

MISSISSIPPIAN

Price = Borden (KY.), Grainger (Tn.), Pocono (W.Va.)

4760-4805 Shale dark grey, silty, carbonaceous, micaceous, pyritic.

Big Stone Gap = Sunbury (Ky, Oho, W. Va.), Chattanooga (Tn)

4805-41 Shale, dark grey/ grey black, silty, micaceous.

Devonian Shale = Ohio (Ky, Oh, W.Va.)

4841-90 Shale, brown grey, fairly silty, micaceous, highly calcareous, 12% interbedded, siltstone, medium grained, argillaceous 10% Shale, grayish-black, silty, scattered pyritic.

4890-4938 Shale, medium grained, silty, micaceous, pyritic 10% interbedded, Shale, grayish-black, silty micaceous, 12% interbedded siltstone as above, trace fossiliferous

4938-5000 Shale, as above 18% siltstone, as above. 12% interbedded siltstone, as above.

5000-5010 Missing

5010-5070- Shale medium grained, silty, micaceous, slightly pyritic 50% interbedded siltstone, medium grained, argillaceous, slightly calcareous, slightly sandy.

5070-5150 Shale, as above 45% interbedded siltstone, medium grained, slightly sandy.

5150-5220 Shale, as above 25% interbedded sandstone, light gray, very fine grained/ silty, argillaceous, very slightly and partly dolomitic, micaceous 35% interbedded, siltstone, medium gray, argillaceous, slightly sandy/fairly sandy.

5220-5283 Sandstone, light gray, very finely grained, silty, hard, very slightly & partly dolomitic 30% interbedded shale, as above. 30% interbedded siltstone, medium/ dark gray, argillaceous, sandy.

5283-5303 Shale, dark gray, silty, micaceous, pyritic, 20% interbedded sandstone, as above 15% interbedded siltstone, as above.

5303-5360 Shale medium gray /brownish - gray, silty, micaceous, pyritic, 30% interbedded sandstone, light gray/white, very finely grained, hard, argillaceous, silty, 20% interbedded siltstone, light/ medium-gray, argillaceous, sandy

5360-5418 Shale, grayish-black, silty, micaceous, pyritic, 15% interbedded Shale, dark gray, silty, micaceous 25% interbedded sandstone, as above. 25% interbedded siltstone, as above.

5418-5443 Shale; grayish-black, silty, micaceous 30% interbedded shale, medium gray/brownish-gray, silty, micaceous, pyrite and spores.

5443-5476 Shale, grayish-black, silty, micaceous 5% interbedded shale, brownish-gray, silty, trace spores.

- 5476-5500 Shale, medium gray/brownish-gray, silty, micaceous, pyritic 60% shale, grayish-black, silty, trace spores.
- 5500-5610 Shale, medium gray/brownish-gray, silty, micaceous, pyritic 18% interbedded shale, grayish-black, silty, micaceous, 18% interbedded sandstone, light gray, very finely grained/silty, argillaceous, 18% interbedded siltstone, medium/dark gray, argillaceous, sandy. Trace fossiliferous - Brachiopods (5560-70), conodont (5580-90)
- 5610-5760 Missing.
- 5760-5830 Shale, grayish-black/black, silty, micaceous, pyritic 15% interbedded siltstone, dark gray, argillaceous. scattered calcite-filled fractures. (5780-90)
- 5830-40 Missing.
- 5840-5890 Shale, as above, 15% interbedded shale, medium gray/brownish-gray, silty, 15% interbedded siltstone, medium gray, argillaceous, scattered calcite-filled fractures.
- 5890-5945 Shale, brownish-gray, medium gray, silty, micaceous, slightly pyritic, 20% interbedded shale, grayish-black/black, silty, 20% interbedded siltstone, medium gray, argillaceous, trace fractures.
- 5945-60<sup>2</sup>~~30~~ Shale, grayish-black/black, silty, micaceous, 10% interbedded siltstone, medium gray, argillaceous, slightly calcareous, fossiliferous, pyritic & spores.
- 60<sup>2</sup>~~30~~-6078 Shale, medium gray, silty, micaceous, pyritic 10% interbedded siltstone, medium gray, argillaceous, slightly calcareous, fossiliferous, 10% interbedded shale, grayish-black/black, silty, scattered brachiopods.
- 6078-6081 METABENTONITE<sup>white</sup>, white, micaceous.
- 6081-6130 Shale, medium gray, silty, slightly calcareous, micaceous, pyritic, 8% interbedded shale, black, silty. 15% interbedded siltstone, medium gray, argillaceous, slightly calcareous. scattered fossil fragments, mostly brachiopods, scattered mentabentonite, light gray/white, micaceous.
- 6130-6200 Shale, medium gray/brownish-gray, silty, slightly calcareous, micaceous, pyritic; scattered brachiopods & conodonts. 10% interbedded shale, black, silty. 15% interbedded siltstone, medium gray, argillaceous, slightly calcareous.
- 6200-6244 Shale, as above 10% interbedded siltstone, as above 5% interbedded black shale, as above.
- 6244-6247 Metabentonite, white, micaceous.
- 6247-6282 Shale, as above, 10% interbedded siltstone, medium gray, argillaceous, slightly calcareous, 5% interbedded shale, black silty, trace brachiopods.

Olanth sh

6282-6375 Shale, brownish-black, silty, micaceous, pyritic, slightly fossiliferous. 2% streaks of siltstone, medium gray, argillaceous; trace brown micaceous flakes at the base.

Tioga

6375-6378 Metabentonite, light gray, dirty, micaceous.

6378-6410 Shale, as above.

Onondaga

6410-6455 Limestone, white/light gray/yellowish-gray, micro crystalline, argillaceous, fossiliferous, 15% chert, light gray/white, translucent; trace glauconite. Trace fossils.

