

OPERATOR: Columbia Gas Transmission Corporation
 FARM: Pittston Company
 WELL NO. 9835
 LOCATION: Dickenson County
 3500' S of 37° - 15'
 450' E of 82° - 15'
 ELEVATION: 1815.37' GR.
 TOTAL DEPTH: 4774'
 DRILLING COMMENCED: August 11, 1973
 WELL COMPLETED: November 27, 1973
 RESULT: Gas Well

DI-87

WELL LOG

DEPTH
(feet)

0-10	Sandstone - medium light gray (N6), fine to medium, moderate sorting, poorly in local areas, angular and subangular clear quartz grains; siliceous; hard to brittle; local feldspar; micas - and hydromuscovites - 1-10% or varying locally; crushed rock (siltstone/shale) fragments; coal.
10-20	As 0-10; coal.
20-30	As 0-10; 1-2 fragments light gray siltstone and light gray shale (N7), soft; coal.
30-40	As 20-30.
40-50	As 20-30.
50-60	As 20-30; coal.
60-70	As 20-30; siltstone fragments, while sparse, are sandy with local carbonaceous fossil prints; increasing feldspar.
70-80	As 60-70.
80-90	As 60-70.
90-100	As 60-70.
100-110	As 60-70.
110-120	As 60-70 (small sparse fragments).
120-130	As 60-70 (coal).
130-140	As 60-70.
140-150	As 60-70.

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150-160	As 60-70.
160-170	As 60-70.
170-180	As 60-70.
180-190	As 60-70; coal.
190-200	As 60-70.
200-210	Sandstone - light to very light gray (N7-N8); fine to coarse, mostly coarse; moderately well sorted, subangular; siliceous; brittle; 1% fine dark gray siltstone fragments, rare micas, but locally.
210-220	As 200-210.
220-230	As 200-210.
230-240	As 200-210.
240-250	As 200-210; local feldspar.
250-260	As 200-210.
260-270	As 200-210.
270-280	As 200-210.
280-290	As 200-210.
290-300	As 200-210.
300-310	As 200-210.
310-360	No samples.
370-380	Siltstone - medium gray (N5), firm; local very sparse mica; and sandstone as 200-210 - 10%±.
380-390	As 370-380; 20%± sandstone.
390-400	As 370-380; 20%.
400-410	As 370-380; 10%.
410-420	Sandstone - very light olive gray (5Y /1), very fine to medium, mostly very fine, moderately well sorted, subangular, clear quartz crystals; no visible cement, siliceous to feldspathic probably; 1-3% very fine siltstone fragments.
420-430	Sandstone/Siltstone - sandstone as 410-420; 30% siltstone fragments.

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430-440	Sandstone - as 420-430; 1% siltstone.
440-450	<u>As 420-430.</u>
450-460	As 420-430; 10% very fine siltstone.
460-470	<u>Siltstone - medium gray (N5); soft; sandy.</u>
470-480	Sandstone/Siltstone - 50% each; siltstone as 460-470 and sandstone as 410-420, except fine to coarse grained.
480-490	As 470-480; mica.
490-500	As 470-480.
500-510	As 470-480.
510-520	As 470-480.
520-530	As 470-480; siltstone grading to shale.
530-540	Sandstone/Siltstone-Shale - as 520-530.
540-550	As 520-530.
550-560	Sandstone/Shale - sandstone as 410-420; shale is medium dark gray (N4), soft, fissile (sandstone is very fine - medium).
560-570	As 550-560.
570-580	As 550-560.
580-590	As 550-560; local feldspar; mica.
590-600	Sandstone/Siltstone - as 470-480; some shale fragments.
600-610	As 470-480; local carbon films.
610-620	As 470-480.
620-630	Sandstone/Shale - as 550-560.
630-640	Siltstone - medium gray (N5); hard, massive.
640-650	Siltstone - as 630-640.
650-660	As 630-640.
660-670	As 630-640.
670-680	As 630-640.

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680-690 As 630-640.

690-700 As 630-640.

700-710 As 630-640; coal partings; local carbonaceous films and fossil prints.

