

BU-132  
Prater

OPERATOR: Columbia Gas Transmission Corp.  
FARM: Pittston Company  
WELL NO. 9781-T  
LOCATION: Buchanan County  
1200' S. of 37° - 15'  
5700' W. of 22° 0 10'  
ELEVATION: 1567.97' GR.  
DRILLING COMMENCED: September 26, 1973  
WELL COMPLETED: October 17, 1973  
RESULT: Dry Hole

WELL LOG

DEPTH  
(feet)

0 - 10	Siltstone - medium gray (N5); hard; and 5% sandstone - light gray - fine to medium grained, moderate sorting, subangular clear grains of quartz; feldspathic; 1-3% rock fragments; <u>coal</u> ; local mica.
10 - 20	As 0 - 10'.
20 - 30	As above; coal - concoidal fracture, high luster.
30 - 40	As above; coal.
40 - 50	As above.
50 - 60	As above.
60 - 70	As above; coal with blocky fracture.
70 - 80	As above; no coal.
80 - 90	As 70 - 80'; large fragment sandstone; iron oxide stained.
90 - 100	As above.
100 - 110	As above.
110 - 120	As above.
120 - 130	As above; coal - blocky fractures, dull luster.
130 - 140	Siltstone/Shale - medium dark gray (N4) - hard; some fissility; fine texture, massive locally with some bedding planes.
140 - 150	As above.
150 - 160	As above.

DEPTH  
(feet)

160 - 170	As 130 - 140'.
170 - 180	As 130 - 140'.
180 - 190	As 130 - 140'.
190 - 200	As 130 - 140'.
200 - 210	As 130 - 140'.
210 - 220	As 130 - 140'.
220 - 230	As 130 - 140'.
230 - 240	As 130 - 140'.
240 - 250	Siltstone - grayish black (N2) - hard, local mica.
250 - 260	As above.
260 - 270	As above.
270 - 280	As above; sandstone fragments - as 0 - 10 "dirty".
280 - 290	As above.
290 - 300	As above; brownish gray siltstone fragments.
300 - 310	As above.
310 - 320	As above.
320 - 330	As above.
330 - 340	As above.
340 - 350	As above.
350 - 360	As above; medium gray siltstone.
360 - 370	As 350 - 360'; 10-20% medium gray siltstone.
370 - 380	As above.
380 - 390	As above.
390 - 400	As above.
400 - 410	As above.
410 - 420	As above.
420 - 430	As above.

DEPTH  
(feet)

- 430 - 440 As 360 - 370'.
- 440 - 450 As 360 - 370'.
- 450 - 460 Sandstone; both calcareous, light brownish gray (5YR 6/1) - very fine to fine, poorly sorted, subangular clear and iron stained quartz grains; calcareous cement; "dirty" in appearance - grading from sandy siltstones to very dirty graywacke types to sandstone with less than 1% worn rock fragments; local carbon as fragments; calcareous.
- 460 - 470 As above; 10% dark gray siltstone.
- 470 - 480 As above; local mica.
- 480 - 490 Siltstone, sandy - medium dark gray (N4) - highly variable, soft, up to 50% fine grained quartz grains; calcareous in sandstone fragments from above.
- 490 - 500 Siltstone - medium dark gray (N4) hard, some as 480 - 490'.
- 500 - 510 Siltstone, sandy - as 480 - 490'.
- 510 - 520 Sandstones - light gray (N7) - fine and coarse to very coarse, moderately sorted, subangular clear, milky and smoky quartz grains; feldspathic; loosley cemented; porous; 10% rock fragments; local mica; coal.
- 520 - 530 Sandstone - medium light gray (N6) - fine to medium with some coarse grains moderately poor sorting, subangular clear and milky quartz grains; calcareous; loosley cemented; porous; micaceous - (masses) chlorite and (fresh) muscovite, fine-grained brown and black material in masses and in between quartz grains; siltstone fragments - loose and in sandstone; feldspathic areas; local coal.
- 530 - 540 Sandstone - medium light gray (N6) - very clean sandstone - fine to coarse moderate sorting, subangular, clear quartz grains; no cement; not calcareous; 10% fine siltstone fragments; mica; feldspathic fragments; coal.
- 540 - 550 As above; increasing siltstone.
- 550 - 560 As above; increasing siltstone.
- 560 - 570 Sandstone/Siltstone - as above; brown/green masses in siltstone fragments.
- 570 - 580 As 530 - 540'; fine to medium clean; coal with concoidal fracture, dull luster.
- 580 - 590 Sandstone/Siltstone - as 560 - 570'; coal local and in stringers.
- 590 - 600 As above.
- 600 - 610 As above.

DEPTH  
(feet)

- 610 - 620 Shale - grayish black (N2)- soft, fissile.
- 620 - 630 As above.
- 630 - 640 Sandstone - very light gray as 530 - 540; fine to medium, clean; no coal.
- 640 - 650 As 530 - 540'; mica; 1-3% siltstone.
- 650 - 660 As 640 - 650'.
- 660 - 670 As above.
- 670 - 680 As above.
- 680 - 690 As above.
- 690 - 700 As above; fine to coarse.
- 700 - 710 As 690 - 700'.
- 710 - 720 As 690 - 700; fine to very coarse.
- 720 - 730 As 690 - 700'.
- 730 - 740 As 690 - 700'.
- 740 - 750 As 690 - 700'.
- 750 - 760 Shale - as 610 - 620'; coal.
- 760 - 770 (coal all through out this interval sampling or bedding) Coal sulfur.
- 770 - 780 As 610 - 620'. coal - dull, blocky.
- 780 - 790 As above.
- 790 - 800 As above.
- 800 - 810 As above.
- 810 - 820 As above; coal.
- 820 - 830 As above.
- 830 - 840 As above; coal.
- 840 - 850 As above.
- 850 - 860 As above; 30% siltstone as 690 - 700'.
- 860 - 870 As 850 - 860'.