Wild Cat Valley

6455-6500 Sandstone, white, subangular, fairly/poorly sorted, with cement, hard, calcareous, glauconitic, fossiliferous, pyritic, 40% chert, white, translucent/opaque. Corals, brachiopods, ostracods.

Helderberg

6500-6520 Limestone, light brown/pale brown, micro crystalline, argillaceous, fossiliferous. scattered coarse sandgrains. 2% chert, white translucent. Streaks of medium gray, micaceous shale. Brachiopods, ostracods.

SILURIAN

Hancock

6520-6580 Dolomite, dusky brown/dark brown, cr pto crystalline, argillaceous, 35% interbedded limestone, dusky brown, lithographic, argillaceous. This limestone resembles Upper Silurian limestone of West Virginia.

Ben 129  
Prater

OPERATOR: Columbia Gas Transmission Corp.  
 FARM: John W. Pobst et al  
 WELL NO. 9722-T  
 LOCATION: Buchanan County  
 450' S. of 37°-10'  
 4900' W. of 82°-07'-30"  
 ELEVATION: 1670. 86' GR.  
 TOTAL DEPTH: 9296'  
 DRILLING COMMENCED: December 11, 1972  
 WELL COMPLETED: January 13, 1973  
 RESULT: Dry Hole

WELL LOG

<u>DEPTH</u> <u>(feet)</u>	
0 - 300	No Samples.
300 - 310	Siltstone - medium dark gray (N4) -(5%)slightly micaceous, hard.
310 - 320	No sample.
320 - 330	As 300 - 310'.
330 - 340	As 300 - 310'.
340 - 350	Sandstone - medium light gray (N5.5); medium to coarse grained, moderate sorting, subrounded grains, clear; feldspathic - moderately; micaceous - 5-10% (green and brown); hard; and siltstone (10%) medium dark gray - micaceous; hard.
350 - 360	As 340 - 350; rare siderite grains.
360 - 370	Siltstone - as 300 - 310; sandstone - (5%) - medium light gray.
370 - 380	As 360 - 370'.
380 - 390	Dark gray (N3) - hard, fissile and sandstone (10%) - medium dark gray - fine to medium, moderate sorting, subangular, clear grains; feldspathic; micaceous (10%) - green and brown; trace porosity.
390 - 400	Siltstone - medium gray (N5) - slightly micaceous; hard; calcareous; grain size increasing toward depth.
400 - 410	Sandstone - medium light gray (N6) - fine to very coarse grained, subangular, moderate sorting, clear grains; calcareous (cement); moderate; micaceous.

DEPTH  
(feet)

410 - 420	Siltstone - as 390 - 400'.
420 - 430	Sandstone - as 400 - 410; calcareous.
430 - 440	As 400 - 410'.
440 - 450	As 400 - 410'; (N6.5) rare calcareous.
450 - 460	As 400 - 410'; ironoxide particles.
460 - 470	Sandstone, crushed - medium light gray (N6); fine to coarse grained, moderate sorting; subangular clear grains; no calareous-cement; sparse feldspar; rare micas.
470 - 600	No samples.
600 - 610	Siltstone - medium gray (N5); micaceous; hard; no porosity; coal fragments.
610 - 620	Sandstone, crushed - medium light gray (N6) - fine to coarse grain- ed; moderate sorting; angular and subangular clear grains; rare mica; iron oxide particles; rare feldspar; (no cement).
620 - 630	As 610 - 620'.
630 - 650	No sample.
650 - 660	Sandstone - as 610 - 620; 45% siltstone - dark gray (N3), ground micaceous, hard.
660 - 670	No sample.
670 - 680	Sandstone -- as 650 - 660'.
680 - 690	As 650 - 660'.
690 - 700	As 650 - 660'.
700 - 710	As 650 --660'.
710 - 720	As 650 - 660'.
720 - 760	No sample.
760 - 770	Siltstone - medium dark gray (N4) - <u>hard</u> ; very rare mica; sand- stone, crushed as 610 - 620'.
770 - 780	Dark gray (N3) - hard; very rare mica; slight porosity; coal; and sandstone - as 610 - 620'; calcareous.
780 - 800	No sample.

DEPTH  
(feet)

800 - 810	Sandstone, crushed, shaly - light gray (N7) - fine grained, moderate sorting, subangular clear grains; sparsely clacareous cement, micaceous; iron oxide particles; and siltstone (40%) as 770 - 780';
810 - 820	As 800 - 810'.
820 - 830	As 800 - 810'.
830 - 840	As 800 - 810'.
840 - 850	As 800 - 810'.
850 - 860	As 800 - 810'; (20%) siltstone, decreasing calcite; increasing amounts of silica as cement.
860 - 870	As 850 - 860'.
870 - 880	Sandstone - very light gray (N8); medium grained; well sorted, angular and subangular clear grains; siliceous cement; very rare mica and iron oxide grains; brittle (breaks); and siltstone - medium dark gjay (N4) - 10% very small fragments.
880 - 890	As 870 - 880'; medium to very coarse grained, moderately sorted; and 15% siltstone.
890 - 900	As 880 - 890'; 5% siltstone.
900 - 910	No sample.
910 - 920	Sandstone - light gray (N 6.5) - very fine to coarse grained, moderate sorting, subangular and angular clear grains; siliceous; very rare mica and iron oxide; and 10% siltstone - as 770 - 780'.
920 - 930	No sample.
930 - 940	As 910 - 920'; very light gray (N8) sparse weathered feldspar, micaceous and 10% siltstone.
940 - 950	No sample.
950 - 960	As 910 - 920'; light olive gray (5Y 6/1).
960 - 970	As 930 - 940'.
970 - 980	As 930 - 940'.
980 - 1010	No samples.