710-720 As 700-710; coal; 1-3% sandstone fragments as 410-420; some shale; most (of sample) is very hard siltstone.

720-730 Siltstone-Shale - as 630-640; increasing amounts shale and sandstone.

730-740 As 720-730.

740-750 No sample.

750-760 Shale/Siltstone - as 720-730; coal; 5% sandstone is fine to coarse, poorly sorted; "dirty;" subangular clear quartz in siliceous cement - shale is 80%+, siltstone 15%+; some brownish gray (5YR 4/1) shale - very soft.

760-770 Siltstone/Shale - siltstone, medium dark gray (N4), hard, sandy, silty, carbonaceous and fossiliferous - in some areas, all factors; in other areas, each occurs both locally (single factor) and in combinations; some shale as 550-560; coal, sandy; mica locally.

770-780 Siltstone/Sandstone - as 760-770; 10% sandstone as 750-760; "dirty" and with coal streaks; shale with coal layers (fragment).

780-790 As 770-780.

790-800 Sandstone/Siltstone mixture, interbedded - 50% sandstone, light gray (N7), medium to coarse with 1% larger fragments, moderate to poor sorting, angular and subangular clear and milky grains; siliceous; hard; coal streaks with sandy coal; 50% siltstone/shale/coal - as 760-770.

800-810 As 790-800.

810-820 As 790-800.

820-830 As 790-800; slickensides on coal.

830-840 As 790-800; abundant coal fragments.

840-850 As 790-800.

850-860 As 790-800.

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860-870 Siltstone/Sandstone - as 790-800; 60% siltstone - coal mixture and 40% sandstone; coals and some of the siltstones are sandy.

880-890 Sandstone - very light gray (N8), as 790-800; fragments of brownish gray (5YR 4/1) "dirty"/"graywacke" type sandstone; poor porosity, no visible surface porosity; local feldspar; 1% rock fragments.

890-900 As 880-890.

900-910 As 880-890.

910-920 As 880-890; no pebbles seen.

920-930 As 880-890; 1% siltstone fragments, as 760-770.

930-940 As 880-890; fine to coarse grains.

940-950 As 880-890; 10% fine rock fragments.

950-960 Sandstone/Siltstone - as 880-890; 60% sandstone; 40% fine rock fragments, dark gray (N3) siltstone-shale.

960-970 Sandstone/Siltstone-Shale (crushed) - as 950-960; increasing shale.

970-980 Sandstone/Shale - as 950-960.

980-990 As 950-960.

990-1000 As 950-960.

1000-1010 As 950-960.

1010-1020 As 950-960; local coal and local mica.

1020-1030 Siltstone, Sandy - medium gray (N5), very coarse grained (or maybe coarse grained sandstone, silty) to fine grained, sandy siltstone - highly variable; disturbed bedding; hard; coal with fossil plant imprints of 3 types.

1030-1040 As 1020-1030; local mica.

1040-1050 As 1020-1030.

1050-1060 As 1020-1030.

1060-1070 As 1020-1030; no coal.

1070-1080 As 1060-1070 (-no coal).

1080-1090 As 1060-1070.

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1090-1100	As 1060-1070.
1100-1110	As 1060-1070.
1110-1120	As 1060-1070.
1120-1130	As 1060-1070.
1130-1140	As 1060-1070.
1140-1150	As 1060-1070; "odd" sandstone fragment.
1150-1160	Siltstone/Sandstone - as 1060-1070; coal; 30%± (medium light gray) "dirty" sandstone, fine to medium, poorly sorted, subangular to subrounded; siliceous; slight porosity; 10% rock fragments; local mica.
1160-1170	Siltstone/Sandstone - 50% each as 1150-1160; coal.
1170-1180	As 1160-1170.
1180-1190	As 1160-1170; fragments of clean, very coarse, porous sandstone with pebble fragments.
1190-1200	As 1180-1190.
1200-1220	Sandstone (ground) - sandstone as 1150-1160; 25%± finely ground siltstone as 1020-1030; local coal/coal streaks.
1220-1230	Sandstone/Siltstone - 50% sandstone and 50% siltstone finely ground, as 1150-1160 and 1150-1160; local mica; local coal; disturbed bedding.
1230-1240	As 1210-1220; finer siltstone; fragments coal; coarse sized grains.
1240-1250	Sandstone - light gray (N7.5), medium to coarse, moderately poor sorting, subangular clear grains; siliceous; hard; coal with fossil plant imprint and 10% siltstone, as 1 ₅₀ -1 ₆₀ .
1250-1260	As 1240-1250.
1260-1270	As 1240-1250; 20% siltstone-shale.
1270-1280	As 1240-1250; 10% siltstone; local mica.
1280-1290	As 1240-1250; 10% shale, dark gray (N3); moderately hard, fissile.
1290-1300	Sandstone - very light gray (N8), fine to medium, as 1240-1250; local feldspar; less than 1% fine rock fragments included and 1% shale as 1280-1290, interbedded; coal.