DEPTH  
(feet)

870 - 880	Sandstone, silty - very light gray (N8) - fine to coarse, moderate sorting, subangular clear quartz grains; no cement; silty; mica; sparse rock fragments.
880 - 890	As 870 - 880'.
890 - 900	As above.
900 - 910	As above.
910 - 920	As above.
920 - 930	As above.
930 - 940	No sample.
940 - 950	As above.
950 - 960	As above, sandstone; (to very coarse.)
960 - 970	As above.
970 - 980	As above.
980 - 990	As above.
990 - 1000	As above.
1000-- 1010	As above; feldspar locally; fine to <u>medium with some coarse.</u>
1010 - 1020	Sandstone, silty - as 820 - 880'; fine to medium.
1010 - 1030	As above.
1030 - 1040	As above.
1040 - 1050	As above.
1060 - 1070	As above.
1070 - 1080	Sandstone, silty - light olive gray (5Y 6/1) - very fine to fine with some medium, moderate sorting, subangular clear quartz grains; no cement; silty fragments of grayish black siltstone/shale present; mica.
1080 - 1090	As above.
1090 - 1100	As above; 1% muscovite.
1100 - 1110	As above; increasing fine rock fragments.
1110 - 1120	As above.
1120 - 1130	As above.

DEPTH  
(feet)

1130 - 1140 As 1080 - 1090'.

1140 - 1150 As above.

1150 - 1160 Sandstone/Siltstone, interbedded - lt. gray sandstone - as 1070-1080'; and siltstone as 490 - 500'; mica.

1160 - 1170 As above; disturbed bedding rippled.

1170 - 1180 As above.

1180 - 1190 As above.

1190 - 1200 Sandstone - very light gray (N8).-- as 630 - 640'; local feldspar and mica.

1200 - 1210 As above; 1-3% rock fragments.

1210 - 1220 As above; 10% fine siltstone fragments.

1220 - 1230 As above.

1230 - 1240 As above; loosely siliceous cement.

1240 - 1250 As above.

1250 - 1260 As above.

1260 - 1270 As above.

1270 - 1280 As above.

1280 - 1290 As above.

1290 - 1300 As above.

1300 - 1310 Shale - as 610 - 620'.

1310 - 1320 As above.

1320 - 1330 As above.

1330 - 1340 As above.

1340 - 1350 As above.

1350 - 1360 As above; sparse sand fragments.

1360 - 1370 As above; sandstone fragments.

1370 - 1380 As above; 15%  $\pm$  sandstone as 1190 - 1200'.

1380 - 1390 As above.

1390 - 1400 Sandstone-30%/Shale 70%; As above; interbedded.

1400 - 1410 Shale - as 610 - 620'.

DEPTH  
(feet)

1410 - 1420	As above.
1420 - 1430	As above.
1430 - 1440	As above.
1440 - 1450	As above.
1450 - 1460	As above.
1460 - 1470	As above.
1470 - 1480	As above.
1480 - 1490	As above.
1490 - 1500	No samples.
1500 - 1510	Sandstone, silty - as 1070 - 1080'; sparse siltstone fragments.
1510 - 1520	As above.
1520 - 1530	As above.
1530 - 1540	As above.
1504 - 1550	As above.
1550 - 1560	As above.
1560 - 1570	As above; mica - 1-3%.
1570 - 1580	As above; mica 1%.
1580 - 1590	As above; very sparse mica.
1590 - 1600	Sandstone, silty - very light olive gray (5Y 7/1) As 1070 - 1080'; very fine grained moderately well sorted.
1600 - 1610	As 1600 - 1610'.
1610 - 1620	As above.
1620 - 6130	As above.
1630 - 1640	As above; siltstone decreasing.
1640 - 1650	Sandstone - as above.
1650 - 1660	Sandstone - as above; very fine to coarse grain, 10% medium gray siltstone feldspathic fragments.
1660 - 1670	<u>As 1650 - 1660'; 1% siltstone.</u>
1670 - 1680	As above.

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DEPTH.  
(feet)