<u>DEPTH</u> <u>(feet)</u>	
1010 - 1020	As 930 - 940'.
1020 - 1030	As 930 - 940'.
1030 - 1040	Siltstone - olive gray (5Y 4/1); soft; micaceous and (40% $\pm$ ) sandstone - as 930 - 940 - (interbedded - from fragments).
1040 - 1050	As 1030 - 1040'; sandstone - fine grained and soft.
1050 - 1110	No sample.
1110 - 1120	Sandstone, silty - light olive gray (5Y 6/1); fine grained, well sorted, subangular, clear grains; siliceous; soft; mica; iron oxide; and (35%) siltstone - soft; micaceous.
1130 - 1140	As 1110 - 1120'.
1140 - 1160	No sample.
1160 - 1170	Siltstone and sandstone - interbedded; coal - siltstone - dark gray (N3) - hard; micaceous; slight porosity; some fissility, and (30%) sandstone - as 1110 - 1120'; fine to coarse grained, moderate sorting; slight porosity; hard; coal.
1170 - 1190	No samples.
1190 - 1200	Siltstone and sandstone (50% each) interbedded as 1160 - 1170'.
1210 - 1220	As 1190 - 1200'.
1230 - 1240	As 1190 - 1200'.
1240 - 1280	No samples.
1280 - 1290	As 1190 - 1200', sandstones - darker and coarser in places.
1290 - 1330	No samples.
1330 - 1340	As 1280 - 1290'; sparse coal.
1340 - 1350	As 1330 - 1340'.
1350 - 1360	As 1330 - 1340'.
1360 - 1370	As 1330 - 1340'; abundant coal.
1370 - 1380	No samples.
1380 - 1390	As 1380 - 1390'; underclay - shickenslides and churned.
1390 - 1700	No samples.

DEPTH  
(feet)

1700 - 1710	Sandstone - light olive gray (5Y 6/1) - fine to coarse grained, moderate sorting, angular clear grains; siliceous; sparse micas (Gr. and Br.) soft (brittle?) fair porosity; and siltstone (5% $\pm$ ) dark gray (N3) - soft; micaceous.
1710 - 1720	As 1700 - 1710'; very rare iron oxide grains.
1720 - 1730	No sample.
1730 - 1740	As 1700 - 1710';
1740 - 1750	As 1700 - 1710, light gray (7.5) sandstone; (10%) siltstone.
1750 - 1760	As 1740 - 1750; slate.
1760 - 1940	No samples.
1940 - 1950	Sandstone, shaly - olive gray (5Y 5/1) - fine to medium grained, moderate sorting; angular clear grains; brittle; porous; siliceous and (50 $\pm$ ) siltstone/shale - as 1700 - 1710'.
1950 - 1960	Siltstone, sandy - as 1940 - 1950'; larger fragments.
1960 - 1970	Sandstone, sandy - as 1940 - 1950'; 25% siltstone.
1970 - 1980	As 1740 - 1750'.
1980 - 1990	As 1940 - 1950'; 15% siltstone.
1990 - 2000	No sample.
2000 - 2010	Siltstone - medium dark gray (N4); hard; some fissility; sparse coal with scattered fossil rock and leaf fragments; and some (3%) sandstone fragments - as 1940 - 1950'.
2020 - 2030	Shale, calcareous - light olive gray (5Y 7/1); broken/weathered; soft; calcareous; 20% sand grains mixed - F-C sizes; and siltstone fragments - dark gray; hard; calcite from argillaceous limestone.
2030 - 2040	As 2020 - 2030'.
2040 - 2050	As 2020 - 2030'; "red shale" - light brownish gray (5 YR 6/1).
2050 - 2060	As 2040 - 2050'.
2060 - 2070	As 2040 - 2050'; (5YR 5/1) brownish gray.
2070 - 2080	As 2040 - 2050'; (5R 6/2) pale red.
2080 - 2090	As 2070 - 2080'.
2090 - 2100	As 2070 - 2080'.



DEPTH  
(feet)

2100 - 2110	As 2070 - 2080'.
2110 - 2120	As 2070 - 2080'.
2120 - 2130	As 2070 - 2080'.
2130 - 2140	As 2040 - 2050'.
2140 - 2150	As 2040 - 2050'.
2150 - 2160	As 2020 - 2030'.
2160 - 2170	As 2020 - 2030'.
2170 - 2180	As 2020 - 2030'.
2180 - 2190	Limestone, argillaceous - light olive gray (5Y 6/1); cryptograined; with grains of quartz; fragments red and dark gray shales.
2190 - 2200	As 2180 - 2190'.
2200 - 2210	As 2180 - 2190'.
2110 - 2220	As 2180 - 2190'.
2220 - 2230	Shale, calcareous - light olive gray (5Y 7/1); soft; calcareous; sand (quartz) grains; black and red siltstones.
2230 - 2240	As 2220 - 2230'; iron oxide.
2240 - 2250	As 2220 - 2230'.
2250 - 2260	No sample.
2260 - 2270	As 2220 - 2230'.
2270 - 2280	As 2220 - 2230'.
2280 - 2290	Shale - dark gray (N3) - hard; sparsely carbonaceous; fissile; very local calcareousness.
2290 - 2300	As 2280 - 2290'.
2300 - 2310	As 2280 - 2290'.
2310 - 2400	As 2280 - 2290'.
2400 - 2410	As 2280 - 2290'; locally pyritic.
2410 - 2420	As 2280 - 2290'.
2420 - 2430	No samples.
2430 - 2440	As 2280 - 2290'.