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1300-1310	As 1290-1300; some coarse grains coal.
1310-1320	As 1300-1310; no coal.
1320-1330	As 1300-1310.
1330-1340	As 1300-1310.
1340-1350	As 1300-1310.
1350-1360	As 1300-1310.
1360-1370	As 1300-1310.
1370-1380	As 1300-1310.
1380-1390	As 1300-1310; mostly medium grained, very closely packed grains, clean, "white."
1390-1400	Sandstone, crushed - very light gray (N8), very fine to coarse grained, moderate sorting, angular grains - actually appears freshly broken; some grains are broken in half, elongated fragments, 4mm long; clear quartz grains; siliceous; hard; brittle; local restricted feldspar; 1% very fine shale fragments, as 1280-1290.
1400-1410	As 1390-1400.
1410-1420	As 1390-1400; pebble fragment.
1430-1440	As 1390-1400.
1440-1450	As 1390-1400; iron stained; fragments and crushed sandstone; pebbles and fragments of.
1450-1460	As 1390-1400.
1460-1470	As 1390-1400.
1470-1480	As 1390-1400.
1480-1490	As 1390-1400; coal; 1-3% siltstone and shale fragments, as 1280-1290; some milly.
1490-1500	As 1480-1490; 5% rock fragments.
1500-1510	As 1480-1490; coal.
1510-1520	As 1480-1490.
1520-1530	As 1480-1490.

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1530-1540 As 1480-1490.

1540-1550 As 1480-1490.

1550-1560 As 1480-1490; locally carbonaceous; 20% siltstone-shale; some brownish gray shale.

1560-1570 Sandstone/Shale - 50% sandstone, light gray (N7), "graywacke"/ "dirty"; fine to medium, moderately poor sorting, angular and subangular clear quartz grains; siliceous; local feldspar; micas; 10-20% rock fragments.

1570-1580 As 1560-1570.

1580-1590 As 1560-1570.

1590-1600 As 1560-1570.

1600-1610 Sandstone (crushed) - very pale yellowish brown (10YR 7/2), fine to medium, moderate sorting, subangular, clear and iron stained quartz grains; siliceous; brittle; iron oxide stained, giving sample its color; coal fragment; 5% siltstone-shale fragments; feldspar; mica.

1610-1620 As 1600-1610; sulfur.

1620-1630 As 1600-1610; coal in honeycombed horizontal layers with sulfur.

1630-1640 As 1600-1610; coal.

1640-1650 Sandstone conglomerate/Siltstone - 50% sandstone as 1600-1610, except with pebble fragments and firmly cemented; and 50% siltstone, medium dark gray (N4), firm, locally micaceous.

1650-1660 As 1640-1650; sandstone fragments variable from all medium grained, clean, well cemented, to fine to coarse, clean, well cemented, to "graywacke" highly variable type; coal - as in 1620-1630; siltstone, as 1640-1650.

1660-1670 Sandstone - as 1600-1610.

1670-1680 As 1600-1610.

1680-1690 As 1600-1610; 10% sandstone fragments, clean white, firmly cemented.

1690-1700 As 1600-1610.

1700-1710 As 1680-1690.

1710-1720 As 1680-1690.

