

BU38

OPERATOR: Columbia Gas Transmission Corp.
FARM: Howard Coleman
WELL NO: 20005
LOCATION: Buchanan County
1600' S. of 37° - 15'
4000' E. of 82° - 15'
ELEVATION: 1791.37' GR
TOTAL DEPTH: 4735
DRILLING COMMENCED: May 5, 1974
WELL COMPLETED: August 9, 1974
RESULT: Gas Well

WELL LOG

0 - 10	Sandstone - very light gray to light gray (N8-7); medium grained, subangular, moderate sorting; clear to white quartz grains; hard; feldspar; 1-3% micas - muscovite and green/brown hydro-micas; siliceous (?); porous moderate; dark unidentified minerals.
10 - 20	As above.
20 - 30	As above.
30 - 40	As above.
40 - 50	As above.
50 - 60	As above.
60 - 70	As above. ; brittle
70 - 80	As above.
80 - 90	As above.
90 - 100	As above; 7% mica, coal
100 - 110	As above; coal; 10% mica; plant impressions.
110 - 120	Sandstone, (crushed) light olive gray - (5Y 6/1) as 0 - 10; coal; mica; ("Dirty White").

DEPTH
(feet)

120 - 130 Siltstones - medium gray (N5); grading to sandstone locally; hard.

130 - 140 As 120 - 130.

140 - 150 Shale - medium dark gray (N4); hard; coal-sparse.

150 - 160 Sandstone, crushed - as 0 - 10; coal; small fragments shale/
siltstone - dark gray.

160 - 170 As 150 - 160'.

170 - 180 As 150 - 160; 5% mica; coal

180 - 190 As above 150 - 160'.

190 - 200 As above 150 - 160'.

200 - 210 As 150 - 160'; 30% very fine dark matter - some coal, some siltstone/
shale fragments; plant fossil prints on coal; feldspar.

210 - 220 As 200 - 210; coal.

220 - 230 Shale - medium dark gray (N4); hard.

230 - 240 Shale/Siltstone - as above; grading to siltstone

240 - 250 As 230 - 240'.

250 - 260 Siltstone/Sandstone/Shale - light to medium light gray (N7-6);
siltstones grading to siltstone, sandy mixed sizes - quartz; and
some impure sandstone; 1% rounded grayish black shale fragments.

260 - 270 As 250 - 260'.

270 - 280 As 250 - 260'.

280 - 290 As 250 - 260'.

290 - 300 As 250 - 260'.

300 - 310 As 250 - 260'.

310 - 320 Siltstone/Shale - as 250 - 260'; shale is medium dark gray; hard;
massive; local mica.

320 - 330 As 250 - 260'.

330 - 340 As 250 - 260'.

DEPTH
(feet)

340 - 350	Siltstone/Shale - as 310 - 320'; more shales.
350 - 360	As 310 - 320'.
360 - 370	As 310 - 320'.
370 - 380	Siltstone/Shale - as 310 - 320'; about equal amounts; fragments dark yellowish brown (10YR 4/2) sandstone - fine R medium, poorly sorted clear grains,? local calcareousness; coal.
380 - 390	Sandstone - pale yellowish brown (10YR 6/2); as 370 - 380; 30% siltstone/shale - medium dark gray; weathered; mica.
390 - 400	Sandstone/Siltstone - 50% each; sandstone - light gray - medium to coarse, moderate sorting, subangular clear quartz; no cement feldspathic locally and sparsely; mica; and siltstone - medium gray; hard; local mica.
400 - 410	As 390 - 400; brownish gray siltstone - sparse.
410 - 420	As 390 - 400'; layered, medium gray and brown gray siltstone.
420 - 430	Sandstone/Siltstone - as 390 - 400'; siltstone is 50% medium gray; 50% brown gray; mica.
430 - 440	Siltstone - medium gray - hard, micaceous, locally sandy; some brownish gray.
440 - 450	Shale - medium dark gray (N4); hard, fissile; grading to siltstone, as 430 - 440'.
450 - 460	Siltstone/Shale/Sandstone - shale as 440 - 450, sandstone as 0-10; crushed-no cement; mica.
460 - 470	Shale/Sandstone - as 450 - 460'; 1% brownish gray siltstone - hard; micaceous as 450 - 460'.
470 - 480	Shale/Sandstone - as 450 - 460; 50% each; 1% mica in sandstone.
480 - 490	Sandstone - light gray (N7); fine to medium, well sorted, sub-angular clear quartz grains; some calcareousness (confined to single grains); no cement, 1% mica; 1% weathered rock fragments; feldspar - saprolitic.
490 - 500	As 480 - 490'; 10% accessories.
500 - 510	Sandstone - as 480 - 490'.
510 - 520	Sandstone - as 480 - 490'.
520 - 530	Sandstone - as 480 - 490'.

