty, very slightly to slightly calcareous, medium gray (N5), micaceous; trace blacky coal.
- 747- 757 Ditto; some (about 20%), shaly, calcareous, medium light gray (N6), siltstone; no coal noted.
- 757- 768 Ditto.
- 768- 777 Shale, slightly silty, very slightly calcareous, medium gray (N5), finely micaceous.
- 777- 787 Shale, non-silty to slightly silty, as above.
- 785- 795 Shale, silty to slightly silty, medium gray (N5), very slightly calcareous, finely micaceous.
- 795- 803 Shale, non-silty to slightly silty, medium dark gray (N4), slightly fissile, trace very finely micaceous material; part medium gray (N5), slightly calcareous to calcareous.
- 803- 808 Shale, medium gray (N5), very slightly calcareous, slightly fissile, trace very finely micaceous material.
- 808- 816 Graywacke, light gray (N7), very slightly calcareous, fine-grained, angular to subangular, very poorly sorted, (very fine-grained to medium-grained), about 70% quartzose, dark and green inclusions, micaceous (muscovite, some chlorite, and phlogopite), silt cement, moderately well cemented, much as loose grains.
- 816- 825 Ditto, predominantly loose grains.
- 825- 831 Ditto, very fine-grained, more green inclusions.
- 831- 838 Ditto, very fine-grained to fine-grained.
- 838- 844 Ditto, fine-grained, predominantly clustered.
- 844- 850 Ditto, some chert, fine-grained pebbles.
- 850- 857 Ditto, loose grains.
- 857- 872 Ditto, extremely poorly sorted, (very fine-grained to coarse-grained).
- 872- 881 No sample.

- 881- 887 Graywacke, medium brownish gray (5YR 5/1), very fine-grained subangular to subrounded, poorly sorted, about 60% quartzose, dark and browns and some green inclusions, micaceous, silt and shale cement, moderately well cemented, some brownish gray siltstone, micaceous, very well cemented.
- 887- 894 Graywacke, light gray (N7), fine-grained, angular to subangular, very poorly sorted, (very fine-grained to medium-grained), about 75% quartzose, dark and some green inclusions, much silt cement and moderately well cemented, many loose grains, some shale, very silty, medium gray (N5), micaceous.
- 894- 900 Siltstone, medium light gray (N6), very coarse-grained, subrounded, poorly sorted, dark inclusions, micaceous; and shale, medium dark gray (N4), very slightly silty to non-silty, slightly micaceous.
- 900- 905 Shale, medium dark gray (N4), very slightly fissile, very finely micaceous.
- 905- 916 Ditto.
- 916- 923 Ditto.
- 923- 943 Ditto.
- 943- 957 Ditto.
- 957- 969 Shale, very silty, medium light gray (N6), about 40%; shale, as above, about 60%.
- 969- 981 Shale, non-silty to slightly silty, medium gray (N5), very finely micaceous; little very silty shale, as above.
- 981- 994 Ditto.
- 994-1007 Siltstone, calcareous to very slightly calcareous, shaly, medium light gray (N6), coarse-grained, poorly sorted, dark inclusions, micaceous, about 50%; shale, very silty to non-silty, medium dark gray (N4), micaceous, about 50%.
- 1007-1021 Shale, medium dark gray (N4), trace very finely micaceous material.
- 1021-1035 Ditto, little siltstone, light gray (N7), very coarse-grained, subrounded, moderately well sorted, dark inclusions, slightly micaceous.
- 1035-1049 Shale, medium dark gray (N4), very slightly fissile, trace very finely micaceous material.
- 1049-1055 Graywacke, calcareous to slightly calcareous, light brownish gray to light gray (5YR 6/1 to N7), very fine-grained (approaching siltstone), subangular, poorly sorted, about 70% quartzose, brownish, dark, and few green inclusions, micaceous, much silt and shale cement; moderately well cemented, to well cemented.

- 1055-1065 Ditto, light brownish gray graywacke, calcareous; light gray, non-calcareous.
- 1055-1065 Siltstone, medium dark gray (N4)\*, shaly, in clusters, very micaceous, many other black minerals, 50%; sandstone, light gray (N7), very fine-grained, subangular to angular, poorly sorted, in clusters, silty, micaceous, numerous green and black minerals, 40%; shale, medium dark gray (N4), very micaceous, 10%.
- 1065-1074 Coal, 40%; shale, as above, 30%; siltstone, as above, 20%; sandstone, as above, 10%; one piece shale, brownish gray (5 YR 4/1).
- 1074-1082 Sandstone, light gray, very fine- to fine-grained, angular, poorly sorted, in clusters, slightly calcareous, micaceous, numerous black and green minerals (chlorite, hornblende?), 85%; shale, as above, 10%; siltstone, 5%.
- 1082-1089 Shale, medium dark gray (N4), very micaceous, some slightly silty, 75%; siltstone, between medium dark gray (N4) and brownish gray (5 YR 4/1), clustered, micaceous, shaly, 25%.
- 1089-1109 Shale, as above, 85%; siltstone, as above, 10%; sandstone, as in 1074-1082, 4%; coal, 1%.
- 1109-1125 Shale, as above, 70%; siltstone, as above, 5%; sandstone, medium light gray (N6), very fine-grained, angular, poorly sorted, silty, micaceous, many dark and black minerals, 25%.
- 1125-1135 Ditto.
- 1135-1141 Sandstone, as above, 75%; shale, as above, 20%; siltstone, as above, 5%.
- 1141-1150 Sandstone, as above, 80%; shale, as above, 20%.
- 1150-1166 Shale, medium dark gray (N4), very micaceous, 65%; sandstone, as in 1109-1125, 35%.
- 1166-1176 Shale, medium dark gray, very micaceous, 25%; shale, dark gray (N3), micaceous, 75%.
- 1176-1188 Shale, dark gray, as above, 90%; shale, medium dark gray, as above, 5%; coal, 5%.
- 1188-1196 Shale, medium dark gray (N4), some very micaceous, some very silty, 40%; shale, dark gray (N3), as above, 35%; siltstone, medium light gray (N6), micaceous, shaly, many black minerals, 20%; coal, 5%.
- 1196-1202 Shale, dark gray (N3), silty, micaceous, 50%; shale, medium dark gray, as above, 25%; shale, dark gray (N3), 15%; siltstone, as above, 5%; sandstone, as in 1109-1125, 5%; trace of coal.