DEPTH  
(feet)

2240 - 2250	As in 2280 - 2290'.
2450 - 2460	As in 2280 - 2290'.
2460 - 2470	As in 2280 - 2290'.
2470 - 2480	As in 2280 - 2290'.
2480 - 2490	No samples.
2500 - 2510	As 2280 - 2290'.
2510 - 2520	As 2280 - 2290'.
2520 - 2530	As in 2280 - 2290'.
2530 - 2570	No samples.
2570 - 2580	Sandstone - light (olive) gray (5Y 6/1) very fine to medium grained, well sorted; subrounded with some frosting of grains; siliceous - moderately sparsely calcareous; hard; 10% small fragments red and black shale.
2580 - 2590	As 2570 - 2580'.
2590 - 2600	As 2570 - 2580'; iron stains - contamination; coarse grained.
2600 - 2610	As 2570 - 2580'; subangular and subrounded grains; iron stains; very sparse shale fragments.
2610 - 2620	As 2600 - 2610';
2620 - 2630	As 2600 - 2610'.
2630 - 2640	As 2600 - 2610'.
2640 - 2650	Limestone - medium light gray (N6) - cryptograined; with grains of shales - red, black.
2650 - 2660	As 2640 - 2650'; light gray (N7).
2660 - 2670	As 2640 - 2650'.
2670 - 2680	As 2649 - 2650'.
2680 - 2690	As 2640 - 2650'.
2690 - 2700	As 2640 - 2650'.
2700 - 2710	As 2640 - 2650'.
2710 - 2720	Sandstone - medium light gray (N6) very fine to medium grained, well sorted, subrounded clear grayish - green grains; siliceous; <u>hard</u> ; local mica; moderate porosity; iron oxide particles and stains.

<u>DEPTH</u> <u>(feet)</u>	
2720 - 2730	As 2710 - 2720'.
2730 - 2740	As 2710 - 2720'.
2740 - 2750	No sample.
2750 - 2760	Shale - dark gray (N3) - hard; fissile; and 20% dark grayish red (5R 3/2) soft; 30% $\pm$ QUARTZ grains of various sizes; fissile.
2760 - 2770	Sandstone - as 2710 - 2720'; and shale (10% $\pm$ ) as 2750 - 2760'.
2770 - 2780	As 2710 - 2720'; crushed;
2790 - 2800	As 2710 - 2720'.
2800 - 2810	As 2760 - 2770'; red and black shale - 20% $\pm$ each.
2810 - 2820	As 2800 - 2810'; 10% each shale
2820 - 2830	Shale - grayish brown (5YR 3/2); hard; very sparse mica.
2830 - 2840	Limestone - medium gray (N 4.5) calcareous; micrograined; impure, grading into siltstone - gray and red; sand sparse sandstone- medium gray fragments.
2840 - 2850	Shales - medium olive gray (5Y 5/1) 50% each dark gray and red shale; soft; slightly calcareous; micaceous, especially the red; fissile; porous; and some quartz grains probably included in shales.
2850 - 2860	As 2840 - 2850'; some sandstone fragments; fine grained, medium gray; "dirty" (silty); ofssile fragments (very!) on gray shale/siltstone.
2860 - 2870	Sandstone, silty - olive gray (5Y 4/1); fine grained; poorly sorted; sparsely micaceous; locally pyrite; local coal; local grading to siltstone; no calcareousness; iron staining; fossil prints in some coal.
2870 - 2880	No sample.
2880 - 2890	As 2860 - 2870'; (seems to be a light and dark gray sandstone - interbedded with a siltstone).
2880 - 2890	As 2860 - 2870; mostly sandstone; less impurities.
2900 - 2910	As 2890 - 2900'.
2910 - 2920	As 2890 - 2900'.
2920 - 2930	As 2890 - 2900'.
2930 - 2940	As 2890 - 2900'.

DEPTH  
(feet)

2940 - 2950	As 2890 - 2900'; 50% siltstone medium dark gray (N4); hard; micaceous; some fissilty.
2950 - 2960	Siltstone.
2960 - 2970	Sandstone - very light olive gray (5Y 7/1) - fine to medium grained, well sorted; subrounded clear grains; clean; hard (in clasts-but breaks up); siliceous.
2970 - 2980	As 2960 - 2970'.
2980 - 2990	As 2960 - 2970'.
2990 - 3000	As 2960 - 2970'.
3000 - 3010	As 2960 - 2970'.
3010 - 3020	Shale - medium gray (N5) - calcareous; hard some local areas <u>not</u> calcareous.
3020 - 3030	As 3010 - 3020'.
3030 - 3040	Shale - medium dark gray (N4) hard; not calcareous.
3040 - 3050	As 3030 - 3040'.
3050 - 3060	As 3030 - 3040'.
3060 - 3070	As 3030 - 3040'; (10% $\pm$ ). Sandstone/conglomerate.
3070 - 3080	No sample.
3080 - 3090	Sandstone - very light olive gray (5Y 7/1) very fine grained; well sorted; subrounded clear grains; clean; siliceous and (35-40%) <u>shale</u> as 3030 - 3040'.
3090 - 3100	As 3080 - 3090'; (20%) shale.
3100 - 3110	As 3090 - 3100'.
3110 - 3120	As 3090 - 3100'.
3120 - 3130	Sandstone - as 3080 - 3090'; fine to medium grained; sparse small shell fragments and iron oxide particles and fragments; very sparse shale.
3130 - 3140	As 3120 - 3130'.
3140 - 3150	As 3120 - 3130'; silty in areas; small fragments sandy limestone with fossil print (leaf).