DEPTH
(feet)

530 - 540 As 480 - 490'.

540 - 550 Shale - as 440 - 450; soft; weathered small fragments.

550 - 560 Shale - as 540 - 550'.

560 - 570 As 540 - 550'; mica.

570 - 580 As 540 - 550'.

580 - 590 As 540 - 550'.

590 - 600 Shale - as 540 - 550'; 5% sandstone as 480 - 490'.

600 - 610 Sandstone - as 480 - 490'; 10% shale.

610 - 620 Sandstone/Shale - 60% sandstone - as 480 - 490; 40% shale as 540 - 550'.

620 - 630 As 610 - 620'.

630 - 640 As 610 - 620'; 50% each.

640 - 650 As 610 - 620' 50% each.

650 - 660 Shale/Sandstone as 610 - 620'; 10% sandstone.

660 - 670 As 610 - 620'; 10% sandstone.

670 - 680 As 610 - 620'; 10% sandstone.

680 - 690 As 610 - 620';

690 - 700 Shale/Sandstone graywacke as 610 - 620'; 40% sandstone as 0 - 10'. but calcareous; "Dirty" white.

700 - 710 Shale/Sandstone - as 630 - 640; sandstone is as 690 - 700'; dirty. ———

710 - 720 As 630 - 640; 50% each; sandstone very light gray (N8) to medium gray (N5) "dirty" graywacke; 1% fragments grayish black soft shale. ———

720 - 730 As 710 - 720'; as above, siltstone.

730 - 740 As 710 - 720'.

740 - 750 As 710 - 720'.

750 - 760 As 710 - 720'.

760 - 770 As 710 - 720'; Mica on both, Shale - Siltstone, grading.

770 - 780 Sandstone/Shale - sandstone as 540 - 550. Small weathered fragments; shale 10% mica in sandstone;

DEPTH
(feet)

780 - 790	50% each; as 540 - 550'.
790 - 800	Sandstone - very light gray (N9); medium to coarse, moderate sorting; subangular, clear quartz grains; feldspar; mica; 10% small weathered fragments; local calcareous grains.
800 - 810	As 790 - 800'.
810 - 820	As 790 - 800'.
820 - 830	Sandstone/Shale - sandstone as 790 - 800'; 40% shale as 540 - 550'.
830 - 840	Shale/Siltstone - dark gray shale (N3) hard; grading to dark gray siltstone - hard, sandy, rippled.
840 - 850	As 830 - 840; local carbon on disturbed bedding; mica; large coarse grains in rows across some fragments.
850 - 860	As 830 - 840'.
860 - 870	Shale - grayish black (N2); soft, fissile, small rounded weathered fragments; 1% brownish gray shale; pyrite.
870 - 880	As 860 - 870'; no pyrite.
880 - 890	As 860 - 870'.
890 - 900	As 860 - 870'.
900 - 910	As 860 - 870'.
910 - 920	As 860 - 870'; mica locally.
920 - 930	Shale/Sandstone - shale as 860 - 870; 10% [±] sandstone as 0-10'.
930 - 940	Shale/Sandstone - 60% shale grading into siltstone dark gray (N3) to medium dark gray (N4); hard; rippled in some places; coal fragments, impressions; and sandstone - 40% medium light gray - as 790 - 800'; dirty to clean, local mica.
940 - 950	Shale/Sandstone - as 930 - 940; coal-fragments and sandstone; brown gray shale fragments sandstone - siliceous, hard.
950 - 960	As 930 - 940'.
960 - 970	Sandstone/Shale - 80% sandstone as 930 - 940, crushed, feldspar; mica; 20% shale/siltstone - as 930 - 940'.
970 - 980	As 960 - 970'.
980 - 990	As 960 - 970'.
990 - 1000	Sandstone - as 790 - 800; mica.
1000 - 1010	As 790 - 800'.