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1720-1730	As 1680-1690.
1730-1740	As 1680-1690.
1740-1750	As 1680-1690; 10% dark gray siltstone (N3), hard.
1750-1760	Sandstone - as 1600-1610.
1760-1770	As 1600-1610.
1770-1780	As 1600-1610; 3% siltstone, as 1740-1750.
1780-1790	As 1770-1780.
1790-1800	As 1770-1780.
1800-1810	As 1770-1780.
1810-1820	As 1770-1780.
1820-1830	As 1770-1780.
1830-1840	As 1770-1780.
1840-1850	Siltstone/Sandstone - 50% each, as 1770-1780, with large siltstone fragments and crushed sandstone.
1850-1860	As 1840-1850.
1860-1870	As 1840-1850.
1870-1880	Siltstone/Sandstone - 60% siltstone and 40% sandstone, as 1770-1780; coal.
1880-1890	Siltstone - as 1740-1750.
1890-1900	Siltstone/Sandstone - 60% siltstone/40% sandstone as 1770-1780.
1900-1910	As 1770-1780.
1910-1920	Siltstone grading into sandstone - as 1770-1780, but not 2 clear rock types, grading i.e., there are sandy siltstones, silty sandstones and highly variable (in grain size and "cleanness") sandstones; local coal; local mica.
1920-1930	Siltstone/Sandstone - as 1840-1850.
1930-1940	As 1840-1850.
1940-1950	As 1840-1850; coal.

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1950-1960 As 1940-1950; coal has fossil imprints.

1960-1970 As 1950-1960; no coal.

1970-1980 As 1950-1960.

1980-1990 As 1950-1960.

1990-2000 As 1950-1960.

2000-2010 Sandstone - light and very light gray (N7, N8), fine to medium, some pebble fragments, moderate to moderately well and some poorly sorted, subangular and clear quartz grains; siliceous; hard; some fragments with coarse grains; local mica; 1% siltstone fragments; and 1-3% "graywacke" type sandstone, as above, but poorly sorted, light medium gray; coarse grained; and some siltstone, sandy, medium light gray (N6) to light gray (N7), hard; siltstone, medium dark gray (N4), hard; 1-2 fragments; and shale, dark gray (N3), soft, micaceous.

2010-2020 As 2000-2010.

2020-2030 Sandstones - 50% each of: sandstone, as 2000-2010 and sandstone, grayish orange pink (5YR 7/2), fine to medium with some coarse, moderate sorting, angular and subangular clear quartz grains; no cement; silty; some areas of weathered feldspar.

2030-2040 As 2020-2030.

2040-2050 Sandstone - grayish orange pink, as 2020-2030; "freshly broken appearance", angular.

2050-2060 As 2040-2050.

2060-2070 As 2040-2050.

2070-2080 As 2040-2050.

2080-2090 Siltstone - medium dark gray (N4), firm; sandy; coal with fossil plants - impressions.

2090-2100 Siltstone/Sandstone - 80% siltstone, as 2080-2090, and 20% sandstone, medium light gray (N6), medium grained, well sorted, subangular, clear, quartz grains; siliceous; moderately firm; local coal.

2100-2150 No samples.

2150-2160 As 2090-2100; still with coal; fragments underclay with slickensides; sandstone becoming varied, mixed grain sizes; graywacke types; coarse grained fragments.

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2160-2170 As 2150-2160.

2170-2180 Siltstone/Limestone - 85%+ siltstone as 2080-2090, sandy; 15% limestone, brownish gray (5YR 4/1), medium grained, fossiliferous.

2180-2190 Siltstone/Limestone? - as 2170-2180; limestone is powder coating the siltstone; siltstone is sandy (fine to medium); silty in other areas and variable; disturbed bedding; local fossiliferous coal.

2190-2200 As 2180-2190.

2200-2210 As 2180-2190; no limestone.

2210-2220 As 2180-2190.

2220-2230 As 2180-2190.

2230-2240 As 2180-2190; very light gray sandy siltstone; greenish gray siltstone; siltstones are approaching a fine grained silty sandstone; claystone fragments with carbon fragments included.