\*Color descriptions and numbers taken from National Research Council Rock-Color Chart.

- 1202-1212 Sandstone, white (N9), with slight mottling of black and green due to numerous black and green minerals, very fine- to medium-grained, rounded to subrounded, poorly sorted, micaceous, calcareous, few clusters, slightly iron stained, 75%; coal, 25%; few places of shales and siltstone, as above.
- 1212-1215 Sandstone, as above; few pieces of shales and siltstone, as above; trace of coal.
- 1215-1227 Sandstone, as above except medium light gray (N6), with numerous angular quartz fragments (conglomeratic?), medium grains well rounded, mostly in clusters, largely non-calcareous, much mica and green and dark minerals, 85%; shale, medium dark gray (N4), micaceous, some silty, 15%.
- 1227-1232 Shale, medium gray (N5), silty, micaceous, some slightly calcareous, 50%; shale, medium dark gray (N4), silty, micaceous, 10%; sandstone, as above, 25%; siltstone, medium light gray (N6) to light gray (N7), shaly, many dark and black minerals, 15%.
- 1232-1240 Shale, medium dark gray, slightly silty to very silty, micaceous, 70%; siltstone, as above, 15%; sandstone, as above, 15%.
- 1240-1245 Shale, dark gray (N3), very finely micaceous, some slightly silty, 80%; sandstone, as above, 15%; siltstone, 5%.
- 1245-1250 Sandstone, very light gray (N8), fine- to medium-grained rounded to subangular, poorly sorted, mostly loose grains, calcareous, micaceous, few to many green, dark and black minerals (chlorite?), some grains slightly iron-stained, 80%; shale, medium dark gray (N4), very micaceous, 12%; shale, dark gray (N3), as above, 8%.
- 1250-1265 Sandstone, white (N9), fine- to medium-grained, rounded to subrounded, calcareous to non-calcareous, micaceous, few to many green and black minerals, mostly loose grains, some iron-stained, 75%; shale, medium dark gray (N4), as above, some silty, 25%.
- 1265-1282 Shale, medium dark gray, some silty.
- 1282-1302 Shale, as above, 95%; siltstone, light gray (N7), few black minerals, 5%.
- 1302-1322 Shale, as above, 100%.
- 1322-1330 Sandstone, brownish gray (5 YR 4/1), very fine-grained, with few fine-grained clusters, well rounded, very silty cement, 50%; shale, as in 1265-1282, 50%; trace of coal.
- 1330-1340 Sandstone, very light gray (N8), fine- to medium-grained, rounded to angular, mostly loose grains, micaceous, few black minerals, some iron stained, 95%; shale, as in 1265-1282, 3%; sandstone, as above, 2%.

- 1340-1357 Siltstone, medium dark gray (N4), shaly, micaceous; trace of shale, as above.
- 1357-1370 Sandstone, medium light gray (N6), very fine- to fine-grained, subangular to angular, poorly sorted, very micaceous, many black minerals, 50%; shale, medium dark gray, slightly silty, very micaceous, 30%; siltstone, as above, 20%.
- 1370-1384 Sandstone, very light gray (N8), very fine- to medium-grained, rounded to angular, poorly sorted, slightly micaceous, silty cement, few green and many black minerals, 65%; sandstone, medium light gray (N6), as above, 30%; shale, as above, 5%.
- 1384-1407 Sandstone, very light gray (N8), medium- to coarse-grained, rounded to angular, very poorly sorted, loose and in clusters, silty cement, considerable black and white minerals other than quartz, 90%; sandstone, as above, 5%; shale, as above, 5%.
- 1407-1424 Shale, dark gray (N3), 99%; sandstone, as in 1322-1330, 1%.
- 1424-1431 Shale, medium gray (N5), slightly fissile.
- 1431-1451 Sandstone, very light gray (N8), very fine- to medium-grained, subrounded to angular, poorly sorted, loose and in clusters, considerable black mineral, some red and green minerals, micaceous, 99%; shale, as above, 1%.
- 1451-1480 Sandstone, very light gray, very fine-grained, rounded to subrounded, well sorted, in clusters, slightly micaceous, few black minerals; few pieces of sandstone, as above.
- 1480-1533 Shale, medium dark gray (N4).
- 1533-1553 Ditto.
- 1553-1565 Sandstone, as in 1451-1480, loose and in clusters, 60%; shale, as above, micaceous, some silty, 40%; trace of coal.
- 1565-1577 Sandstone, very light gray (N8), very fine- to fine-grained, rounded to subangular, poorly sorted, mostly loose, few dark minerals, 75%; shale, as above, 25%; few pieces of coal.
- 1577-1583 Shale, medium dark gray (N4), slightly fissile.
- 1583-1596 Shale, as above, some slightly micaceous, some silty, 65%; sandstone, very light gray (N8), as in 1565-1577, 20%; siltstone, medium gray (N5), shaly, 15%.
- 1596-1624 Shale, medium dark gray, slightly fissile, micaceous.
- 1624-1633 Sandstone, very light gray (N8), very fine- to fine-grained, rounded to subangular, fairly well sorted, mostly loose, slightly micaceous, few black minerals, much iron stained, 70%; shale, as above, 30%.

- 1633-1649 Sandstone, very light gray, very fine- to medium-grained, rounded to angular, very poorly sorted, nearly all loose grains, few black minerals, much iron stained, 90%; shale, as in 1596-1624, 10%.
- 1649-1661 Sandstone, as above, 90%; shale, as above, 10%.
- 1661-1669 Sandstone, as above, slightly silty (?), 95%; (very dirty, sample needs washing); shale, as above, 5%.
- 1669-1680 Sandstone, as above, very fine- to fine-grained with few medium grains, 95%; shale, as above, 5%.
- 1680-1700 Sandstone, as above, with quartz conglomerate fragments, 100%; trace of coal.
- 1700-1723 Sandstone, white (N9), very fine- to medium-grained, rounded to angular, all loose grains, numerous conglomerate quartz fragments, very clean sandstone, much iron-stained.
- 1723-1735 Sandstone, as above, no conglomeratic fragments, but trace of green and black minerals.
- 1735-1750 Sandstone, as above, fine to coarse-grained, numerous angular quartz fragments of conglomerate (?), 85%; shale, dark gray (N3), 10%; coal, 5%.
- 1750-1771 Sandstone, as above, conglomeratic, with numerous quartz conglomeratic fragments, many dark, green and black minerals, micaceous, very calcareous to non-calcareous, 80%; coal, 12%; shale, as above, 8%.
- 1771-1790 Sandstone, white, very fine-grained to fine-grained, free, angular to subangular, little limonite stain, one or two larger fragments of sandstone; trace dark gray shale, trace coal, occasional green mineral (glauconite?).
- 1790-1800 Shale, dark gray to medium dark gray, occasionally slightly micaceous; siltstone (60%) light gray to medium gray, some shaly; sandstone (2%) light gray, very fine-grained to fine-grained, some shaly, two or three larger quartz fragments, trace coal.
- 1800-1810 Same as 1790-1800.
- 1810-1830 Sandstone, white, fine-grained to medium-grained, angular to subangular, free, some clusters, poorly sorted, little limonite stain, few scattered green (glauconite?) and black minerals, few pieces shaly, trace dark gray shale.
- 1830-1851 Same as 1810-1830 only sandstone, very fine-grained to fine-grained to some medium-grained, very few clusters.