DEPTH
(feet)

1010 - 1020	As 790 - 800'.
1020 - 1030	As 790 - 800'.
1030 - 1040	Sandstone/Shale - 50% sandstone as 790 - 800'; 50% shale as 930 - 940' - small weathered fragments.
1040 - 1050	As 1030 - 1040'.
1050 - 1060	Shale/Sandstone - as 1030 - 1040'; 80% shale.
1060 - 1070	As 1030 - 1040'; 80% shale.
1070 - 1080	As 1030 - 1040' 10% sandstone.
1080 - 1090	As 1080 - 1090'.
1090 - 1100	As 1080 - 1090'.
1100 - 1110	As 1080 - 1090'.
1110 - 1120	As 1080 - 1090'.
1120 - 1130	As 1080 - 1090'.
1130 - 1140	As 1080 - 1090'.
1140 - 1150	As 1080 - 1090'.
1150 - 1160	Shale/Sandstone - as 1080 - 1090; local mica.
1060 - 1070	As 1080 - 1090'.
1070 - 1080	As 1080 - 1090'.
1180 - 1190	As 1080 - 1090'.
1190 - 1200	As 1080 - 1090'.
1200 - 1210	As 1080 - 1090'.
1210 - 1220	As 1080 - 1090'.
1220 - 1230	As 1080 - 1090'.
1230 - 1240	Sandstone - light gray (N7) to very light gray (N8) - medium grained, well sorted, subangular clear quartz grains; siliceous; hard clean; slight porosity 1% fragments with medium to granule sized grains and milky pebble fragments; 1% with some mica/accessory minerals; 1-3% graywacke with coal; coal stringers and disturbed bedding surfaces.
1240 - 1250	As 1230 - 1240'.

DEPTH
(feet)

1250 - 1260	As 1230 - 1240'.
1260 - 1270	As 1230 - 1240'.
1270 - 1280	As 1230 - 1240'.
1280 - 1290	As 1230 - 1240'.
1290 - 1300	As 1230 - 1240'.
1300 - 1310	As 1230 - 1240'.
1310 - 1302	As 1230 - 1240'.
1320 - 1330	As 1230 - 1240'.
1330 - 1340	As 1230 - 1240'.
1340 - 1350	As 1230 - 1240'.
1350 - 1360	As 1230 - 1240'.
1360 - 1370	Very light gray (N8) - fine to coarse, moderately sorted; subangular; clear quartz grains; no cement - probably silica and brittle; local saprolitic feldspathic areas; sparse rock fragments /mica.
1370 - 1380	As 1360 - 1370'.
1380 - 1390	As 1360 - 1370'.
1390 - 1400	Sandstone/Shale - as 1360 - 1370'; all coarse sized grains; 1% feldspathic areas (feldspar surrounded by several quartz grains); 1% shale grayish black (N1) - hard; worn/weathered.
1400 - 1410	As 1390 - 1400'.
1410 - 1420	As 1390 - 1400'.
1420 - 1430	As 1390 - 1400'; coal.
1430 - 1440	As 1390 - 1400'. mica; coal.
1440 - 1450	As 1390 - 1400'.
1405 - 1460	As 1390 - 1400'.
1460 - 1470	As 1390 - 1400'; sandstone fragments; coal.
1470 - 1480	Sandstone (crushed) light olive gray (5Y 6/1) fine to medium, moderate sorting, subangular clear quartz grains; argillaceous; feldspathic; 30% fine rock fragments; mica.
1480 - 1490	As 1470 - 1480'.

DEPTH
(feet)

1490 - 1500	As 1470 - 1480'.
1500 - 1510'	As 1470 - 1480'.
1510 - 1520	As 1470 - 1480'.
1520 - 1530	As 1470 - 1480'.
1530 - 1540	As 1470 - 1480'.
1540 - 1550	As 1470 - 1480'.
1500 - 1560	As 1470 - 1480'.
1560 - 1570	Shale - medium dark gray (N5); locally sandy; fissile; local mica; usually hard; 1 % siltstone - medium gray (N5) - hard; micaceous; coal.
1570 - 1580	Shale/Sandstone - as 1560 - 1570'; some siltstone grading to coarse grained sandstone - as 1390 - 1400'; 1% local carbon film on shale.
1580 - 1590	Shale - as 1560 - 1570'.
1590 - 1600	As 1560 - 1570'.
1600 - 1610	Shale/Sandstone - as 1570 - 1580'; with sandstone.
1610 - 1620	As 1570 - 1580; with sandstone
1620 - 1630	As 1570 - 1580'.
1630 - 1640	As 1570 - 1580'; with sandstone.
1640 - 1650	Shale - as 1560 - 1570'.
1650 - 1660	As 1560 - 1570'; small fragments; soft; worn.
1660 - 1670	As 1560 - 1570'.
1670 - 1680	As 1560 - 1570'.
1680 - 1690	As 1560 - 1570'.
1690 - 1700	As 1506 - 1570'.
1700 - 1710	As 1560 - 1570'.
1710 - 1720	Sandstone/Shale - sandstone, crushed - as 1390 - 1400'; 45% \pm fine, worn shale as 1560 - 1570'.
1720 - 1730	Shale/Sandstone - 80%;shale; as 1710 - 1720'; coal plant fragments, coal; medium gray (N5) fragment- 5%.
1730 - 1740	Shale 80%/ Sandstone 20% - as 1720 - 1730'.