2240-2250 Siltstone/Claystone - as of 2170-2180; claystone, medium dark gray (N4), soft, silty, fine grained, local carbon inclusions; appearance of a limestone - no "fizz" (X-ray shows high kaolin, illite).

2250-2260 Siltstone - as 2170-2180; and dark greenish gray (5GY 4/1); sandy; hard local calcite; local mica.

2260-2270 As 2250-2260.

2270-2280 Siltstone - as 2240-2250; medium dark gray.

2280-2290 As 2240-2250.

2290-2300 Limestone, 60%/Siltstone, 40% - light olive gray (5GY 6/1); crushed; siltstone as 2240-2250.

2300-2310 Siltstone/Limestone - as 2290-2300.

2310-2320 As 2290-2300.

2320-2330 As 2290-2300; siltstone becoming less sandy, more "fine grained" in appearance; light gray and brownish gray fragments also.

2330-2340 Siltstone/Limestone - as 2320-2330; decreasing limestone.

2340-2350 As 2320-2330; grayish red fragment.

2350-2360 As 2320-2330; mostly medium dark gray; 1-3% light brownish gray.

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2360-2370	As
2370-2380	Siltstone - as 2240-2250; medium dark gray and light gray (N7) siltstones; no limestone except occasional fragment; siltstone is "fine grained"; moderately firm.
2380-2390	As 2370-2380.
2390-2400	As 2370-2380.
2400-2410	As 2370-2380.
2410-2420	Siltstone, calcareous - as 2370-2380; slightly calcareous.
2420-2430	As 2410-2420.
2430-2440	As 2410-2420; some grayish purple red.
2440-2450	As 2430-2440.
2450-2460	As 2430-2440.
2460-2470	As 2430-2440.
2470-2480	As 2430-2440.
2480-2490	As 2430-2440; siltstone; sandy; local carbonaceous.
2490-2500	Siltstone - dark gray (N3), hard, sandy; varying to light gray on some fragments; some grayish black "fine grained" fragments (-1%).
2500-2510	As 2490-2500.
2510-2520	As 2490-2500.
2520-2530	As 2490-2500.
2530-2540	As 2490-2500.
2540-2550	Siltstone/Shale - as 2490-2500; becoming less sandy.
2550-2560	Siltstone/Shale - as 2490-2500, but not sandy.
2560-2570	Shale - grayish black (N2), soft.
2570-2580	As 2560-2570; local fine mica.
2580-2590	As 2560-2570.
2590-2600	As 2560-2570.

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2600-2610 As 2560-2570.

2610-2620 As 2560-2570.

2620-2630 As 2560-2570.

2630-2640 Siltstone/Shale - as 2490-2500; grayish red shale fragments.

2640-2650 As

2650-2660 Sandstone, crushed, calcareous?/Siltstone-Shale - (Note - physical appearance is that of 50% quartz grains/50% clay-like powder, which is slightly calcareous in nature); light olive gray (5Y 6/1), fine to medium, moderately well sorted, subrounded clear quartz grains; no cement; 10% very fine rock fragments; and crushed shale? (same color); calcareous.

2660-2670 As 2650-2660.

2670-2680 As 2650-2660.

2680-2690 As 2650-2660.

2690-2700 As 2650-2660.

2700-2710 As 2650-2660.

2710-2720 As 2650-2660; fragments are grayish red and grayish black shales; fragment (1) of light gray limestone, fine grained.

2720-2730 Shale-Siltstone - grayish red (5R 4/2), soft; massive to fissile.

2730-2740 As 2720-2730.

2740-2750 As 2720-2730.

2750-2760 As 2720-2730.

2760-2770 Shale, (crushed), calcareous - medium dark gray (N4); soft; fissile; strong odor upon application of HCl.

2770-2780 As 2760-2770.

2780-2790 As 2760-2770.

2790-2800 As 2760-2770; fragments of light gray and grayish red shale.

2800-2810 As 2790-2800

2810-2820 As 2790-2800.

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2820-2830 As 2790-2800.

2830-2840 Sandstone, 50%/Limestone, crushed?, 50% - as 2650-2660; shale fragments.

2840-2850 Sandstone/Calcareous powder? - as 2650-2660; shale fragments.