1680 - 1690	Sandstone, silty - very pale yellowish brown (10YR 6/2) - very fine to sparse coarse, moderate sorting subangular with some subrounded clear quartz; silty; probable feldspar cement; sparse mica; very sparse siltstone fragments.
1690 - 1700	As above.
1700 - 1710	As above.
1710 - 1720	As above.
1720 - 1730	Coal/Sandstone, silty - sandstone - as 1680 - 1690'; and coal- high luster, blocky fracture.
1730 - 1740	Sandstone, silty - as (1680 - 1690'); 20% grayish black shale - fissile, soft.
1740 - 1750	As above.
1750 - 1760	As above; very fine to fine, no visible shale fragments.
1760 - 1770	As above; 5% shale fragments.
1770 - 1780	As above; 10% shale fragments.
1780 - 1790	As above.
1790 - 1800	As above.
1800 - 1810	Sandstone/Shale - 50% each - as 1680 - 1690'; and 1730 - 1740'.
1810 - 1820	As 1800 - 1810'.
1820 - 1830	As above.
1840 - 1850	Siltstone/Sandstone - 70-80% siltstone-grayish black - firm, calcareous, sandy - very fine to fine grained quartz grains; coal fragments; pyrite; siltstone grades into sandstone. Sandstone 20% <sup>±</sup> as 1750 - 1760'.
1850 - 1860	As above.
1860 - 1870	Siltstone - Shale/Sandstone - as 1850 - 1860'; siltstone grades into sandstone and shale - as 1730 - 1740'; local carbon - crushed.
1870 - 1880	Siltstone/Shale - medium dark gray - (N4) - hard, grades into similar shale fissile; and 30% light brownish gray siltstone/Shale.
1880 - 1890	As above.
1890 - 1900	As above.
1900 - 1910	As above.



DEPTH  
(feet)

1910 - 1920	As above; greenish gray siltstone.
1910 - 1920	As above; greenish gray siltstone increasing.
1920 - 1930	Siltstones/Sandstone/Shale - siltstones 30%; medium gray (N5); greenish gray (5GY 6/1) - moderately firm to soft, some grading to sandstone; locally highly micaceous, and 50% sandstone - light gray (N7) - fine to medium subangular, clear quartz, moderate sorting; brittle; 2% very fine rock fragments; feldspar locally; local large fragments green mica; and 20% shale - grayish red (10 R 4/2) - soft, grading to siltstone.
1930 - 1940	As 1920 - 1930'.
1940 - 1950	As above; increasing sandstone; decreasing shale
1950 - 1960	As above.
1960 - 1970	As 1920 - 1930'; 75% sandstone; <u>20% siltstone</u> 5%; grayish red shale.
1970 - 1980	Shale - grayish red (10 R 4/2) - brittle to soft; some <u>fissility</u> .
1980 - 1990	As 1970 - 1980'.
1990 - 2000	As 1970 - 1980'.
2000 - 2010	As 1970 - 1980'; medium gray fragments.
2010 - 2020	As 1970 - 1980'.
2020 - 2030	As 1970 - 1980'.
2030 - 2040	As 1970 - 1980'.
2040 - 2050	As 1970 - 1980'; medium gray fragments; (10%).
2050 - 2060	As 2040 - 2050'.
2060 - 2070	As 1970 - 1980'.
2070 - 2080	Shale - grayish black (N2) - firm, thin, fissile to massive and hard.
2080 - 2090	As 2070 - 2080'.
2090 - 2100	As 2070 - 2080'.
2100 - 2110	As 2070 - 2080'.
2110 - 2120	As above.
2120 - 2130	As above.
2130 - 2140	As above.
2140 - 2150	As above.
2150 - 2160	As above.

DEPTH  
(feet)

2160 - 2170	As 2070 - 2080'.
2170 - 2180	As above.
2180 - 2190	As above.
2190 - 2200	Medium gray - As above; increasing amounts - crushed sandstone.
2200 - 2210	Shale/Sandstone - interbedded - 50% sandstone - light gray (N7) - as 1920 - 1930'; with rare subrounded quartz grains and 50% shale as 2070 - 2080'.
2210 - 2220	As above.
2220 - 2230	As above.
2230 - 2240	As above.
2240 - 2250	As above.
2260 - 2270	As above.
2270 - 2280	Sandstone - light olive gray (5Y 6/1) - fine to medium, moderately well sorted, subrounded with some subangular, clear quartz grains; silty; 8% shale fragments; <u>no visible cement.</u>
2280 - 2290	As above.
2290 - 2300	As above; subangular with subrounded, occasional coarse grains and very rare angular coarse-sized milky fragments.
2300 - 2310	Sandstone, silty - as 2290 - 2300; silt probably from crushed shale.
2310 - 2320	Sandstone, silty/Shale - as 2200-2210; 70% sandstone, silty and 30% large shale fragments.
2320 - 2330	Sandstone, silty/Shale - as 2290 - 2300; 50% each no angular fragments.
2330 - 2340	Sandstone, silty - as 2300 - 2310; 10% shale.
2340 - 2350	As 2300 - 2310'.
2350 - 2360	As above.
2360 - 2070	As 2300 - 2310'.
2370 - 2380	Sandstone - light olive gray (5Y 6/1) very fine to fine, well sorted, subangular; clear quartz grains; no visible cement; local feldspar; micaceous; and 20 % siltstone - medium light gray - sandy, hard; and <u>occasional shale fragments.</u>
2380 - 2390	As above.
2390 - 2400	As above.