<u>Depth</u> <u>(feet)</u>	
1740 - 1750	As 1720 - 1730'.
1750 - 1760	As 1720 - 1730'.
1760 - 1770	As 1720 - 1730'; still coal fragments.
1770 - 1780	As 1720 - 1730'; large coal fragments; plant fossils on coal;
1780 - 1790	As 1720 - 1730'; sandstone as 1720 - 1730'.
1790 - 1800	Sandstone/Shale - 50% each shale as 1570 - 1580'; interbedded; coal; fossil prints on coal - sigularia. sandstone - lightly siliceous, clean to dirty.
1800 - 1810	As 1790 - 1800; small coal fragments.
1810 - 1820	As 1790 - 1800'.
1820 - 1830	As 1790 - 1800'.
1830 - 1840	As 1790 - 1800'.
1840 - 1850	Sandstone (rushed) light gray (N7) - medium grained, well sorted, angular to subangular clear quartz grains; siliceous; brittle; 10% mica/rock fragments.
1850 - 1860	As 1790 - 1800'; coarse grained.
1860 - 1870	As 1790 - 1800';
1870 - 1880	As 1790 - 1800'; coal.
1880 - 1890	As 1790 - 1800'; coal.
1890 - 1900	As 1790 - 1800'.
1900 - 1910	As 1790 - 1800'.
1910 - 1920	As 1790 - 1800'.
1920 - 1930	As 1790 - 1800'; large fragments sandstone; hard to brittle
1930 - 1940	As 1920 - 1930; hard to brittle; mainly harder medium grained; in large fragments; few impurities; coal stringers.
1940 - 1950	As 1840 - 1850; brittle; coal.
1950 - 1960	As 1840 - 1850'.
1960 - 1970	As 1840 - 1850'.

DEPTH
(feet)

1970 - 1980	Sandstone, conglomeratic - as 1230 - 1240; fine to medium and medium to coarse and coarse grained; milky quartz pebble fragments; some "impure" sandstone areas.
1980 - 1990	As 1970 - 1980; feldspathic areas.
1990 - 2000	Sandstone - as 1970 - 1980 - probably with fresh, angular fragments from newly broken pebbles, etc; no cement; 1% shale - dark gray (N3); hard, fissile.
2000 - 2010	As 1970 - 1980; 10mm pebble fragments; 30% pebble fragments - angular, milky quartz.
2010 - 2020	As 2000 - 2010'.
2020 - 2030	As 2000 - 2010'.
2040 - 2050	Sandstone, crushed - very light gray (N8); fine to coarse, angular, moderate sorting; clear to milky grains quartz; no cement but probably silica; brittle; sparse pebble fragments; very sparse rock fragments.
2050 - 2060	No sample.
2060 - 2070	As 2040 - 2050'.
2070 - 2080	As 2040 - 2050'.
2080 - 2090	No sample.
2090 - 2100	As 2040 - 2050'.
2100 - 2120	Sandstone - as 2040 - 2050'; 10% medium light gray - as 2040 - 2050' otherwise; 1% conglomeratic fragments; coal - 10% and large fragments.
2120 - 2130	Sandstone - light gray (N7) to medium light gray (N6) to medium dark gray (N4) - fine to coarse grained with some pebbles, poorly sorted, clear to milky; siliceous; hard; grading into impure sandy siltstone; coal; coal fossils.
2130 - 2140	Sandstone, crushed as 2120 - 2130'; area greatly diversified/disturbed.
2140 - 2150	Siltstone/Shale, calcareous - dark gray (N3) siltstone, sandy - coal fragments, hard-grading to shale same color - hard, calcareous sandstones - as 2120 - 2130; calcareous also; coal fragments; calcite cleavages, crystals; fossils - crinoid stems, coral/ tr? .
2050 - 2060	As 2140 - 2150; some greenish gray sandstone.
2060 - 2070	Siltstone/sandstone - divisions between 2 rock types becoming clearer medium dark siltstone/shale and light gray to coarse sandstone.