2850-2860 As 2840-2850 or above.

2860-2870 Sandstone/Limestone - As 2650-2660; grayish red shale fragments, 1%; and fragment medium gray (N5) limestone - fine grained.

2870-2880 As 2860-2870.

2880-2890 As 2860-2870.

2890-2900 As 2860-2870; fragments of greenish gray (5GY 6/1) sandstone, grading into a coarse-looking sandy siltstone with fine to coarse grains of quartz; both sandstone and siltstone have 35% green/black rock fragments and local mica.

2900-2910 As 2890-2900.

2910-2920 As 2890-2900.

2920-2930 As 2890-2900; grains subangular and subrounded.

2930-2940 As 2890-2900.

2940-2950 As 2890-2900; 1-3% grayish red shale; pyrite.

2950-2960 As 2890-2900.

2960-2970 Crushed Sandstone/Shale, finely mixed; percentages estimated - 50% each? - sandstone, fine grained; moderate sorting, subangular and subrounded; no cement - 1 fragment showing "loose" siliceous cement; and shale - olive gray (5Y 4/1); minute fragment/powder residue - pyrite; 1% calcite grains; local carbon.

2970-2980 As 2960-2970.

2980-2990 As 2960-2970.

2990-3000 As 2960-2970.

3000-3010 As 2960-2970.

3010-3020 As 2960-2970.

3020-3030 As 2960-2970.

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3030-3040 Limestone, silty - medium gray (N5), fine grained; quartz grains (fine) incorporated.

3040-3050 Limestone, silty/Siltstone, calcareous - as 3030-3040; siltstone is same color; local carbon included in both limestone and siltstone.

3050-3060 No sample.

3060-3070 Siltstone, calcareous, 80%?/Limestone - as 3040-3050; majority of sample is siltstone.

3070-3080 As 3040-3050.

3080-3090 Sandstone - pale yellowish brown (10YR 6/2), fine to medium, well sorted, subrounded with some (-1%) subangular clear quartz grains; no cement; 10% medium gray siltstone, worm fragments; local carbon on siltstone; iron oxide stains.

3090-3100 As 3080-3090; local mica.

3100-3110 As 3080-3090; pyrite.

3110-3120 As 3080-3090; pyrite.

3120-3130 As 3080-3090.

3130-3140 AS 3080-3090.

3140-3150 As 3080-3090; shale - grayish black fragments; some fragments sandstone, weakly siliceous; sparse grayish red shale fragments.

3150-3160 As 3140-3150.

3160-3170 As 3140-3150.

3170-3180 As 3140-3150.

3180-3190 As 3140-3150.

3190-3200 As 3140-3150.

3200-3210 As 3140-3150.

3210-3220 As 3140-3150.

3220-3230 As 3140-3150.

3230-3240 As 3140-3150.

3240-3250 As 3140-3150.

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3250-3260 As 3140-3150.

3250-3270 Limestone - medium light gray (N6); micritic; some (-1%) crystalline spar fragments.

3270-3280 As 3250-3270.

3280-3290 As 3250-3270.

3290-3300 As 3250-3270; sparse sandstone fragments.

3300-3310 Siltstone/Sandstone - 70% sandstone, light gray (N7), as 3080-3090; and 30+% siltstone, medium dark gray (N4) to dark gray shale (N3), moderately firm variable siltstone grading to shale.

3310-3320 Shale - grayish black (N2), soft; fissile.

3320-3330 As 3310-3320.

3330-3340 As 3310-3320.

3340-3350 As 3310-3320; disturbed bedding; local carboniferous - plant fossils; pyrite; light gray siltstone fragments.

3350-3360 As 3310-3320.

3360-3370 As 3310-3320.

3370-3380 As 3310-3320, sparse light gray limestone.

3380-3390 Limestone - light olive gray (5Y 6/1); micritic; grayish red shale fragments; some grayish black shale fragments.

3390-3400 Shale - as 3310-3320.

3400-3410 As 3310-3320.

3410-3420 As 3310-3320.

3420-3430 As 3310-3320; sparsely fossiliferous; siltstone - sparse fragments; pyrite; calcite; crystal fragments.