DEPTH  
(feet)

2400 - 2410	As above.
2410 - 2420	As above.
2420 - 2430	As above.
2430 - 2440	As above.
2440 - 2450	As above.
2450 - 2460	As above.
2460 - 2470	As above.
2470 - 2480	As above.
2480 - 2490	As above.
2490 - 2500	As above; fragments of grayish red and grayish black shale, and shale calcareous.
2500 - 2510	Siltstone, calcareous, sandy - medium dark gray and light gray - fine to coarse grained sandy siltstones, calcareous grading to sandstone, silty. Medium dark gray has fine to medium grained quartz, local fine carbonaceous plant fragments and granular pyritic areas and veins. Light gray not carboniferous, pyritic; calcareous.
2510 - 2520	As above.
2520 - 2530	As above.
2530 - 2540	Shale - 60% grayish red - as 1970 - 1980; calcareous and 40% mixed siltstone's as 2500 - 2510'.
2540 - 2550	As above.
2550 - 2560	As above.
2560 - 2570	As above; 80% shale.
2570 - 2580	Sandstone, crushed - light gray (N7) - fine to medium, moderate sorting, Subangular; siliceous; hard; micaceous locally; fine worn shale and siltstone fragments. (in sandstone) and 5% shale/siltstone dark gray fragments - as 2570 - 2580'.
2580 - 2590	As above.
2590 - 2600	Sandstone/Siltstone - 50% each - as 2570 - 2580'.
2600 - 2610	Siltstone/Sandstone - 70% siltstone; 30% sandstone as 2570 - 2580'.
2610 - 2620	80% siltstone; 20% sandstone - as 2570 - 2580'.
2620 - 2630	As 2610 - 2620'.

DEPTH  
(feet)

2620 - 2630	As 2610 - 2720'.
2630 - 2640	As above.
2640 - 2650	As above.
2650 - 2660	As above.
2660 - 2670	Sandstone - light gray (5Y 6/1) fine to sub-coarse; moderate sorting; subangular to subrounded clear quartz grains; no cement - probably siliceous; local feldspar; local rare mica and (15%) siltstone - as 2570 - 2580'.
2670 - 2680	As above; subrounded.
2680 - 2690	As above.
2690 - 2700	As above; some rounded also; iron staining.
2700 - 2710	Sandstone - very pale yellowish brown (10YR 6/2) - fine to coarse, coarse about 15%, moderate sorting, subrounded clear quartz grains; no cement; silty; 3-5 % very fine rock fragments = probably siltstone.
2710 - 2720	Sandstone, silty - light yellowish brown (10YR 5/4); sandstone as 2700 - 2710; siltstone is dark yellow orange (10YR 6/6); and 1% each-fragments of shale - grayish red and medium dark gray.
2720 - 2730	As 2710 - 2720'.
2730 - 2740	Siltstone - medium gray (N5) - firm rounded fragments; coal; pyrite; light greenish gray clay fragments.
2740 - 2750	As 2730 - 2740 siltstone; 10% light gray.
2750 - 2760	As above.
2760 - 2770	As above.
2770 - 2780	As above.
2780 - 2790	As above; sandstone, crushed - 10% as 2710 - 2720' 1 some "dirty".
2790 - 2800	As above; calcareous.
2800 - 2810	Siltstone - greenish gray (5GY 6/1) and light gray (N7) - firm, rounded; calcareous, occasional coal and (20% $\frac{1}{2}$ ) sandstone - sub-graywacke type "dirty" - 30% rock fragments, pyrite.
2810 - 2820	As above.
2820 - 2830	As above.

DEPTH  
(feet)

2830 - 2840	Sandstone/Siltstone - 60%/40% siltstone interbedded - light olive gray - fine to coarse, moderate sorting, subrounded; clear quartz; no cement; - and siltstone - medium dark gray and medium gray (N4 & 5) massive, calcareous; coal.
2840 - 2850	As above.
2850 - 2860	As above. 50% each.
2860 - 2870	As above; 20% greenish gray siltstone.
2870 - 2880	As above; siliceous cement; iron staining.
2880 - 2890	As above; no greenish gray siltstone - all gray; feldspathic fragment with alternating bands of sulfur and coal.
2890 - 2900	Siltstone - medium dark gray (N4) - firm rounded fragments; coal; iron staining.
2900 - 2910	As above.
2910 - 2920	As above.
2920 - 2930	As above.
2930 - 2940	As above.
2940 - 2950	As above.
2950 - 2960	As above.
2960 - 2970	As above.
2970 - 2980	As above.
2980 - 2990	As above.
2990 - 3000	As above.
3000 - 3010	Siltstone, calcareous/Shale, calcareous - 20% grayish green (5GY 6/1) siltstone; 50% dark gray (N3) and 2-% medium dark gray siltstones; and 10% grayish black shale - worn; soft; calcareous.
3010 - 3020	As above.
3020 - 3030	As above.
3030 - 3040	As above; greenish gray sandstone - very fine to fine, moderate sorting, subangular to subrounded clear quartz grains; siliceous (medium gray) grading into very silty sandstone's.
3040 - 3050	As above.
3050 - 3060	As above.

DEPTH  
(feet)