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(feet)

2070 - 2080	No sample.
2080 - 2090	Shale grayish orange pink (5YR 7/2), soft, sandy - very fine to silty. calcareous, sparsely micaceous.
2090 - 2200	As 2080 - 2090'.
2200 - 2210	As 2080 - 2090'.
2210 - 2220	As 2080 - 2090'.
2220 - 2230	As 2080 - 2090'.
2230 - 2240	As 2080 - 2090'.
224- - 2250	As 2080 - 2090'.
2250 - 2260	As 2080 - 2090'.
2260 - 2270	As 2080 - 2090'.
2270 - 2280	As 2080 - 2090'.
2280 - 2290	As 2080 - 2090'.
2290 - 2300	Limestone, argillaceous - dark gray 9N3); fragments look like shale, but dissolve into quartz grains/silt residue; in limestone organic carbon fragments; coal and pyrite fragments; crinoid stem.
2300 - 2310	As 2290 - 2300'.
2310 - 2320	Siltstone/Shale - greenish gray (5GY 6/1); soft; local mica; small worn-rounded fragments and shale - as 2080 - 2090, crushed; coal; pyrite; sample lightly calcareous.
2320 - 2330	Shale (red/black)Siltstone(green/gray) as 2310 - 2320'; about 50% each shale/siltstone; with the addition of 25% (or 50% of the shale) dark gray shale and 15% dark reddish brown (10R 3/4) shale - hard silty; sparsely calcareous.
2330 - 2340	Siltstone - sandstone; sandstone - light greenish gray (5G 6/1); siltstone to very fine grained sandstone - well sorted; subangular to subrounded, clear quartz grains; mica; foreign matter - minute coal green mica/rock fragments; 1 - 3% reddish brown shale/siltstones as 2320 - 2330'; 1% dark gray shale; 50% sandstone: - crushed - very light gray (N8); fine to coarse subrounded, clear quartz grains; mica calcareous.
2340 - 2350	As 2330 - 2340'; 3-5 reddish brown shale.
2350 - 2360	Siltstone, sandy - as 2330 - 2340; 1 10% reddish brown shale. No sandstone; all green gray sandy siltstone as <u>2340 - 2350.</u>

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(feet)

2360 - 2370	As 2350 - 2360'.
2370 - 2380	As 2350 - 2360'.
2380 - 2390	Siltstones - light gray (N7); soft; 1-3% very fine impurities - black; garnet phantom outline in iron oxide - filled with darker gray siltstones; stringers of dark gray siltstone-rougher textured than light gray; fragments of dark gray siltstone; red brown siltstone/shale; calcareous.
2390 - 2400	As 2380 - 2390; = just siltstone - light gray; sparse dark gray fragments as 2390 - 2400 sparse dark gray shale.
2410 - 2420	Shale - grayish black; very soft, weathered, in very small worn fragments, 1-3% light gray siltstones from above; calcareous.
2420 - 2430	As 2410 - 2420'.
2430 - 2440	As 2410 - 2420'.
2440 - 2450	As 2410 - 2420'.
2450 - 2460	As 2410 - 2420'.
2460 - 2470	As 2410 - 2420'.
2470 - 2480	As 2410 - 2420'.
2480 - 2490	As 2410 - 2420'.
2490 - 2500	As 2410 - 2420'.
2500 - 2510	As 2410 - 2420'.
2510 - 2520	No sample.
2520 - 2530	As 2410 - 2420'.
2530 - 2540	As 2410 - 2420'.
2540 - 2550	As 2410 - 2420'.
2550 - 2560	As 2410 - 2420'.
2560 - 2570	As 2410 - 2420'.
2570 - 2600	As 2410 - 2420'.
2600 - 2610	Siltstone/Shale - medium dark gray (N4) siltstone - hard, gritty; and large, hard fragments of above shale with minor amounts of soft reddish brown shale; not calcareous.
2610 - 2620	As 2500 - 2510'.