- 1851-1880 Sandstone, white to some gray (shaly), fine-grained to medium-grained, angular to subangular, poorly sorted, free, some clusters, few scattered black and green (glauconite?) minerals, little limonite stain; shale (2%) dark gray to medium dark gray, two or three pieces coal.
- 1880-1900 Sandstone, white, fine-grained to few pieces medium-grained, free, some clusters, angular to subangular, very few scattered black and green (glauconite?) minerals, little limonite stain, few pieces shaly; trace shale, dark gray, two or three pieces coal.
- 1900-1911 Coal; shale (3%) medium dark gray, trace sandstone, light gray, very fine-grained.
- 1911-1920 Sandstone, white to light gray, very fine-grained, few pieces slightly shaly, clustered, scattered black and few green (glauconite?) minerals, little limonite stain; shale (10%) medium dark gray to dark gray, occasional piece slightly micaceous, three or four pieces coal.
- 1920-1940 Same as 1911-1920 only sandstone free, some clusters, no black and green minerals; shale - 3%, no coal.
- 1940-1965 Sandstone, white to gray, very fine-grained to some fine-grained, clustered, shaly, scattered black minerals, occasionally slightly micaceous, trace medium dark gray shale.
- 1965-1985 Sandstone, white to few gray (shaly), fine-grained to some medium grained, clustered, few scattered black and green (glauconite?) minerals, little limonite stain, trace dark gray shale, one piece coal.
- 1985-2000 Shale, medium dark gray, trace silty material, light gray.
- 2000-2025 Siltstone to very fine-grained sandstone, light gray to medium gray, shaly; sandstone 45%; shale (10%) medium dark gray; scattered black minerals, little limonite stain.
- 2025-2050 Sandstone, white to some gray, fine-grained, angular to subangular, clustered, some free, non-calcareous to calcareous, some slightly shaly, few scattered black minerals, little limonite stain; shale (1%) medium dark gray.
- 2050-2057 Sandstone, white, very fine-grained to fine-grained, to few medium-grained, clustered, some free, scattered black and few green (glauconite?) minerals, some shaly, little limonite stain, trace medium dark gray shale.
- 2057-2070 Sandstone, white to some gray, fine- to medium-grained, one or two larger quartz fragments, free, some clusters, subangular to subrounded, little limonite stain; shale to siltstone (30%) medium gray (15%-15%), siltstone is shaly.
- 2070-2093 Shale, medium gray; siltstone to very fine-grained sandstone (25%), slightly shaly, siltstone - 5%, few scattered black minerals.



- 2093-2105 Sandstone, white, very fine-grained to fine-grained, clustered and free, slightly calcareous; shale (40%) medium gray to some medium dark gray.
- 105-2120 Sandstone, white to gray, very fine-grained, shaly, clustered, non-calcareous to some slightly calcareous, scattered black minerals; shale (5%) medium dark gray to medium gray, trace limonite stain.
- 2120-2131 Sandstone, white, fine-grained to very fine-grained, free, few clusters, few black and occasional green (glauconite?) minerals, some shaly, trace limonite stain; shale (2%) dark gray to medium dark gray.
- 2131-2153 Sandstone, white, fine-grained to very fine-grained, free and clustered, angular to subangular, few scattered black minerals, little limonite stain; shale (3%) medium dark gray.
- 2153-2162 Same as 2131-2153, only sandstone clustered and occasionally slightly calcareous, some pieces shaly.
- 2162-2172 Fine-grained sandstone to siltstone (20%) to some medium-grained sandstone, free, few clusters, angular to subrounded, occasional piece slightly calcareous, limonite stain, few black and green (glauconite?) minerals, poorly sorted; shale (2%) medium dark gray.
- 2172-2184 Sandstone, white, fine-grained to very fine-grained, few pieces medium-grained, free, angular to subangular, few scattered black and green (glauconite?) minerals; shale (1%) dark gray to medium dark gray, little limonite stain.
- 2184-2198 Sandstone, white, very fine- to fine-grained, clustered, some free, angular to subangular, few scattered black minerals, non-calcareous to slightly calcareous, some limonite stain; shale (20%), medium gray to medium dark gray.
- 2198-2210 Sandstone, white, fine- to medium-grained, angular to subangular, free, occasional cluster, some limonite stain; shale (10%), medium gray to medium dark gray.
- 2210-2217 Shale, medium gray, slightly calcareous.
- 2217-2225 Shale, medium gray to grayish red (5R4/2) (15%) some very slightly calcareous.
- 2225-2239 Shale, medium gray to grayish red (20%), very occasionally slightly calcareous.
- 2239-2250 Shale, medium dark gray (some with brownish tint) to grayish red (30%), very occasional piece calcareous.
- 2250-2280 Sandstone, gray, very fine-grained, clustered, few free, shaly, very occasional piece calcareous; shale (20%), medium gray to two or three pieces grayish red, much is silty, trace limonite stain.