3430-3440 Siltstone and Siltstone, calcareous/Limestone - siltstone, as 3300-3310; and limestone, medium dark gray (N4); fossil fragments in silty (argillaceous) and sandy limestone; limestone and siltstone appear to be grading.

3440-3450 As 3430-3440; siltstone, sandy to limestone, silty and sandy with sandstone fragments, clear and graywacke type (medium grained) with local carbon; light gray coarse siltstone also (1-2 fragments).

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- 3450-3460 As 3430-3440; highly variable.
- 3460-3470 As 3450-3460.
- 3470-3480 Siltstone/Limestone - as 3300-3310 and limestone, light olive gray (5Y 6/1), fine grained and "white" crystalline (angular) fragments in coarse grained, silty olive gray (5Y 4/1) matrix; 3% variable sandstone as 3440-3450.
- 3480-3490 90% Siltstone/10%± Limestone - light olive brown (5Y 5/6), clear, (crystalline ?); grayish black and white; fine grained and fossiliferous.
- 3490-3500 As 3480-3490; very light gray limestone fragment.
- 3500-3510 Limestones - medium gray (N5); partially oolitic brownish gray (5YR 4/1) in micrograined matrix; very light gray; silty; micrograined and partially dolomitic; and olive gray (5Y 4/1) limestone fragments/oolites in coarse siltstone matrix with 3% fine quartz grains in matrix also; medium gray to light gray fine grained limestone; grayish red shale fragments; medium dark gray fragments siltstone; percentages difficult to estimate due to variety and duplication of colors in siltstones and limestones; chert fragments, white, angular.
- 3510-3520 As 3500-3510.
- 3520-3530 As 3500-3510; increasing siltstone.
- 3530-3540 Siltstones, calcareous and argillaceous - 60%± medium dark gray (N5) with medium light gray (N6) and dark gray (N3) siltstone, fine to silty to coarse textured siltstones; some with fine quartz grains; all argillaceous; 1% with crystalline (white) veins or fragments; 1% oolitic limestone, some fragmented limestone as 3500-3510.
- 3540-3550 As 3530-3540.
- 3550-3560 Siltstone - medium gray, disturbed, local carbon, argillaceous, sandy and calcareous; all and in combinations; 10% mixture as above.
- 3560-3570 As 3550-3560.
- 3570-3580 Siltstone, calcareous - medium gray (N5), varies locally as 3550-3560; sparse local fossil fragments; crystal fragments.
- 3580-3590 As 3570-3580.
- 3590-3600 As 3570-3580; increasing limestone.
- 3600-3610 As 3570-3580; increasing limestone.

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3610-3620 Limestones - light olive gray and light brownish gray (5Y 6/1 and 5YR 6/1), rounded, fine grained; sparsely oolitic; sparse crystals; sparse siltstone.

3620-3630 As 3610-3620.

3630-3640 As 3610-3620.

3640-3650 As 3610-3620.

3650-3660 As 3610-3620.

3660-3670 As 3610-3620; grayish black siltstone.

3670-3680 Siltstone, calcareous - grayish black (N2), firm, calcareous, locally sandy; and fragments of limestone as above.

3680-3690 Siltstone/Limestone - as 3670-3680; grading to limestone.

3690-3700~ Limestone, argillaceous - grayish black (N2), silty; micrograined with siltstones present also; sparse crystalline fragments.

3700-3710 As 3690-3700.

3710-3720 As 3690-3700.

3720-3730 Limestone - light olive gray (5Y 6/1) and very light gray (N8); fine grained; sparsely oolitic.

3730-3740 As 3720-3730.

3740-3750 As 3720-3730.

3750-3760 As 3720-3730.

3760-3770 As 3720-3730.

3770-3780 As 3720-3730.

3780-3790 As 3720-3730.

3790-3800 As 3720-3730.

3800-3810 As 3720-3730; 1-3% medium dark gray.

3810-3820 As 3800-3810.

3820-3830 As 3800-3810.

3830-3840 As 3800-3810.

3840-3850 As 3800-3810.