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2620 - 2630	Shale/Siltstone - as 2500 - 2510; 70 - 80% shale, local mica.
2630 - 2640	Limestone - light gray (N7); fine grained; crushed.
2640 - 2650	Siltstone/Limestone (crushed) siltstone - as in 2600 - 2610'; limestone as 2630 - 2640; some dark green shales.
2650 - 2660	Siltstone; calcareous - as 2600 - 2610; or siltstone/limestone - with limestone crushed into powder, rounded fragments.
2660 - 2670	Siltstone/Limestone, sandy; as 2650 - 2660'.
2670 - 2680	As 2650 - 2660'; fossils.
2680 - 2690	As 2650 - 2660'.
2690 - 2700	As 2650 - 2660'.
2700 - 2710	Shale, calcareous, dark gray (N3); soft rounded worn fragments; 1% reddish brown shale; calcareous; clayey to silty.
2710 - 2730	As 2700 - 2710'.
2720 - 2730	Siltstone/Shale, calcareous - grayish red - (10R 5/2) (much grains red - powder clay) siltstone to shale, hard to soft, sandy-mixed grain sizes; local mica; calcareous and dark gray shales.
2730 - 2740	As 2720 - 2730; black shale and greenish gray siltstone.
2740 - 2750	Equal amounts - green-gray/black shale/ gr. red. as 2720 - 2730'.
2750 - 2760	As 2720 - 2730'.
2760 - 2770	Shale/Siltstone, calcareous - 50% black shale, rest greenish gray (5GY 6/1) siltstone and gray red siltstone/shales - as 2720-2730'.
2770 - 2780	Shale/Siltstone; calc. - 50% black shale; 50% grayish red siltstone - as 2720 - 2730'.
2780 - 2790	As 2770 - 2780'.
2790 - 2800	As 2770 - 2780'.
2800 - 2810	As 2770 - 2780'; sparse light gray coarse grained sandstone fragments.
2810 - 2820	As 2770 - 2780'.
2820 - 2830	As 2770 - 2780'.

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2830 - 2840	Light olive gray (5Y 6/1) to medium gray (N5) - 80% limestone, fine grained, small impurities - coal fragments; sand 20% mixed reddish brown shale and grayish red shale; dark gray calcareous shale interbedding with coarse grained "dirty" sandstone; dark gray siltstone - all as above - ie: shales are worn, soft, fissile siltstone is soft, weathered, sandy and locally micaceous.
2840 - 2850	As 2830 - 2840'; 15% dark gray shale.
2850 - 2860	As 2830 - 2840'.
2860 - 2870	Shale/Limestone (20%) limestone as (70%) dark gray shale; 1% grayish red siltstone with 10% mica within and grayish red shale - no mica; 1% medium light gray (N6) siltstone with dark impurities.
2870 - 2880	As 2860 - 2870'.
2880 - 2890	Shale/Siltstone - 80% dark gray shale; 1% siltstone with siltstone being micaceous and 10-13% siltstone - sandstone, coarse poorly sorted; dirty, medium light gray (N6); limestone fragments - as above 2830 - 2840'.
2890 - 2900	As 2880 - 2900'.
2900 - 2910	As 2890 - 2900'.
2910 - 2920	No sample.
2920 - 2930	Shale/Siltstone/Limestone - as 2860 - 2870'.
2930 - 2940	As 2860 - 2870'.
2940 - 2950	Siltstone/Shale - 50% \pm dark gray shale, locally micaceous, 30% light greenish gray (5GY 7/1) siltstone - hard, calcareous, locally micaceous, 20% grayish red shale; soft; and very light gray sandstone fragments; pyrite locally; sparse and local calcareousness.
2950 - 2960	As 2940 - 2950'.
2960 - 2970	Siltstone/Shale - 40% \pm medium light to medium gray siltstone - 20% grayish red shale; 10% dark gray shale; sandstone fragments; dark brownish gray shale fragments; local calcareousness (as 2940-2950)!.
2970 - 2980	As 2960 - 2970'.
2980 - 2990	As 2960 - 2970; general gray siltstone.
2990 - 3000	As 2960 - 2970'; no dark gray, but 50% greenish gray to light gray siltstone.
3000 - 3010	Siltstone/Shale - 50% grayish red shale soft; micaceous; 40% siltstone = as 2960 - 2970' and 10% dark gray micaceous shale - as above. Sample still slightly calcareous.

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(feet)

3010 - 3020	As 3000 - 3010'.
3020 - 3030	As 3000 - 3010'.
3030 - 3040	As 3000 - 3010; 1% reddish brown shale.
3040 - 3050	As 3000 - 3010'.
3050 - 3060	As 3000 - 3010'; 1% dark green shale.
3060 - 3070	As 3000 - 3010'; some very light gray siltstone - hard; 1% dark gr. shale.
3070 - 3080	As 3000 - 3010'.
3080 - 3090	As 3000 - 3010'.
3090 - 3100	Sandstone (crushed) very pale yellowish brown (10YR 6/2); fine to medium, moderately sorted subrounded, clear quartz grains; no cement - probably silica; clean; some calcareousness; 1-3% fine weathered dark gray rock fragments.
3100 - 3110	As 3090 - 3100'.
3110 - 3120	As 3090 - 3100;.
3120 - 3130	As 3090 - 3100'.
3130 - 3140	As 3090 - 3100'.
3140 - 3150	As 3090 - 3100'.
3150 - 3160	As 3090 - 3100'.
3160 - 3170	As 3090 - 3100'.
3170 - 3180	Shale, - 3100- Shale, silty - medium dark gray (N4); worn, soft, calcareous.
3180 - 3190	As 3090 - 3100'.
3190 - 3200	As 3090 - 3100'.
3200 - 3210	As 3090 - 3100'; dark gray.
3220 - 3230	As 10% light gray siltstone to sandstone.
3230 - 3240	Sandstone - as 3090 - 3100'.
3240 - 3250	As 3090 - 3100'.
3250 - 3260	As 3090 - 3100'.
3260 - 3270	Shale, sandy/Limestone - as 3170 - 3180; sandy to silty; 10% small light gray, fine grained limestone fragments.