- 2280-2290 Same as 2250-2280, sandstone, non-calcareous to calcareous, no red shale.
- 2290-2296 Same as 2250-2280, sandstone, non-calcareous to calcareous, no red shale, shale - 15%.
- 2296-2304 Same as 2290-2296, two or three pieces chert.
- 2304-2314 Sandstone, white to few gray (shaly), fine-grained to some very fine-grained, clustered, some free, angular to sub-angular, some calcareous, little limonite stain, few scattered black mineral; shale (10%), medium dark gray, trace pyrite.
- 2314-2323 Same as 2304-2314, more free sandstone.
- 2323-2330 Sandstone, white to gray, very fine to fine-grained, clustered, some free, some shaly, slightly calcareous to calcareous, scattered black minerals, little limonite stain; shale (15%) medium dark gray, some carbonaceous, several pieces coal; trace pyrite.
- 2330-2340 Sandstone, white to gray, fine-grained to little very fine-grained, clustered, non-calcareous to calcareous, some shaly, limonite stain; shale (3%) medium dark gray to dark gray, trace pyrite.
- 2340-2356 Siltstone, light gray to medium gray, non-calcareous to slightly calcareous, some shaly; shale (35%) medium dark gray, some slightly silty; sandstone (1%) white, fine-grained, slightly calcareous, trace white to gray clastic limestone, trace micro-fossil.
- 2356-2365 Siltstone, white to gray, clustered, non-calcareous to slightly calcareous, some shaly, scattered black minerals, little limonite stain; shale (10%) medium dark gray, some silty, trace brownish gray limestone.
- 2365-2376 Siltstone, light gray to gray, clustered, non-calcareous to calcareous, some shaly, few scattered black minerals; shale (10%) medium dark gray.
- 2376-2395 Same as 2365 to 2376.
- 2395-2405 Shale, medium dark gray; siltstone (5%) gray, shaly, occasionally very slightly calcareous.
- 2405-2425 No samples.
- 2425-2445 Same as 2395-2405, siltstone - 15%.
- 2445-2465 Shale, medium dark gray, trace siltstone as in 2395-2405.
- 2465-2500 Shale, medium dark gray.
- 2500-2509 Shale, medium dark gray, siltstone, 15%, white, few pieces shaly; limestone 1%, white to gray, clastic.

- 2509-2520 Siltstone, white to little gray, clustered, calcareous, trace limonite stain; shale (30%) dark gray.
- 2520-2529 Same as 2509-2520 only siltstone non-calcareous to some calcareous, shale - 10%.
- 2529-2536 Siltstone (15%) to very fine-grained sandstone, white, clustered to some free, occasionally slightly calcareous, limonite stain; shale - 15%, dark gray.
- 2536-2541 Sandstone, white to few pieces gray (shaly), very fine-grained, free and clustered, occasional piece calcareous, limonite stain, few scattered black minerals; shale (10%) dark gray to medium dark gray, few pieces very micaceous.
- 2541-2545 Sandstone, white to light gray, some yellow, very fine-grained to fine-grained, free and some clusters, much limonite stain, some pieces slightly shaly, occasional piece calcareous; shale (20%) dark gray to medium dark gray, few pieces micaceous.
- 2545-2560 Shale, medium dark gray, few pieces silty, some slightly micaceous, little limonite stain; siltstone (40%), white to gray, non-calcareous to slightly calcareous, some shaly, trace pyrite, trace white to gray sandstone.
- 2560-2580 Shale, dark gray to medium dark gray, few pieces silty; siltstone (30%) white to some gray (shaly) occasionally very slightly calcareous, few scattered black minerals, little limonite stain, trace pyrite.
- 2580-2584 Siltstone, white to few pieces gray (shaly), clustered, occasional piece calcareous, few scattered black minerals, limonite stain; shale (15%) dark gray.
- 2584-2595 Shale, medium dark gray to dark gray, non-calcareous to calcareous, some slightly silty, trace siltstone as in 2580-2584, trace brownish gray limestone.
- 2595-2617 Shale, medium dark gray, few pieces silty, trace siltstone as above.
- 2617-2635 Shale, medium dark gray, few pieces slightly silty.
- 2635-2650 Shale, medium dark gray, very occasionally slightly calcareous.
- 2650-2657 Shale, medium dark gray, non-calcareous to calcareous, some silty; siltstone (15%) gray, shaly, non-calcareous to calcareous; limestone (3%) brownish gray to gray, shaly.
- 2657-2667 Sandstone, white, fine-grained to few pieces medium-grained, angular to subrounded, mostly free, limonite stain, non-calcareous to calcareous; shale (15%) dark gray to medium dark gray, trace brownish gray limestone.

- 2667-2669 Sandstone, white, very fine- to fine-grained, angular to subangular, clustered, limonite stain, non-calcareous to calcareous; shale (45%) dark gray to medium dark gray.
- 2669-2673 Shale, medium dark gray, non-calcareous to slightly calcareous; sandstone (10%) white to some gray, very fine-grained, very calcareous; limestone (30%) white to brownish gray to gray, shaly to clastic, some dense.
- 2673-2675 Shale, medium dark gray, occasional piece mica; sandstone (35%), white very fine-grained to fine-grained, three or four larger quartz fragments, very calcareous to some non-calcareous, some shaly, mostly clustered; limestone (15%) white to brownish gray to gray, clastic, some shaly, few dense some very silty.
- 2675-2678 Sandstone, white, very fine-grained to fine-grained, occasional larger quartz fragment, angular to subrounded, free and some clusters; shale (10%) dark gray to medium dark gray; limestone (20%) brownish gray to little white to little gray, dense, clastic, little limonite stain, trace pyrite.
- 2678-2681 Sandstone, white to some yellow, very fine-grained to fine-grained, angular to subangular, free, few clusters, much limonite stain, occasionally slightly calcareous; shale (15%) dark gray to medium dark gray, one piece reddish gray; limestone (2%) as in 2675-2678.
- 2681-2684 Same as 2678-2681, shale - 30%, only trace limestone, no reddish gray shale.
- 2684-2687 Same as 2678-2681 very much limonite stain, only trace limestone, no reddish gray shale, very occasional cluster sandstone.
- 2686-2689 Sandstone, white to yellow, fine-grained, angular to subangular, mostly free, very occasional piece slightly calcareous, much limonite stain; shale (10%) dark gray to grayish black.
- 2689-2692 Same as 2686-2689, some very fine-grained sandstone, shale 5%.
- 2692-2695 Same as 2686-2689.
- 2695-2697 Same as 2686-2689, some very fine-grained sandstone, non-calcareous.
- 2697-2700 Same as 2686-2689, shale 5%.
- 2700-2703 Same as 2686-2689, some very fine-grained sandstone, non-calcareous, trace pyrite.
- 2703-2706 Same as 2700-2703, no pyrite.
- 2706-2708 Same as 2700-2703, no pyrite.