DEPTH  
(feet)

3150 - 3160	As 3120 - 3130'.
3160 - 3170	As 3080 - 3090'; fine to coarse; (20%) <u>shale</u> .
3170 - 3180	Siltstone - medium dark gray (N4) - hard; limited fissility and grading into sandstone; with clasts - sandstone (white - as 3080 - 3090').
3180 - 3190	As 3170 - 3180'.
3190 - 3200	As 3170 - 3180'.
3200 - 3210	Sandstone - very light olive gray (5Y 7/1); fine to medium grained; moderate sorting, subrounded clear grains; siliceous; clean and <u>shale</u> - reddish gray, black in minute sparse fragments).
3210 - 3220	No sample.
3220 - 3230	As 3200 - 3210'.
3230 - 3250	No samples.
3250 - 3260	Limestone, sandy - medium dark gray (N4) micrograined; assorted sizes quartz grains grading into sandstone, carbonaceous - medium dark gray poorly sorted; carbonaceous.
3260 - 3270	No samples.
3300 - 3310	Sandstone - as 3200 - 3210'.
3310 - 3320	As 3200 - 3210'; with (20%) siltstone-micaceous; soft.
3320 - 3330	Siltstone - medium dark gray (N4); hard; some fissility; micaceous; local pyrite; locally calcareous.
3330 - 3340	As 3320 - 3330'.
3340 - 3350	As 3320 - 3330'; calcareous.
3350 - 3360	No sample.
3360 - 3370	As 3340 - 3350'.
3370 - 3380	As 3340 - 3350'; fragments - fine grained; soft, white sandstone; pyrite.
3380 - 3390	
3390 - 3400	As 3370 - 3380'.
3400 - 3410	Sandstone - light gray (N7) - fine to medium grained, poor sorting; subrounded grains; siliceous; hard; and (10%) siltstone - reddish brown gray (5YR 4/1); soft; iron oxide particles and stain contamination.
3410 - 3420	As 3400 - 3410'; (10%) black siltstone; calcareous - contamination from up well - not on any clasts.

DEPTH  
(feet)

3420 - 3430 As 3410 - 3420'.

3430 - 3440 As 3410 - 3420'.

3440 - 3450 As 3410 - 3420'; some red siltstone, pyrite.

3450 - 3460 As 3410 - 3420'.

3450 - 3470 Shale - dark gray (N3) - soft; fissile; and sandy limestone (might be a limestone WF laminae of shale; quartz grains) (crushed and semi-crushed) - quartz grains - fine to medium.

3470 - 3480 As above.

3480 - 3490 As above.

3490 - 3500 As above.

3500 - 3510 As 3460 - 3470'; actual limestone

3510 - 3520 As 3500 - 3510'.

3520 - 3530 As 3500 - 3510'.

3530 - 3540 As 3500 - 3510'.

3540 - 3550 No sample.

3550 - 3560 Limestone, argillaceous - light olive gray (5Y 6/1); sparse small fragments; and shale; calcareous - dark gray (N3) soft; fissile interbedded.

3560 - 3570 As 3550 - 3560; no shale.

3570 - 3580 As 3560 - 3570'; calcite crystals.

3580 - 3590

3590 - 3610 No samples.

3610 - 3620 Limestone - light olive gray (5Y 6/1); to light gray (N7); crushed; cryptograined; fossil fragment; pyrite (local).

3620 - 3630 As 3610 - 3620'.

3630 - 3640 As 3610 - 3620.

3640 - 3650 As 3610 - 3620'.

3650 - 3660 As 3610 - 3620'; brownish gray (5YR 4/1).

DEPTH  
(feet)

3660 - 3670 As 3650 - 3660'.  
3670 - 3680 As 3650 - 3660'.  
3680 - 3690 As 3610 - 3620'; medium gray.  
3690 - 3700 As 3680 - 3690'; grayish red shale fragments.  
3700 - 3710 As 3680 - 3690'; (1) fragment greenish gray sandstone.  
3710 - 3720 As 3680 - 3690'; some quartz grains - fine to coarse.  
3720 - 3730 No sample.  
3730 - 3740 As 3650 - 3660'; brownish gray.  
3740 - 3750 As 3650 - 3660' (or 3730 - 3740'.)  
3750 - 3760 As 3610 - 3620'; light gray.  
3760 - 3770 As 3610 - 3620' ( or 3750 - 3760'.)  
3770 - 3780 As 3610 - 3620'.  
3780 - 3790 As 3610 - 3620'.  
3790 - 3800 No sample.  
3800 - 3810 As 3610 - 3620'; light olive gray.  
3810 - 3820 As 3800 - 3810'.  
3820 - 3830 As 3800 - 3810'.  
3850 - 3860 As 3800 - 3810'.  
3860 - 3870 As 3800 - 3810'.  
3870 - 3880 As 3800 - 3810'.  
3880 - 3890 No sample.  
3890 - 3900 As 3800 - 3810'.  
3900 - 3910 As 3610 - 3620'.  
3900 - 3920 As 3900 - 3910'; some crystalline matter.  
3920 - 3930 As 3900 - 3910'.  
3930 - 3940 As 3900 - 3910'.  
3940 - 3950 As 3900 - 3910'.

DEPTH  
(feet)

3950 - 3960	As 3900 - 3910'.
3960 - 3970	As 3900 - 3910'.
3970 - 3980	As 3900 - 3910'.
3980 - 3990	As 3900 - 3910'.
3990 - 4000	As 3900 - 3910'; (25% $\pm$ ) fragments - rounded, crystalline limestone very hard.
4000 - 4010	As 3990 - 4000'.
4010 - 4020	As 3990 - 4000'.
4020 - 4030	As 3990 - 4000'.
4030 - 4040	As 3990 - 4000'.
4040 - 4050	As 3990 - 4000'; (40% $\pm$ ) crystalline limestone fragments.
4050 - 4060	As 3900 - 3910'.
4060 - 4070	As 3900 - 3910'.
4070 - 4080	As 3900 - 3910'.
4080 - 4090	As 3900 - 3910'.
4090 - 4100	As 3900 - 3910'.
4100 - 4110	As 3900 - 3910'.
4110 - 4120	As 3900 - 3910'.
4120 - 4130	As 3900 - 3910'.
4130 - 4140	As 3900 - 3910'.
4140 - 4150	As 3900 - 3910'.
4150 - 4160	As 3900 - 3910'.
4160 - 4170	Shale - grayish-red (10R 4/2) moderately hard; sparsely micaceous; sandstone fragments/quartz grains; calcareous (contaminated?).
4170 - 4180	As 4160 - 4170'.
4180 - 4190	As 4160 - 4170'.
4190 - 4200	As 4160 - 4170'.