<u>DEPTH</u> <u>(feet)</u>	
3270 - 3280	As 3260 - 3270'.
3280 - 3290	As 3260 - 3270'.
3290 - 3300	As 3260 - 3270'.
3300 - 3310	As 3260 - 3270'.
3310 - 3320	As 3260 - 3270'.
3320 - 3330	As 3260 - 3270'.
3330 - 3340	Sandstone/Siltstone - 60% sandstone as 3090 - 3100'; 30% siltstone-medium dark gray hard, sandy and 10% shales-dark gray, black and grayish red; pyrite; calcareous.
3340 - 3350	As 3330 - 3340'.
3350 - 3360	As 3330 - 3340'.
3360 - 3370	No sample.
3370 - 3380	Sandstone/Shale - 50% sandstone - 50% dark gray shale to siltstones; 1% pyrite, slight calcareousness.
3380 - 3390	Limestone (crushed) - light olive gray - (5Y 6/1) - silty and sandy; fine grained; worn minute dark gray shale fragments.
3390 - 3400	As 3380 - 3390'.
3400 - 3410	As 3380 - 3390'.
3410 - 3420	As 3380 - 3390'.
3420 - 3430	As 3380 - 3390'.
3430 - 3440	As 3380 - 3390'; equal amounts - medium gray and light brownish gray limestone; also chert fragments; crystalline and possible fossil fragments; sparse "sand".
3440 - 3450	As 3430 - 3440'.
3450 - 3460	As 3430 - 3440'.
3460 - 3470	As 3430 - 3440'.
3470 - 3480	As 3430 - 3440'.
3480 - 3490	Limestones - white, brownish gray (5YR 5/1); medium gray (NS); about equal amounts; occasional quartz grains.
3490 - 3500	As 3480 - 3490'.
3500 - 3510	As 3480 - 3490'.

DEPTH
(feet)

3510 - 3520	As 3480 - 3490'.
3530 - 3530	As 3480 - 3490'.
3530 - 3540	As 3480 - 3490'.
3540 - 3550	As 3480 - 3490'.
3550 - 3560	As 3480 - 3490'.
3560 - 3570	As 3480 - 3490'.
3570 - 3580	As 3480 - 3490'; medium light gray, 1-3% dark gray; moderate reddish brown (10 R 4/6) shale - soft fragment.
3580 - 3590	As 3570 - 3580'.
3590 - 3600	As 3570 - 3580'.
3600 - 3610	As 3570 - 3580'; dark reddish brown (10R 3/4) shale fragment.
3610 - 3620	As 3600 - 3610'.
3620 - 3630	As 3600 - 3610'; dark gray and reddish brown shale fragments.
3630 - 3640	As 3620 - 2630'.
3640 - 3650	As 3630 - 3640'; sparse shale.
3650 - 3660	As 3640 - 3650'.
3660 - 3670	As 3640 - 3650'.
3670 - 3680	As 3640 - 3650'; 1% reddish brown shale.
3680 - 3690	As 3670 - 3680'.
3690 - 3700	As 3670 - 3780'.
3700 - 3710	<u>Limestone - as 3670 - 3680'; no shale.</u>
3710 - 3720	As 3670 - 3680'.
3720 - 3730	As 3670 - 3680'.
3730 - 3740	As 3670 - 3680'.
3740 - 3750	As 3670 - 3680'.
3750 - 3760	As 3670 ---3680'; medium dark gray (N4) limestone fragments - fine grained, no fossils.
3760 - 3770	As 3670 - 3680'.
3770 - 3780	As 3670 - 3680'.