- 3060 - 3070 As above; not calcareous (fossil plant fragments).
- 3070 - 3080 Sandstone - very fine yellowish brown (10 YR 7/2) - fine to medium, moderate sorting, subrounded clear quartz grains; no cement; locally feldspathic; iron stained; 5% worn siltstone/shale fragments.
- 3080 - 3090 Sandstone/siltstone - 50% each, interbedded - siltstone as 3070 - 3080'; siltstone as 3000 - 3010'.
- 3090 - 3100 As 3080 - 3090'.
- 3100 - 3110 Sandstone - as 3080 - 3090'; 30% siltstone.
- 3110 - 3120 Sandstone - as 3100 - 3110'.
- 3120 - 3130 Siltstone - dark gray (N3) - hard; worn; calcareous, sandy, fine grained to silt sized quartz grains.
- 3130 - 3140 As 3120 - 3130'.
- 3140 - 3150 Sandstone/Siltstone - sandstone - 70% sandstone as 3080 - 3090'. 30% siltstone as 3120 - 3130'.
- 3140 - 3150 Sandstone/Siltstone - sandstone - 70% sandstone as 3080 - 3090'. 3-% siltstone as 3120 - 3130'.
- 3150 - 3160 As 3140 - 3150'.
- 3160 - 3170 Siltstone as 3120 - 3130'.
- 3170 - 3180' As above.
- 3180 - 3190 As above.
- 3190 - 3200 As above.
- 3200 - 3210 Siltstone/Limestone/Sandstone - mixed interbedded area approximately 3 each of: siltstone - as 3120 - 3130'; sandstone greenish gray (5GY 6/1); fine grained; moderately sorted, subrounded; clear quartz; siliceous; hard; 10% dark (smoky quartz?) medium sized grains. Limestone argillaceous - light brownish gray and medium dark gray - intraclasts with pellets in coarse grained background; and areas of all 3 fragments in sandstone or silty limestone matrix; as complex intraclasts.
- 3210 - 3220 As 3200 - 3210'.
- 3220 - 3230 As above.
- 3230 - 3240 Siltstone, calcareous - as 3120 - 3130'; very coarsely silty with Limestone fragments.
- 3240 - 3250 As above.
- 3250 - 3260 As above.

DEPTH  
(feet)

3260 - 3270	As 3230 - 3240'; crinoid fragments, fossil fragments; pyrite; small fragments of fine grained limestone.
3270 - 3280	As 3260 - 3270'.
3280 - 3290	As 3260 - 3270'.
3290 - 3300	Limestones! Very light gray (N8) light brownish gray (5YR 4/1) - fine grained very light gray and fragments of all types of limestone and fossil fragments with limestone matrix (interclasts); and siltstone sandy and sandstone, coarse; "dirty" type; with fragments of both in limestone "Breccia" fragments; fossil fragments - <u>Crinoid</u> , <u>Bryozoa</u> <u>pyrite</u> . Larger rock fragments are subrounded, smaller are angular to subangular.
3300 - 3310	As 3290 - 3300'.
3310 - 3320	As 3290 - 3300'.
3320 - 3330	As above; more clean limestone, fine grained.
3300 - 3340	As above; fewer limestone reworked fragments, 1-3% sandstone/siltstone.
3340 - 3350	As above; light gray fine grained with 10% <sup>+</sup> reworked (white, brownish gray) limestone fragments; rare sandstone/siltstone; iron staining; 1% pellets in limestone.
3350 - 3360	As above.
3360 - 3370	As above; increasing light gray.
3370 - 3380	As above.
3380 - 3390	As above.
3390 - 3400	As 3360 - 3370'.
3400 - 3410	Limestone - light brownish gray (5YR 4/1); fine to medium grained; silty with 1-3% fragments of fine grained white limestone; <u>Crinoid</u> fragments and rare sandstone fragments; rare calcite fragments and light gray limestone fragments.
3410 - 3420	As above.
3420 - 3430	As above.
3430 - 3440	As above.
3440 - 3450	As above; with white/brownish gray fragments.
3450 - 3460	As above.
3460 - 3470	Limestone - light brownish gray; fine grained with rare pellets.
3470 - 3480	As above/shale

DEPTH  
(feet)

3480 - 3490	As above/shale.
3490 - 3500	As above; 1-3% mixture of intraclastic fragments, dark gray siltstone fragments and white limestone.
3500 - 3510	As above.
3510 - 3520	Light gray, fine grained; some white.
3520 - 3530	As above.
3530 - 3540	As above.
3540 - 3550	As above.
3550 - 3560	As above.
3560 - 3570	As above.
3570 - 3580	Light brownish gray; fine grained.
3580 - 3590	As above.
3590 - 3600	As above.
3610 - 3520	As above.
3620 - 3630	As above.
3630 - 3640	Medium Gray.
3640 - 3650	As above.
3650 - 3660	As above.
3660 - 3670	As above.
3670 - 3680	As above.
3680 - 3690	Limestone/Shale - grayish red (10R 4/2); calcareous; 50% Limestone fragments from 3670 - 3680'; 50% shale, sandy - (grayish red) - soft, fine to medium, subrounded quartz grains with occasional dark gray. and medium gray shale fragments.
3910 - 3700	Shale - as 3680 - 3690'; no limestone; still calcareous in local fragments only; not calcareous except for limestone/calcite fragments.
3710 - 3720	As above.
3720 - 3730	As above.
3730 - 3740	As above.
3740 - 3750	As above.



DEPTH  
(feet)

3750 - 3760	As above; very sparse local mica.
3760 - 3770	As above.
3770 - 3780	As above; light gray siltstone fragments and sparse very light gray limestone fragments.
3780 - 3790	As above.
3790 - 3800	Sandstone - light to medium gray (N7 and N5), fine to medium grained moderately poor sorting; subangular and subrounded clear quartz grains; siliceous, weakly; subgraywacke type sandstone; 1% clean white type, pyrite; glauconite.
3800 - 3810	As 3790 - 3800'; limestone fragments.
3810 - 3820	As above; greenish gray (5 GY 6/1) sandstone fragments.
3870 - 3830	As 3810 - 3820'.
3830 - 3840	As 3810 - 3820'; increasing amounts dark gray siltstone (gray); silty siltstone, sandy and brownish gray limestone fragments.
3840 - 3850	Sandstone, silty - as above; local carbon or very fine rock fragments.
3850 - 3860	As above.
3860 - 3870	As above.
3870 - 3880	As above.
3880 - 3890	As above.
3890 - 3900	As above.
3900 - 3910	As above.
3910 - 3920	As above.
3920 - 3930	<u>Siltstone</u> - medium gray - (N5); soft to firm fragments.
3930 - 3940	As above.
3940 - 3950	As above.
3950 - 3960	As above.
3960 - 3970	As above.
3970 - 3980	As above.
3980 - 3990	As above.