- 2708-2710 Sandstone, white, very fine-grained, clustered, few pieces' free, much limonite stain, occasionally slightly calcareous; shale (25%), dark gray to grayish black, trace pyrite.
- 2710-2713 Same as 2708-2710, no pyrite.
- 2713-2716 Sandstone, white to some yellow, very fine-grained to fine-grained, angular to subangular, much limonite stain, occasionally slightly calcareous, free, some clustered; shale (3%) dark gray to grayish black, one or two pieces coal, trace pyrite.
- 2716-2721 Same as 2713-2716, shale - 5%, no coal.
- 2721-2724 Siltstone to very fine-grained sandstone, white to yellow, clustered, some free, very occasionally slightly calcareous, much limonite stain; sandstone-10%; shale (5%), dark gray, trace pyrite.
- 2724-2726 Sandstone, white, very fine-grained, free, some clusters, calcareous cement, little limonite stain; shale - 1%, dark gray to grayish black.
- 2726-2728 Same as 2724-2726 only sandstone very fine-grained to fine-grained, more limonite stain; shale - 10%.
- 2728-2731 Same as 2726-2728, shale - 15%, only occasionally calcareous.
- 2731-2735 Sandstone, white to yellow, very fine-grained, clustered, some free, much limonite stain, occasionally slightly calcareous; shale (10%) grayish black to dark gray, trace pyrite.
- 2735-2739 Sandstone, white (N9), very fine-grained, subrounded, medium sorted, few dark grains and slightly micaceous, 9/10 moderately friable in small clusters and 1/10 well cemented, 80%; shale, medium dark gray (N4), 20%.
- 2739-2742 Sandstone, white (N9), very fine-grained, subrounded to rounded, moderately well sorted, few dark grains, friable with small clusters, 95%; shale, medium gray to dark gray (N5-N3), 5%. Considerable pyrite and iron staining.
- 2742-2745 Ditto; no pyrite noted.
- 2745-2750 Ditto; shale, grayish black (N2), 5%.
- 2750-2755 Ditto, 90%; shale, medium dark gray (N4), finely micaceous, and grayish black, 10%.
- 2755-2759 Ditto, slightly silty, 97%; shale, as above, 3%.
- 2759-2765 Siltstone, medium light gray (N6), coarse-grained, subrounded, moderately well sorted, very slightly calcareous, 50%; shale, medium gray (N5), silty, trace mica, 30%; shale, dark gray (N3), 20%. Considerable pyrite.

- 2765-2770 Shale, medium gray (N5), as above, 60%; siltstone, as above, 40%. Trace dark gray shale.
- 2770-2784 Shale, medium gray (N5), part silty, finely micaceous, 80%; siltstone, as above, 20%.
- 2784-2791 Sandstone, light gray (N7), very fine-grained, subrounded to subangular, poorly sorted, silty, considerable dark mineral inclusions, calcareous cement, moderately well cemented, 50%; shale, medium dark gray (N4), fossiliferous, part slightly micaceous, 40%; limestone, light brownish gray (5YR6/1), medium clastic, 10%.
- 2791-2798 Shale, medium light gray (N6), finely micaceous, 80%; shale, medium dark gray, as above, 10%; sandstone, as above, 10%.
- 2798-2806 Limestone, medium dark gray (N4), little light gray (N7), finely clastic to some medium clastic and crystalline, slightly shaly, fossiliferous (crinoid and other fragments), 60%; shale, medium dark gray (N4), very calcareous to calcareous, 40%. Trace sandstone, as above.
- 2806-2820 Limestone, as above, more mottled with light gray, 80%; shale, as above, 20%.
- 2820-2832 Limestone, as above, 90%; shale, as above, 10%.
- 2806-2840 Ditto.
- 2840-2863 Shale, grayish red (10R4/2) with little mottled with gray, very slightly calcareous, 50%; shale, medium light gray (N6), 30%; limestone, as above, 20%.
- 2863-2873 Shale, grayish red, as above, 95%; shale, medium gray (N5), calcareous, 5%.
- 2873-2883 Ditto.
- 2883-2893 Shale, grayish red, as above.
- 2883-2900 Shale, grayish red, as above, 99%; shale, medium gray, calcareous, 1%.
- 2900-2920 Shale, grayish red, as above, 55%; shale, medium gray (N5), 20%; shale, medium light gray (N6), slightly silty, slightly fossiliferous, 20%; sandstone, light gray (N7), very fine-grained, 5%.
- 2920-2927 Sandstone, medium light gray (N6), very fine-grained, subangular to subrounded, moderately poorly sorted, shaly, considerable greenish and dark minerals present, about half quartzose, moderately friable with most in clusters, 50%; shale, medium gray (N5.5), finely micaceous, slightly silty to little silty, 20%; shale, grayish red, as above, 20%; shale, very dusky reddish purple (5RP2/2), 10%.

- 2927-2945 Sandstone, white (N9), very fine-grained to fine-grained, subangular to subrounded, poorly sorted (silt to fine-grained) silty, very slightly calcareous cement, few dark grains inclusions, 50%; shale, grayish red (5R4/2), 30%; shale, medium dark gray (N4), part finely micaceous, 20%.
- 2945-2955 Shale, grayish red (as above), 40%; shale, medium gray (N5), very finely micaceous, 20%; shale, medium gray (N5), silty, finely micaceous, 20%; sandstone, white, as above, 15%; sandstone, greenish gray (5GY6/1), very fine-grained, subrounded, moderately well sorted, considerable green mineral inclusions, micaceous, silty, about half quartzose, 5%.
- 2955-2961 Sandstone, white, as above, friable, 50%; sandstone, greenish gray, as above, 25%; shale, medium gray (N5), as above, 15%; shale, grayish red, as above, 10%.
- 2961-2970 Sample missing.
- 2970-2977 Shale, medium gray (N5), micaceous, 50%; shale, medium light gray (N6), calcareous, slightly silty, finely micaceous, 25%; shale, grayish red, as above, 15%; siltstone, light gray (N7), coarse-grained, subrounded calcareous cement, 10%.
- 2977-2985 Ditto. Trace white fine-grained finely micaceous sandstone.
- 2985-3005 Shale, medium dark gray (N4), slightly calcareous to some calcareous, 50%; siltstone, as above, 40%; shale, grayish red, as above, 10%.
- 3005-3020 Shale, grayish red (5R4/2), calcareous, very finely micaceous, 60%; sandstone, pale red (5R6/2), very fine-grained (near siltstone), very calcareous cement, some dark mineral grains, about half quartzose, 20%; limestone, pale red (10R6/2), very finely clastic, 5%; shale, medium dark gray, as above, 5%; shale, light gray (N7), slightly silty, 10%.
- 3020-3030 Shale, grayish red (5R4/2), finely micaceous, 60%; shale, medium gray (N5), 20%; shale, dark gray (N3), 15%; limestone, grayish red (5R4/2), some light brownish gray (5YR6/1) 5%.
- 3030-3050 Ditto; shale, grayish red, 75%; sandstone, pale red, 15%; limestone, pale red, 5%; shale, medium dark gray, 5%.
- 3050-3063 Ditto.
- 3063-3085 Siltstone, very light gray (N8), coarse-grained, subangular to subrounded, moderately well sorted, shaly, calcareous cement, peppered with dark minerals, micaceous, about 2/3 quartzose, moderately friable with small clusters, 80%; shale, grayish red, (10R4/2), 15%; siltstone, light brownish gray (5YR6/1), fine-grained, well cemented, 5%.
- 3085-3095 Siltstone, very light gray, as above, 90%; shale, grayish red, 10%.