DEPTH  
(feet)

4200 - 4210	As 4160 - 4170'.
4210 - 4220	As 4160 - 4170'.
4220 - 4230	As 4160 - 4170'.
4230 - 4240	As 4160 - 4170'.
4240 - 4250	As 4160 - 4170'.
4250 - 4260	Shale, silty - medium light gray (N6) sparsely micaceous; local pyrite; hard; siltstone interbedded and grading into sandy shales/siltstones, calcareous (contamination?).
4260 - 4270	As 4250 - 4260; fissile.
4270 - 4280	Siltstone - as 4250 - 4260'; sparse shale; stains.
4280 - 4290	As 4270 - 4280'.
4290 - 4300	As 4270 - 4280'.
4300 - 4310	As 4270 - 4280'.
4310 - 4320	As 4270 - 4280; light olive gray (5Y 5/2) A greenish gray -; with moderate amounts light gray fine grained sandstone.
4320 - 4330	As 4310 - 4320'.
4330 - 4340	As 4320 - 4330'.
4340 - 4350	Shale, silty as 4250 - 4260 - light gray (N7); not calcareous.
4350 - 4360	As 4340 - 4350'.
4360 - 4370	As 4340 - 4350'.
4370 - 4380	
4380 - 4390	As 4340 - 4350'.
4380 - 4390	
4390 - 4400	As 4340 - 4350'.
4400 - 4410	Sandstone - light olive gray (5Y 6/1); fine to coarse grained, moderately well sorted, subrounded clear grains; calcareous, iron oxide particles and stains; brittle; porous; and sparse shale - dark gray (N3) fragments.
4410 - 4420	As 4400 - 4410'.
4420 - 4430	As 4400 - 4410'.

DEPTH  
(feet)

4430 - 4440 Siltstone - light olive gray (5Y 6/1); soft fissile with sandstone/shale fragments; calcareous.

4440 - 4450 As 4430 - 4440'.

4450 - 4460 As 4430 - 4440'.

4460 - 4470 As 4430 - 4440'; more shale; sparsely calcareous local pyrite.

4470 - 4480 As 4430 - 4440'; medium gray (N5); sandstone; some black shale;

4480 - 4490 As 4470 - 4480'.

4490 - 4500 Siltstone - medium gray (N5) - soft, fissile; sandy; not calcareous; and sandstone fragments - as 4400 - 4410; and (5%) black shale; (10%  $\pm$ ) pyrite nodules.

4500 - 4510 As 4490 - 4500'; medium light gray (N6); micaceous on "Bedding Planes".

4510 - 4520 As 4490 - 4500'.

4520 - 4530 Shale - medium light gray (N6) - fissile; massive; micaceous on cleavage.

4530 - 4540 As 4520 - 4530'.

4540 - 4550 As 4520 - 4530'.

4550 - 4560 As 4520 - 4530'; iron particles; sandstone grains/fragments.

4560 - 4570 As 4520 - 4530'.

4570 - 4590 No samples.

4590 - 4600 As 4520 - 4530'.

4600 - 4620 No sample.

4620 - 4630 As 4520 - 4530'; sandstone fragments.

---

4640 - 4650 As 4620 - 4630'.

4650 - 4660 As 4620 - 4630'.

4660 - 4670 As 4520 - 4530'.

4670 - 4680 As 4520 - 4530'.

4680 - 4690 As 4520 - 4530'.

4690 - 4700 As 4520 - 4530'.

4700 - 4710 As 4520 - 4530'.

DEPTH  
(feet)

4710 - 4720	As 4520 - 4530'.
4720 - 4730	As 4520 - 4530'.
4740 - 4760	No Samples.
4760 - 4770	As 4520 - 4530'; olive gray (5Y 4/1). ( or grayish black (N2)).
4770 - 4780	As 4760 - 4770'.
4780 - 4790	As 4760 - 4770'.
4790 - 4800	As 4760 - 4770'.
4800 - 4810	As 4760 - 4770'.
4810 - 4820	As 4760 - 4770'; some fragments with thick brown yellow weathering zone; organic (??) fragment.
4820 - 4830	As
4830 - 4840	As
4840 - 4850	(Weathered Shale) - as 4760 - 4770'; sandstone fragments; local pyrite; mica.
4850 - 4860	As 4840 - 4850'; milanerite (oxidation of pyrite).
4860 - 4870	As 4840 - 4850'.
4870 - 4880	As 4840 - 4850'.
4880 - 4890	As 4760 - 4770'; sandy shale and siltstone - medium gray; hard.
4890 - 4900	As 4760 - 4770'.
4900 - 4910	As 4760 - 4770'.
4910 - 4920	As 4760 - 4770'.
4920 - 4930	As 4760 - 4770'.
4930 - 4940	As 4760 - 4770'.
4940 - 4950	As 4760 - 4770'.
4950 - 4960	As 4760 - 4770'.
4960 - 4970	As 4760 - 4770'; sandstone fragments; fragment red siltstone; uncertain.
4970 - 4980	As 4760 - 4770'.