DEPTH  
(feet)

3990 - 4000	As 3920 - 3930'.
4000 - 4010	As above.
4010 - 4020	As above.
4020 - 4030	As above.
4030 - 4040	As above.
4040 - 4050	As above.
4050 - 4060	As above.
4060 - 4070	As above.
4070 - 4080	As above.
4080 - 4090	As above.
4090 - 4100	As above.
4100 - 4110	As above.
4110 - 4120	As above.
4120 - 4130	As above.
4130 - 4140	Siltstone - medium dark gray (N4), hard.
4140 - 4150	As above.
4150 - 4160	As above.
4160 - 4170	As above.
4170 - 4180	As above.
4180 - 4190	As above.
4190 - 4200	As above.
4200 - 4210	Siltstone - medium dark gray (N4), hard.
4210 - 4220	As above.
4220 - 4230	Siltstone - dark gray (N3); hard.
4230 - 4240	As 4220 - 4230'.
4240 - 4250	As above.

DEPTH  
(feet)

4250 - 4260	As 4220 - 4230 <sup>1</sup> .
4260 - 4270	As above.
4270 - 4280	As above.
4280 - 4290	As above.
4290 - 4300	As above.
4300 - 4310	As above.
4310 - 4320	As above.
4320 - 4330	As above.
4330 - 4340	As above.
4340 - 4350	Shale/Siltstone - <u>(light gray crushed coating)</u> - grayish black (N2); hard to moderately firm, fissile shale fragments.
4350 - 4360	Shale - grayish black (N2) with brownish black (5YR 2/1) - soft to moderately firm; carbonaceous?; fissile.
4360 - 4370	
4370 - 4380	
4380 - 4390	
4390 - 4400	
4400 - 4420	
(Berea?)	
4420 - 4430	Siltstone - medium light to medium dark gray (N6 - N4) - hard.
4430 - 4440	
4440 - 4450	
4450 - 4460	
4460 - 4470	No sample.
4470 - 4480	
4480 - 4490	
4490 - 4500	

DEPTH  
(feet)

4500 - 4510	Siltstone - medium dark gray - firm.
4510 - 4520	As 4500 - 4510'.
4520 - 4530	As above;
4530 - 4540	Siltstone - dark gray - hard.
4540 - 4550	As above.
4550 - 4560	Siltstone/Shales - medium dark gray - firm, some lighter and darker chips.
4560 - 4570	As 4550 - 4560'.
4570 - 4580	As above.
4580 - 4590	As above.
4590 - 4600	As above.
4600 - 4610	As above.
4610 - 4620	As above.
4620 - 4630	As above.
4630 - 4640	As above.
4640 - 4650	As above.
4650 - 4660	As above.
4660 - 4670	As above.
4670 - 4680	As above.
4680 - 4690	As above.
4690 - 4700	As above.
4700 - 4710	As above.
4710 - 4720	As above.
4720 - 4730	As above.
4730 - 4740	As above.
4740 - 4750	As above.
4750 - 4760	As above.
4760 - 4770	As above.
4770 - 4780	As above.

DEPTH  
(feet)

4790 - 4800	As above.
4800 - 4810	Shale - medium dark gray to dark gray (N4-N3); moderately firm; some sandy siltstone's.
4810 - 4820	As above.
4820 - 4830	As above.
4830 - 4840	As above.
4840 - 4850	As above.
4850 - 5860	As above.
4860 - 4870	Shale/Siltstone, sandy - as 4800 - 4810'; same colors as 4800 - 4810'.
4870 - 4880	As 4860 - 4870.
4800 - 4890	As above.
4890 - 4900	As above.
4900 - 5000	No samples.
5000 - 5010	Shale, sandy; (finely ground) - medium and dark gray (N5 and N3) - firm fine reddish brown rock fragments.
5010 - 5020	As 5000 - 5010'.
5020 - 5030	As above.
5030 - 5040	As above.
5040 - 5050	Siltstone, sandy - medium dark gray (N4) - hard; pyrite, very rare local carbonaceous matter.
5050 - 5060	
5060 - 5070	
5070 - 5080	Siltstone, sandy - medium gray (N5) and medium light gray - hard very fine to fine grained quartz sand grains in siltstone; some fragments mottled in color; very thin laminae of yellowish gray sandstone in fragments - very fine grained, moderate sorting, subangular clear and iron oxide stained quartz grains; siliceous; brittle.
5080 - 5090	As above; sparse sandstone fragments.
5090 - 5100	As above.
5100 - 5110	Shale - dark gray (N3); firm, finely laminated.
5110 - 5120	As 5100 - 5110'.

DEPTH  
(feet)

5120 - 5130 As 5100 - 5110'.