DEPTH
(feet)

3780 - 3790	As 3670 - 3680'.
3790 - 3800	Limestone - light brownish gray (5YR 6/1); fine-grained, no fossils; 1% dark gray shale-soft, weathered fragments.
3800 - 3810	As 3790 - 3800'.
3810 - 3820	As 3790 - 3800'; sparse white limestone fragments.
3820 - 3830	As 3790 - 3800'.
3830 - 3840	As 3790 - 3800'.
3840 - 3850	As 3790 - 3800'.
3850 - 3860	As 3790 - 3800'.
3860 - 3870	As 3790 - 3800'.
3870 - 3880	As 3790 - 3800'.
3880 - 3890	As 3790 - 3800'.
3890 - 3900	As 3790 - 3800'; Crinoid stems.
3900 - 3910	As 3790 - 3800'; no fossils.
3910 - 3920	As 3790 - 3920'; 1-3% whitels.
3920 - 3930	As 3790 - 3800'; dark gray shale fragments.
3930 - 3940	As 3790 - 3800'.
3940 - 3950	As 3790 - 3800'.
3950 - 3960	As 3790 - 3800'.
3960 - 3970	As 3790 - 3800'.
3970 - 3980	Limestone - brownish gray (5YR 4/1); fine grained; light brownish gray (5YR 6/1); 10% reddish brown shale fragment.
3980 - 3990	50% brownish gray and 50% light brown gray.
3990 - 4000	As 3980 - 3990'.
4000 - 4010	Light brownish gray - coarse (?) grained, fossiliferous; silty and dark gray - fine grained none fossiliferous; silty; some white limestone/dark gray shale fragments.
4010 - 4020	As 4000 - 4010'; dark gray siltstone.

DEPTH
(feet)

4020 - 4030	Siltstone/Limestone - dark gray (N3) siltstone 85% - hard, sandy; calcareous; fragment "white" coarse grained sandstone; limestone as 4000 - 4010'.
4030 - 4040	Siltstone/Limestone - 70% siltstone; 30% limestone as 4020 - 4030'.
4040 - 4050	As 4030 - 4040'; pyrite.
4050 - 4060	As 4030 - 4040'.
4060 - 4070	As 4030 - 4040; red brown shale.
4070 - 4080	As 4030 - 4040'.
4080 - 4090	Siltstone/Sandstone - as 4030 - 4040'; no limestone, except as crushed rock powder; 45% sandstone light brownish gray; fine to medium, poorly sorted; clear, subangular and angular grains, crushed; local mica.
4090 - 4100	As 4080 - 4090'.
4100 - 4110	Sandstone/Siltstone - 60% and 40% siltstone as 4080 - 4090'; calcareous pyrite.
4110 - 4120	Siltstone - medium gray (N5) - hard, "gritty" ie, sandy; 30% \pm crushed sandstone; crystalline limestone fragments; calcareous.
4120 - 4130	As 4120 - 4130; dark gray siltstone - shale.
4130 - 4140	As 4120 - 4130; reddish brown shale fragment; pyrite.
4140 - 4150	Limestone (crushed) light olive gray (5Y 6/1) no details; sparse quartz, grains; shale - siltstone fragments - fine dark gray, worn.
4150 - 4160	As 4140 - 4150'; 10% dark gray siltstone.
4160 - 4170	As 4140 - 4150'.
4170 - 4180	As 4140 - 4150'.
4180 - 4190	As 4140 - 4150'.
4190 - 4200	50% light olive gray limestone; 40% dark gray limestone; 10% mixture fragments of white and very light brownish gray limestone; quartz and chert grains.
4200 - 4210	Sandstone/Limestone/Siltstone - equal amounts - sandstone as 4080 - 4090; limestone as above and siltstone as 4020 - 4030'.
4210 - 4220	<u>Sandstone/Siltstone - as 4200 - 4210'; 50% each, traces of limestone;</u> 5 <u>sample calcareous.</u>
4220 - 4230	Siltstone/Sandstone - 60% siltstone; 40% sandstone as 4200 - 4210; calcareous.

DEPTH
(feet)

4230 - 4240	As 4220 - 4230'.
4240 - 4250	As 4220 - 4250'.
4250 - 4260	50% siltstone and 50% sandstone; as 4020 - 4030' and 4080 - 4090'; fragments white and light gray limestone.
4260 - 4270	As 4250 - 4260'.
4270 - 4280	As 4250 - 4260'; 30% ± sandstone.
4280 - 4290	As 4250 - 4260'.
4290 - 4300	As 4250 - 4260'; small worn fragments, reddish brown shale.
4300 - 4310	Siltstone/Sandstone/Limestone - equal amounts each as 4250 - 4260'; and limestone as 3970 with various colored fragments of other limestone.
4310 - 4320	As 4300 - 4310'.
4320 - 4330	As 4300 - 4310'.
4330 - 4340	As 4300 - 4310'.
4340 - 4350	Siltstone/Limestone - 50% each with quartz "sand" grains, fine shale fragments.