DEPTH  
(feet)

4980 - 4990	As 4760 - 4770'; medium gray siltstone; hard-fragments.
4990 - 5000	As 4760 - 4770'.
5000 - 5010	As 4760 - 4770'.
5010 - 5020	As 4760 - 4770'.
5020 - 5030	As 4760 - 4770'.
5030 - 5040	As 4760 - 4770'.
5040 - 5050	As 4760 - 4770'.
5050 - 5060	As 4760 - 4770'; sandstone, siltstone fragments; pyrite.
5060 - 5070	As 4760 - 4770'.
5070 - 5080	As 4760 - 4770'.
5080 - 5090	As 4760 - 4770'.
5090 - 5100	No sample.
5100 - 5110	As 4760 - 4770'; very fissile.
5110 - 5120	As 4760 - 4770'.
5120 - 5130	As 4760 - 4770'.
5130 - 5140	As 4760 - 3770'.
5140 - 5150	As 4760 - 4770'.
5150 - 5160	As 4760 - 4770'.
5170 - 5180	As 4760 - 4770'.
5180 - 5190	As 4760 - 4770'.
5190 - 5200	As 4760 - 4770'; fragments medium grained, light gray sandstone.
5210 - 5220	As 4760 - 4770'.
5220 - 5230	As 4760 - 4770'.
5230 - 5240	As 4760 - 4770'.
5240 - 5250	As 4760 - 4770'.
5250 - 5260	As 4760 - 4770'.
5260 - 5270	As 4760 - 4770'; sandstone and grains (as 5190-5200) and iron staining; pyrite.

DEPTH  
(feet)

5270 - 5280	As 5260 - 5270'.
5280 - 5290	As 5260 - 5270'; micaceous.
5300 - 5310	As 5290 - 5300'.
5310 - 5320	As 5260 - 5270'.
5320 - 5330	As 5260 - 5270'.
5330 - 5340	As 4760 - 4770'; iron ore fragments.
5340 - 5350	(weathered) dark gray - as 4760 - 4770'; sandstone/siltstone fragments; very soft shale.
5350 - 5360	As 5340 - 5350'.
5360 - 5370	As 5340 - 5350'.
5370 - 5380	As 5340 - 5350'.
5380 - 5390	As 5340 - 5350'.
5390 - 5400	As 5340 - 5350'.
5400 - 5410	As 5340 - 5350'.
5410 - 5420	As 4760 - 4770'; (without the ) sandstone/siltstone.
5420 - 5430	As 4760 - 4770'.
5430 - 5440	As 4760 - 5770'.
5440 - 5450	As 4760 - 4770'.
5450 - 5460	As 4760 - 4770'.
5460 - 5470	As 4760 - 4770'.
5470 - 5480	As 4760 - 4770'.
5480 - 5490	As 4760 - 4770'.
5490 - 5500	As 4760 - 4770'.
5500 - 5510	As 4760 - 4770'.
5510 - 5520	As 4760 - 4770'.
5520 - 5530	As 4760 - 4770'.
5530 - 5540	As 4760 - 4770'.
5540 - 5550	As 4760 - 4770'.
5550 - 5560	As 4760 - 4770'.

DEPTH (feet)	
5560 - 5570	As 4760 - 4770'.
5570 - 5580	As 4760 - 4770'.
5580 - 5590	As 4760 - 4770'.
5590 - 5600	As 4760 - 4770'.
5600 - 5610	As 4760 - 4770'.
5610 - 5760	No samples.
5760 - 5770	Shale - black (N2); hard; some sandy siltstone.
5770 - 5780	As 5760 - 5770'.
5780 - 5790	As 5760 - 5770'.
5790 - 5800	(shale, sandy) - as 5760 - 5770'; pyrite; mica; very sandy (45% <sup>+</sup> ); fragments of sandy siltstone.
5800 - 5810	As 5790 - 5800'.
5810 - 5820	As 5790 - 5800'.
5820 - 5830	As 5790 - 5800'.
5830 - 5840	No sample.
5840 - 5850	As 5790 - 5800'; very coarse grains; iron stained; fragments of siltstone.
5850 - 5860	No sample.
5860 - 5879	Interbedded black shale and siltstone (medium gray); 40% loose quartz grains - very fine to very coarse, subrounded.
5870 - 5880	As 5860 - 5870'; black and medium gray shales; hard, fissile.
5880 - 5890	no sample.
5890 - 5900	As 5860 - 5870'; less "sand".
5900 - 5910	
5910 - 5920	Shale (light gray clay) black - (N2); hard; some fissility; local pyrite nodules and masses; feldspar; sparse siltstone and fragments.
5920 - 5930	As 5910 - 5920'.
5930 - 5940	As 5910 - 5920'.

DEPTH  
(feet)

5940 - 5940	As 5910 - 5920'.
5950 - 5960	Dark Gray "clay" (weathered) - as 4760 - 4770'; sparse pyrite.
5960 - 5970	As 5950 - 5960'.
5970 - 5980	As 5950 - 5960'.
5980 - 5990	As 4760 - 4770'; (no pyrite).
5990 - 6000	As 4760 - 4770'.
6000 - 6010	As 4760 - 4770'.
6010 - 6020	As 4760 - 4770'.
6020 - 6030	As 4760 - 4770'.
6030 - 6040	As 4760 - 4770'.
6040 - 6050	As 4760 - 4770'.
6050 - 6060	Bentonite (light gray clay) as 4760 - 4770'; in color (fresh.
6060 - 6070	As 4760 - 4770'.
6070 - 6080	As 4760 - 4770'.
6080 - 6090	As 4760 - 4770'.
6090 - 6100	As 4760 - 4770'.
6100 - 6110	As 4760 - 4770'.
6110 - 6120	As 4760 - 4770'.
6120 - 6130	As 4760 - 4770'.
6130 - 6140	As 4760 - 4770'.
6140 - 6150	As 4760 - 4770'.
6150 - 6160	No sample.
6160 - 6170	As 4760 - 4770'.
6170 - 6180	As 4760 - 4770'.
6180 - 6190	As 4760 - 4770'.
6190 - 6200	As 4760 - 4770'.