5130 - 5140 Siltstone - as 5070 - 5080'; rare fragments of sandstone.

5140 - 5150 As 5130 - 5140'.

5150 - 5160 As 5130 - 5140'; fragments of very fine, thin laminae of dark gray carboniferous (?) and pyrite shale.

5160 - 5170  
5170 - 5180 Siltstone/Shale - siltstone - medium dark gray (N4) hard and 1-3% shale - grayish black (N2) - soft; pyrite.

5180 - 5190

5190 - 5200 As above.

5200 - 5210 As above.

5210 - 5220 As above.

5220 - 5230 As above.

5230 - 5240 As above.

5240 - 5250 Shale! grayish black (N2) - soft.

5250 - 5260 As above.

5260 - 5270 Shales - grayish black (N2) and medium dark gray (N4) soft.

5270 - 5280

5280 - 5290 Shale -medium dark gray - moderately firm.

5290 - 5300 As above.

5300 - 5310 As above.

5310 - 5320 As above.

5320 - 5330 As above; 1%  $\pm$  GRAYISH BLACK SHALES; PYRITE. 3%.

5340 - 5350 Shale, sandy - as above; as much as 1%  $\pm$ . RESIDUE OF QUARTZ GRAINS.

5350 - 5360 As above.

5360 - 5370 As above.

5370 - 5380 Shale - grayish black (N2) - soft.

5380 - 5390 As above; pyrite.

5390 - 5400 As above; very rare lt. gray siltstone.

DEPTH  
(feet)

5440 - 5410	As 5390 - 5400'.
5410 - 5420	As above.
5420 - 5430	As above.
5430 - 5440	As above.
5440 - 5450	As above.
5450 - 5460	No samples.
5460 - 5470	
5470 - 5480	
5480 - 5490	
5490 - 5500	Siltstone - medium gray (N5) and dark gray (N3) - moderately soft.
5500 - 5510	As above; slightly "gritty".
5510 - 5520	As 5500 - 5510'.
5520 - 5530	As above.
5530 - 5540	As above; pyrite - 1%.
5540 - 5550	As above.
5550 - 5560	Siltstone - dark gray (N3)-hard; rare fragments of soft grayish blk shale.
5560 - 5570	As above.
5570 - 5580	As above; 50% medium dark gray (N4) hard.
5580 - 5590	As above.
5590 - 5600	As above.
5600 - 5610	As above.
5610 - 5620	As above.
5620 - 5630	As above.
5630 - 5640	As above.
5640 - 5660	As above.
5660 - 5670	As above.
5670 - 5680	As above.

DEPTH  
(feet)

5680 - 5690	As 5570 - 5580'.
5690 - 5700	As above.
5700 - 5710	Siltstone - medium dark gray (N4) - hard; 10% <sup>+</sup> softer grayish black, occasional finely sandy fragments.
5710 - 5720	As above.
5720 - 5730	As above.
5730 - 5740	As above.
5740 - 5750	As above.
5750 - 5760	As above.
5760 - 5770	As above.
5770 - 5780	Shales - grayish black (N2) - moderately firm to soft; pyrite; carbonaceous slickenslides.
5780 - 5790	As above; no pyrite.
5790 - 5800	As 5780 - 5790'.
5800 - 5810	As above.
5810 - 5820	As above.
5820 - 5830	As above.
5830 - 5840	As above.
5840 - 5850	As above.
5850 - 5860	As above.
5860 - 5870	As above.
5870 - 5920	No samples.
5920 - 5930	Sandstone (crushed) - dark yellowish brown (10YR 4/2); fine to coarse, moderately poor sorting; angular with some subangular clear; pitted and sparsely frosted quartz grains; sample not calcareous but calcareous cement has weathered out; 1% white milky chert; 10% <sup>+</sup> iron oxide fragments in thin flat plate-like fragments, with some magnetic possibilities indicating fault replacement; fine shale fragments.
5930 - 5940	Sandstone - as 5920 - 5930'; now slightly calcareous.
5940 - 5950	Sandstone (crushed) pale yellowish brown (10 YR 6/2) - very fine to medium, moderately sorted, angular and subangular with 10% subrounded,



DEPTH  
(feet)

clear and frosted quartz grains; calcareous cement; 1% chert fragments; iron oxide fragments and fine weathered shale fragments; very rare glauconite.

5	
5950 - 5960	As above.
5960 - 5970	As above.
5970 - 5980	As above.
5980 - 5990	As above; chalcopyrite fragments.
5990 - 6000	As above. - (Hancock - crushed Limestone/Dolomite & blown out - Gamma Log)
6000 - 6010	Sandstone (crushed) - color as 5940 - 5950'; very fine to fine well sorted; subrounded with sparse subangular; clear and frosted quartz grains; calcareous cement; sparse iron oxide and rock fragments.
6010 - 6020	As above.
6020 - 6030	As above.
6030 - 6040	As above.
6040 - 6050	No sample.
6060 - 6070	Sandstone (crushed) as 6000 - 6010; occasional chert; 10% fine weathered rock fragments; iron stains.
6070 - 6080	As 6060 - 6070'.
6080 - 6090	No sample.
6090 - 6100	Sandstone (crushed) very light gray (N8); very fine, well sorted, subrounded clear quartz grains; abundant "white" calcareous cement; sparse very fine rock fragments.
6100 - 6110	Sandstone (crushed) - light olive gray (5Y 6/1); as 6090 - 6100'; iron staining; fragment with medium gray and dark gray (N5 and N3) clay (?) layers within 2 sandstone layers; few black shale fragments.
6110 - 6120	As above.
6120 - 6130	Sandstone (crushed) yellowish gray (5Y 7/1); as 6090 - 6100; iron staining.
6130 - 6140	As above.
6140 - 6150	As 5920 - 5930'; another fault zone?
6150 - 6160	Sandstone (crushed) dusky yellow (5Y 6/4); as 6120 - 6130'; iron staining.
6160 - 6170	As above.
6170 - 6180	As above.