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3850-3860	As 3800-3810.
3860-3870	As 3720-3730.
3870-3880	As 3720-3730.
3880-3890	As 3720-3730.
3890-3900	As 3720-3730.
3900-3910	As 3720-3730.
3910-3920	As 3720-3730.
3920-3930	As 3720-3730.
3930-3940	As 3720-3730.
3940-3950	As 3720-3730.
3950-3960	As 3720-3730.
3960-3970	As 3720-3730; dark brown limestone fragments; grayish black shale fragment.
3970-3980	As 3960-3970.
3980-3990	As 3960-3970.
3990-4000	Limestone - medium dark gray (N4), fine grained limestone with some (5%) light olive gray and 1% very light gray.
4000-4010	As 3990-4000.
4010-4020	Shale - grayish red (5R 4/2); soft, calcareous.
4020-4030	As 4010-4020.
4030-4040	As 4010-4020; grayish black shale fragments, 1-3%.
4040-4050	Siltstone - medium light gray (N5), grading to a fine grained, well sorted sandstone; siltstone is soft; calcareous; sandstone is silty, porous and slightly cemented - siliceous?
4050-4060	As 4040-4050; 1-5% fragments of limestone, same color.
4060-4070	Sandstone - medium gray (N5), fine grained, well sorted, angular and subangular; poorly siliceous; slightly calcareous; "graywacke" in appearance due to inclusion of silt and fine sized black rock fragments; local pyrite; calcareous silty fragments, possibly from above levels.

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4070-4080 As 4060-4070.

4080-4090 As 4060-4070.

4090-4100 Sandstone-Siltstone - as 4060-4070; grading back to siltstone.

4100-4110 Siltstone, calcareous - as 4040-4050; siltstone is locally sandy.

4110-4120 As 4100-4110.

4120-4130 As 4100-4110.

4130-4140 As 4100-4110.

4140-4150 As 4100-4110.

4150-4160 As 4100-4110.

4160-4170 As 4100-4110; fragments grayish red and grayish black shales.

4170-4180 As 4160-4170.

4180-4190 Shale - grayish black (N2), soft, fissile; and siltstone as 4100-4110.

4190-4200 Siltstone - medium gray (N5), sandy, firm.

4200-4210 As 4190-4200.

4210-4220 As 4190-4200.

4220-4230 Siltstone/Shale - as 4190-4200.

4230-4240 Shale - medium gray (N5), soft, fissile.

4240-4250 As 4230-4240.

4250-4260 As 4230-4240.

4260-4270 Shale - as 4230-4240; medium dark gray.

4270-4280 As 4230-4240.

4280-4290 As 4230-4240.

4290-4300 As 4230-4240.

4300-4310 Shale - as 4230-4240; dark gray (N3); not calcareous.

4310-4320 As 4230-4240.

4320-4330 As 4230-4240.

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4330-4340	As 4230-4240.
4340-4350	As 4230-4240.
4350-4360	As 4230-4240.
4360-4370	As 4230-4240.
4370-4380	As 4230-4240.
4380-4390	As 4230-4240.
4390-4400	As 4230-4240.
4400-4410	As 4230-4240.
4410-4420	As 4230-4240.
4420-4430	As 4230-4240.
4430-4440	As 4230-4240.
4440-4450	As 4230-4240; grayish black; weathered, very soft.
4450-4460	As 4230-4240.
4460-4470	As 4230-4240.
4470-4480	As 4230-4240.
4480-4490	As 4230-4240.
4490-4500	As 4230-4240.
4500-4510	As 4230-4240.
4510-4520	As 4230-4240.
4520-4530	As 4230-4240.
4530-4540	As 4230-4240.
4540-4550	As 4230-4240; crushed shale is black.
4550-4560	As 4230-4240.
4560-4570	As 4230-4240.
4570-4580	As 4230-4240.
4580-4590	As 4230-4240.

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4590-4600

Sandstone - moderate olive gray (5Y 5/1), fine to very fine grained, moderately well sorted, subangular and subrounded clear quartz grains; no cement, sparsely calcareous, 30% fine shale fragments.

J. K. Polzin