- 3095-3106 Shale, medium dark gray (N4), 40%; siltstone, light gray (N7), subrounded to subangular, shaly, slightly micaceous, 30%; shale, dark greenish gray (5GY4/1), 15%; limestone, light brownish gray (5YR6/1), very finely clastic, 15%.
- 3106-3118 Sample missing.
- 3118-3126 Sandstone, white (N9), very fine-grained, subrounded, moderately well sorted, moderately friable with small clusters, 75%; shale, dark gray (N3), 10%; shale, medium gray (N5), trace mica, 5%; shale, grayish red, as above, 10%.
- 3126-3133 Sandstone, as above, 85%; shale, dark gray, as above, 10%; shale, grayish red, as above, 5%.
- 3168-3172 Sandstone, white (N9), very fine-grained, subrounded to some subangular, moderate sorting, silty, friable, 70%; shale, grayish red (5R4/2), some mottled with medium gray, 20%; shale, medium gray (N5), 10%.
- 3172-3177 Sandstone, as above, considerable iron staining, trace of dark mineral grains slightly calcareous cement, 90%; shale, grayish red, as above, 5%; shale, medium gray, as above, 5%.
- 3177-3184 Ditto, very small clusters, 95%; shale, medium gray, 5%.
- 3184-3191 Shale, medium dark gray (N4), 50%; sandstone, as above, 50%; trace red shale.
- 3191-3202 Shale, medium dark gray (N4), as above, 90%; shale, very dusky red (10R2/2), some mottled with medium dark gray shale, 10%; trace medium light gray (N6), very silty shale and sandstone as above.
- 3202-3260 Shale, medium light gray (N6), chunky.
- 3260-3270 Sample missing.
- 3270-3300 Sandstone, white (N9), very fine-grained, subrounded, moderately well sorted, silty, calcareous cement, moderately friable in very small clusters, 50%; shale, medium dark gray (N4), 30%; shale, medium gray (N5), 10%; shale, grayish red (5R4/2), 10%.
- 3286-3290 Shale, dark gray (N3), 45%; sandstone, white (N9), very fine-grained, subrounded, moderately well sorted, friable, 45%; shale, grayish red (5R4/2), 10%. Trace pyrite.
- 3300-3308 Sandstone, as above, 50%; shale, grayish red, as above, 25%; shale, dark greenish gray (5GY4/1), 15%; shale, medium gray 10%.
- 3290-3300 Sandstone, as above, 60%; shale, medium dark gray (N4), part slightly silty and calcareous, 35%; shale, grayish red, as above, 5%.




- 3305-3313 Shale, medium light gray (N6), calcareous, part silty, 80%; siltstone, light gray (N7), medium-grained, subrounded, moderately well sorted, some well cemented, slightly calcareous to calcareous cement, 20%.
- 3313-3335 Shale, medium light gray, as above, non-calcareous, 80%; siltstone, as above, 10%; shale, grayish red (5R4/2), 10%.
- 3335-3391 Shale, medium gray (N5), silty to non-silty, micaceous, 80%; siltstone, as above, approaching very fine-grained sandstone, non-calcareous, 20%; trace red shale and pyrite.
- 3391-3395 Sandstone, white (N9), very fine-grained, subrounded, moderately well sorted, friable, 90%; shale, medium gray (N5), little very silty, 10%.
- 3395-3401 Ditto.
- 3401-3408 Sandstone, as above, fine-grained to very fine-grained, 90%; shale, as above, 7%; sandstone, light gray (N7), very fine-grained, subrounded to subangular, moderately well sorted, well cemented, 3%.
- 3408-3420 Sandstone, as above, 95%; shale, as above, 5%.
- 3420-3425 Sandstone, white (N9), very fine-grained, subrounded, moderately well sorted, silty, friable, 90%; shale, grayish red (5R4/2), 5%; shale, dark gray (N3), 5%.
- 3425-3430 Sandstone, ditto, very fine-grained to fine-grained, 95%; shale, gray, as above, 3%; shale, red, as above, 2%.
- 3430-3435 Sandstone, white, fine-grained, subrounded, poorly sorted (very fine-grained to medium-grained), 95%; shales, as above, 5%.
- 3435-3440 Shale, medium gray (N5), to medium dark gray (N4), calcareous, 75%; sandstone, as above, 25%.
- 3440-3490 Shale, medium light gray (N6), about third calcareous, fossiliferous.
- 3490-3505 Siltstone, very light gray (N8), coarse-grained, subrounded to rounded, moderately well sorted, moderately friable, 40%; sandstone, very fine-grained, as siltstone, 40%; shale, very light gray, as above, 10%; shale, medium dark gray (N4), 10%.
- 3505-3520 Sandstone, as above, 90%; shale, as above, and grayish red, 10%.
- 3520-3530 Ditto.
- 3530-3545 Shale, medium dark gray (N4), silty to little non-silty, trace mica, 50%; sandstone, as above, part well cemented, trace mica, 50%. Trace pyrite and red shale.