DEPTH  
(feet)

6180 - 6190	As 6150 - 6160'.
6190 - 6200	As above.
6200 - 6210	Sandstone (crushed) pale yellowish brown (10YR 6.2) - sandstone still very fine to fine, moderately well sorted, subrounded clear quartz grains; abundant calcareous powder.
6210 - 6220	As above.
6220 - 6230	As above.
6230 - 6340	As above.
6240 - 6250	As above.
6250 - 6260	As above.
6260 - 6270	As above.
6270 - 6280	As above; very fine rock fragments, 10% medium sized quartz grains; 10% fine, medium gray siltstone fragments.
6280 - 6290	Sandstone (crushed) - brownish gray (5YR 4/1) very fine to fine with 10% medium moderately well sorted, subangular and subrounded clear quartz grains; abundantly calcareous; 20% medium dark gray (N4) siltstone, 10% iron fragments and staining.
6290 - 6300	Sandstone - moderate olive gray (5Y 5/1); as 6280 - 6290'.
6300 - 6310	No samples.
6310 - 6320	Sandstone - dark yellowish brown (10 YR 4/2) - fine to medium, moderately sorted, subrounded and subangular with rare angular fragments clear and iron stained quartz; slight calcareousness; 10% medium dark gray siltstone; iron fragments.
6320 - 6330	As above.
6330 - 6340	As above; color is yellowish gray (5Y 7/2).
6340 - 6350	As 6330 - 6340'.
6350 - 6360	As above.
(end Hancock)	
6360 - 6370	Sandstone - pale yellowish brown (10 YR 6/2).
6370 - 6380	Siltstone's - medium gray (N5), pale grayish red (10R 5/2), light greenish gray (5GY 7/1) small worn fragments; soft; clasts of calcareous matter from above.

DEPTH  
(feet)

6380 - 6390	Siltstone - grayish red (10 R 4/2) poor samples, badly crushed siltstone fragments.
6390 - 6400	As 6380 - 6390'; sandstone fragments.
6400 - 6410	Sandstone - pale yellowish brown (10YR 6/2) - very fine, moderately sorted, subrounded clear quartz grains; calcareous; 25% fine siltstone fragments (medium gray).
6410 - 6420	Sandstone - light olive gray (5Y 6/1); as above; dark gray siltstone fragments.
6420 - 6430	As above.
6430 - 6440	As above.
6440 - 6450	No sample.
6450 - 6560	As above.
6460 - 6470	As above.
6470 - 6480	As above.
6480 - 6490	As above.
6490 - 6500	Siltstone/Sandstone - grayish red (10R 4/2) - crushed soft siltstone fragments; sandstone as above at 6400 - 6410'.
6500 - 6510	As above.
6510 - 6520	As above.
6520 - 6530	As 6410 - 6420'.
6530 - 6540	As above.
6540 - 6550	As above.
6550 - 6560	As above.
6560 - 6570	As above.
6570 - 6580	<u>Siltstone/Sandstone</u> - as 6490 - 6500'.
6580 - 6590	Siltstone/Sandstone - moderate yellowish brown (10YR 5/4) - dark gray (N3) flat, rounded siltstone fragments; sandstone as 6410 - 6420'; 40% iron oxide fragments.
6590 - 6600	Sandstone/Siltstone - pale yellowish brown (10YR 6/2); sandstone as 6410 - 6420; 20% siltstone (dark gray and grayish red); 20% siltstone fragments.
6600 - 6610	As above.

DEPTH  
(feet)

6610 - 6620	As 6590 - 6600'.
6620 - 6630	As above.
6630 - 6640	As above.
6640 - 6650	As above.
6650 - 6660	As above.
6660 - 6670	As above.
6670 - 6680	As above.
6680 - 6690	As above.
6690 - 6700	As above.
6700 - 6710	Sandstone - dark yellowish orange (10 YR 6/6) - fine to medium, sub-angular, moderately sorted; abundant iron oxide staining.
6710 - 6720	As above; rare rock fragments.
6720 - 6730	As above.
6730 - 6740	Sandstone - dark yellowish brown (10YR 4/2) - 30% dark gray siltstone fragments; iron oxide fragments and staining.
6740 - 6750	As above.
6760 - 6770	Sandstone/Shale - light olive gray (5 Y 6/1) - sandstone - very fine grained moderate sorting; subangular clear quartz grains; uncemented; and siltstone - shales - dark gray, soft.
7650 - 6760	Sandstone - as 6730 - 6740'.
6760 - 6770	See paragraph above - description out of place.
6770 - 6780	As 6760 - 6770'.
6780 - 6790	Sandstone/Shales - sandstone as 6760 - 6770'; shales - grayish red and dark gray - soft, weathered fragments.
6790 - 6798	As above; iron oxide.