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Lower Maxon 5.3

- 3545-3575 Shale, medium dark gray (N4), 50%; shale, medium light gray (N6), 30%; siltstone, light gray (N7), well cemented, 10%; sandstone, as above, 10%. Trace limestone.
- 3575-3585 Shale, medium gray (N5), 70%; siltstone, light gray (N7), subrounded to rounded, moderately well sorted and cemented, slightly micaceous, 30%.
- 3585-3600 Shale, medium gray (N5), as above, 70%; siltstone, as above, 25%; limestone, medium gray (N5), finely clastic, 5%. Trace red shale.
- 3600-3635 Siltstone, medium light gray (N6), subrounded, well sorted, considerably minute black mineral grains, moderately well cemented, 50%; shale, medium light gray (N6), silty, 20%; shale, medium gray (N5), slightly silty, finely micaceous, 10%; shale, dark gray (N3), 20%.
- 3635-3665 Siltstone, as above, grading to very fine-grained sandstone, 70%; shale, medium gray, as above, 10%; shale, medium gray (N5), slightly calcareous, 10%; shale, dark gray (N3), as above, 10%.
- 3665-3700 Shale, medium dark gray (N4), trace fossiliferous.
- 3700-3740 Shale, medium gray (N5).
- 3740-3810 Shale, medium gray (N5), calcareous to non-calcareous, 70%; limestone, light gray (N7), finely to medium clastic to some coarsely crystalline, 20%; limestone, medium gray (N5), finely to medium clastic, 10%.
- 3810-~~3835~~ Shale, medium gray (N5), non-calcareous to 1/5 very calcareous, 90%; siltstone, light gray (N7), fine-grained, very well cemented, 10%; trace limestone.
- 3835-3870 Shale, medium gray (N5), slightly calcareous to calcareous, 85%; limestone, medium gray (N5), finely clastic, very shaly, 15%.
- 3870-3915 Shale, medium dark gray to medium gray (N4-N5), calcareous.
- 3915-3930 Shale, as above, 60%; limestone, medium dark gray (N4), some light gray (N7), medium clastic to finely clastic, slightly fossiliferous, shaly, 40%. Trace calcite.
- 3930-3940 Limestone, medium gray (N5), some very light gray (N8) and light brownish gray (5YR6/1), crinoidal, medium clastic with some finely clastic, 90%; shale, as above, 10%.
- 3940-3950 Ditto: limestone, with trace bryozoan, 95%; shale, 5%.
- 3950-3960 Ditto: limestone, with trace bryozoan, and little coarsely crystalline.
- 3960-3970 Ditto.

- 3970-3975 Ditto: limestone, fossil fragments, 95%; shale, medium gray (N5), calcareous, 5%.
- 3975-3994 Shale, medium gray (N5), calcareous, 95%; limestone, as above, 5%.
- 3994-4015 Shale, as above, very calcareous, 90%; limestone, medium gray, very finely clastic, shaly, 10%. (Sample dirty)
- 4015-4021 Ditto. (Sample dirty).
- 4021-4038 Limestone, medium gray (N5), very finely clastic, 90%; limestone, very light gray (N8), finely clastic, 10%.
- 4038-4047 *Coals Part*  Limestone, as above, medium clastic, slightly oolitic, 40%; limestone, very light gray, as above, medium clastic, moderately oolitic ( $\frac{1}{2}$ -1 mm.), 60%.
- 4047-4058 Limestone, very light gray (N8), as above, moderately oolitic ( $\frac{1}{2}$ -1 mm.), slightly crinoidal, 95%; limestone, medium gray, as above, 5%.
- 4058-4074 Limestone, medium dark gray (N4), very finely clastic, 90%; limestone, very light gray (N8), finely clastic, 10%.
- 4074-4093 Limestone, medium dark gray (N4), finely clastic, shaly, 50%; limestone, medium dark gray, as above, 45%; limestone, very light gray, as above, part oolitic, 5%.
- 4093-4102 Limestone, dark gray (N3), finely clastic, part mottled with light gray, 30%; limestone, medium dark gray, shaly, as above, 20%; limestone, brownish gray (5YR4/1), very finely clastic, 30%; limestone, very light gray, as above, 20%.
- 4102-4110 Limestone, medium dark gray to medium gray (N4-5), very finely clastic with trace  $1/3$  mm. oolites, 85%; limestone, very light gray, as above, 15%.
- 4110-4121 Limestone, as above, to part medium clastic, slightly oolitic and mottled with light gray, 90%; limestone, very light gray, as above, 10%.
- 4121-4132 Ditto, part very light gray limestone oolitic.
- 4132-4152 Limestone, medium dark gray, very finely clastic, 95%; limestone, as above, mottled with light gray, 5%.
- 4152-4160 Limestone, as above, 90%; limestone, very light gray (N8), to light gray (N7), most oolitic ( $2/3$  mm.), 10%.
- 4160-4174 Limestone, as above, 95%; limestone, light gray (N7), finely clastic, 5%.
- 4174-4177 Ditto: limestone, slightly shaly, trace oolitic, 95%; light gray, finely clastic to very finely clastic, 5%.

- 4177-4189 Limestone, light brownish gray (5YR6/1), medium clastic with trace finely to medium crystalline, oolitic (2/3 mm.), slightly mottled with very light gray limestone, trace crinoid.
- 4189-4202 Ditto, more very light gray limestone mottling.
- 4202-4219 Limestone, medium gray (N5), very finely clastic, some mottled with very light gray limestone, 50%; limestone, light brownish gray (5YR6/1), very finely clastic to some coarsely crystalline, 40%; limestone, very light gray (N8), finely clastic, 10%.
- 4219-4229 Ditto.
- 4229-4243 Ditto: limestone, medium gray, 60%; limestone, light brownish gray, 25%; limestone, very light gray, 15%.
- 4243-4250 Sample dirty, apparently as above.
- 4250-4265 Ditto: limestone, light brownish gray, 60%; limestone, medium gray, 20%; limestone, very light gray, 20%.
- 4265-4275 Ditto: limestone, light brownish gray, 70%; limestone, medium gray, 10%; limestone, very light gray, 20%.
- 4265-4291 Ditto. Trace grayish orange chert (10YR7/4).
- 4291-4299 Ditto: limestone, light brownish gray, 60%; limestone, medium gray, 20%; limestone, very light gray, 20%.
- 4298-4307 Limestone, medium dark gray (N4), finely clastic to medium clastic, part oolitic ( $\frac{1}{2}$  mm.), part mottled with light gray limestone, 60%; limestone, light brownish gray, as above, 25%; limestone, very light gray, as above, 15%.
- 4307-4325 Limestone, as above, medium clastic, oolitic (part oolites light brownish gray), 50%; limestone, medium dark gray as above, non-oolitic, 30%; limestone, light gray, as above, 20%.
- 4325-4240 Sample dirty, apparently as above with less oolites.
- 4340-4355 Ditto.
- 4355-4368 Limestone, medium light gray (N6), very finely clastic with trace medium clastic, 75%; limestone, medium dark gray (N4), finely clastic, trace oolites, 20%; limestone, very light gray (N8), medium to finely clastic, part oolitic, 5%. Trace fossil fragments.
- 4368-4384 Ditto.
- 4384-4396 Limestone, medium brownish gray (5YR5/1), very finely to finely clastic.
- 4396-4405 Sample missing.

- 4405-4420 Limestone, medium dark gray (N4), very finely clastic, some slightly mottled with light gray.
- 4420-4441 Limestone, medium brownish gray (5YR5/1), finely to some medium clastic, part oolitic, 70%; limestone, medium dark gray, as above, 20%; limestone, very light gray, as above 10%.
- 4441-4452 Limestone, medium brownish gray, as above, 60%; limestone, medium dark gray, as above, 20%; limestone, very light gray, as above, 20%.
- 4452-4463 Limestone, light gray (N7), very finely clastic, 60%; limestone, very light gray to white (N8-9), finely clastic, 25%; limestone, medium dark gray to medium light gray (N4-6), very finely clastic, slightly shaly, 15%.
- 4463-4476 Limestone, medium dark gray (N4), finely clastic, slightly shaly, 80%; limestone, light gray to very light gray (N7-8), finely clastic, trace oolitic, 20%.
- 4476-4484 Limestone, medium dark gray (N4), very finely clastic, 85%; limestone, light gray (N7), finely clastic, 15%.
- 4484-4499 (Sample little dirty) Shale, medium gray (N5), part slightly silty, 65%; shale, grayish red (5R4/2), slightly silty and micaceous and calcareous, 25%; limestone, as above, 10%.
- 4499-4509 (Sample dirty) Shale, medium gray (N5), silty, 70%; limestone, very light brownish gray (5YR7/1), very finely clastic, 20%; shale, grayish red, as above, 10%.
- 4509-4527 Shale, medium light gray (N6), silty, 85%; shale, medium gray, as above, 10%; shale, grayish red, as above, 5%.
- 4527-4543 Shale, medium gray (N5), 75%; shale, medium light gray, as above, 10%; shale, medium dark gray, silty, as above, 15%. Trace red shale and limestone.
- 4543-4565 Shale, medium gray (N5), slightly silty to non-silty, 40%; shale, light gray (N7), silty, 30%; limestone, very light gray (N8), finely clastic, 10%; limestone, medium light gray (N6), very finely clastic, fossiliferous, 20%.
- 4565-4575 Siltstone, light gray (N7), subrounded, very well sorted, slightly sandy, calcareous cement, friable, some slightly peppered with black mineral, 85%; shale, medium gray (N5), silty, slightly calcareous, 15%; trace limestone.
- 4575-4585 Ditto, better cemented. Trace red shale.
- 4585-4598 Sandstone, light gray (N7), very fine-grained, moderately well sorted, trace mica, very slightly calcareous cement, few dark mineral grains, 80%; shale, medium gray (N5), as above, 20%.
- 4598-4612 Ditto: sandstone, better cemented, 90%; shale, 10%.

- 4612-4623 Ditto: sandstone, as 4585-98, 90%; shale, 10%.
- 4623-4640 Shale, medium gray (N4.8), silty, trace mica, 95%; sandstone, 5%.
- 4640-4650 Sandstone, as 4612-23, 60%; shale, as above, 40%.
- 4650-4660 Siltstone, light gray (N7), fine-grained, well sorted, shaly, 75%; sandstone, as above, 25%.
- 4660-4662 Sample missing.
- 4662-4671 Siltstone, as above, 80%; shale, medium gray (N5), 20%.
- 4671-4686 Shale, dark gray (N3), finely micaceous, 70%; siltstone, as above, 30%. Trace red shale.
- 4686-4700 Shale, medium dark gray (N4), 50%; sandstone, light gray (N7), very fine-grained, subangular to subrounded, moderately poorly sorted, with numerous (2%) medium-grained angular and rounded quartz grains (conglomerate?), 50%. Trace red shale and pyrite.
- 4700-4712 Sandstone, as above, with rounded and angular pieces of quartz to coarse-grained size (5%), conglomeratic, 50%; siltstone, medium light gray (N6), fine-grained, subrounded, moderately well sorted, shaly, 30%; shale, medium dark gray, as above, 20%. Trace red shale.

Buchanan County  
 Pipe Line Construction and Drilling Co.  
 R. J. Carlson #1  
 Index No. 15  
 Elevation: 2122.62'

Remarks: Elevation and location on Buchanan County geological map, particularly along Lower Dismal Creek, indicate well spudded approximately: 70' above the Lower Banner coal; 255' above the Kennedy coal; 455' above the Raven coal; 620' above the Jawbone coal; and 680' above the Tiller coal. See pages 157, 158, 159, 160. The lower coal correlations were determined from the coal geology as observed from the Va. Poc. Mine #2, 2 miles E., and the Linn Camp Core 4 miles W. If a coal is observed in the cuttings near the approximate horizons noted above, the appropriate name is thus applied. Correlations by Marshall Miller, 1970-74, VDMR.

<u>Formation</u>	<u>Top</u>	<u>Bottom</u>	<u>Thickness</u>
<b>Pennsylvanian System</b>			
Post Lee Formation "in at surface"		1700	1700'
		Lower Banner coal 70-72	2'
		Kennedy coal 243-244	1'
		Raven coal horizon at 455'	
		Jawbone coal horizon at 620'	
		Tiller coal horizon at 680'	
		Seaboard coal 1065-1074'?	
		War Creek coal horizon at 1360'	
Lee Formation	1700	1760	60'
		quartzose sand 1700-1760	60'
		conglomeratic quartzose sand 1750-1760	10'
Pocahontas Formation	1760	2210	450'
		Pocahontas #3 coal 1900-1906	6'
<b>Mississippian System</b>			
Bluestone Formation	2210	2675	465'
Pride Shale	2395	2675	280'
Princeton Sand	2675	2798	123'

Little Stone Gap Mem.	2798	2840	42'
Maxon Sands	3118	3184	66'
	3270	3300	30'
	{3391	3435	44'
	{3505	3520	15'
Greenbrier Formation	3930	4484	554'
Maccrady	4484		