DEPTH  
(feet)

6200 - 6210 As 4760 - 4770'.

6210 - 6220 As 4760 - 4770'.

6220 - 6230 As 4760 - 4770'.

6230 - 6240 As 4760 - 4770'.

6240 - 6250 (weathered) as 4760 - 4770'.

6250 - 6260 As 4760 - 4770'.

6250 - 6260 As 4760 - 4770'.

6260 - 6270 Much clay - bentonite?

6270 - 6280 As 6240 - 6250'.

6280 - 6290 As 6240 - 6250'.

6290 - 6300 As 6240 - 6250'; soft; fissile.

6300 - 6310 As 6240 - 6250'.

6310 - 6320 As 6240 - 6250'.

6320 - 6330 As 6240 - 6250'.

6330 - 6340 As 6240 - 6250'.

6340 - 6350 As 6240 - 6250'.

6350 - 6360 As 6340 - 6350'.

6360 - 6370 As 6340 - 6350'.

6370 - 6380 As 6340 - 6350'.

6380 - 6390 As 6340 - 6350'.

6390 - 6400 As 6340 - 6350'.

6400 - 6410 As 4760 - 4770'.

6410 - 6420 As 4760 - 4770'; pyrite; clacareous?; quartz grains - coarse, angular.

6420 - 6430 As 6410 - 6420'.

(end chat. shale)

6430 - 6440 Limestone - olive gray (5Y 4/1); crushed - probably a cement; and (30-40% shale - black; hard; fragments; fine-medium angular quartz grains and fragments. Chert - white, thin; angular.



DEPTH  
(feet)

6440 - 6450 Sandstone, calcareous - as 6430 - 6440'; fine to medium, poorly sorted, angular clear grains; (unconsolidated).

6450 - 6460 As 6440 - 6450'.

6460 - 6470 As 6440 - 6450'; medium olive gray (5Y 5/1).

6470 - 6480 As 6440 - 6450'; very sparse shale; abundant chert - local pyrite; quartz grains subrounded and subangular, porous sandstone.

6480 - 6490 As 6470 - 6480'.

6490 - 6500 As 6470 - 6480'.

6500 - 6510 As 6470 - 6480'; rounded quartz grains.

6510 - 6520 As 6470 - 6480'; fine to very fine grains quartz; occasional salt

6520 - 6530 As 6510 - 6520'.

6530 - 6540 As 6510 - 6520'; siltstone fragments.

6540 - 6550 As 6530 - 6540'.

6550 - 6560 As 6530 - 6540'.

6560 - 6570 As 6530 - 6540'; calcite crystal.

6570 - 6580 As 6530 - 6540'; sandstone - dark fine-grained; and 5% shale-black.

6580 - 6600 No samples.

6600 - 6610 Dolomite - light gray (N7); crushed; slightly calcareous; porous; crystalline fragments; (5-10%) shale - black; hard.

6610 - 6620 As 6600 - 6610'.

6620 - 6630 As 6600 - 6610'; not calcareous- sparse amount grains; very fine of crystalline dolomite.

6630 - 6640 As 6620 - 6630'.

6640 - 6650 As 6630 - 6640'.

6650 - 6660 As 6620 - 6630'.

6660 - 6670 As 6620 - 6630'.

6670 - 6680 Limestone (crushed) medium dark gray (N5); micrograined; and fragments of shale - dark gray (N3); hard and sandstone - medium light gray (N6) - fine grained; hard calcite crystal fragments.

DEPTH  
(feet)

6600 - 6690	As 6670 - 6680'.
6690 - 6700	As 6670 - 6680'.
6700 - 6710	As 6670 - 6680'; and brownish gray limestone also. No sandstone shale; crushed.
6710 - 6720	As 6700 - 6710'.
6720 - 6730	As 6700 - 6710'.
6730 - 6740	As 6700 - 6710'.
6740 - 6750	As 6700 - 6710'.
6750 - 6760	As 6700 - 6710'; interbedded iron oxide particles.
6760 - 6770	
6760 - 6770	Limestone - medium dark gray (N4); micrograined; hard; fresh chips.
6770 - 6780	As 6670 - 6680'.
6790 - 6800	As 6770 - 6780'.
6800 - 6810	As 6770 - 6780'.
6810 - 6820	As 6770 - 6780'.
6820 - 6830	As 6700 - 6710'.
6830 - 6840	As 6700 - 6710'.
6840 - 6850	As 6700 - 6710'; fragments of shale - dark gray (N3); soft; micaceous and calcite - coarse to granule sized crystalline fragments; pyrite nodules.
6850 - 6960	No samples.
6960 - 6970	Limestone, sandy - pale brown (5Yr 5/2); limestone as 6970 - 6980'; shale - red, minute fragments; magnetite - crystal; iron oxide particles and stains (10%) quartz grains; fine to granule size, angular; iron stained.
6970 - 6980	As 6960 - 6970'.
6980 - 6990	As 6960 - 6970'.
6990 - 7000	As 6960 - 6970'; 20% quartz grains.
7000 - 7040	No samples.
7040 - 7050	Limestone, sandy, sparse, siltstone, sandy - magnetite and iron-oxide fragments.

<u>DEPTH</u> <u>(feet)</u>	
7050 - 7060	As 7040 - 7050'.
7060 - 7070	As 7040 - 7050'.
7070 - 7080	As 7040 - 7050'.
7090 - 7100	As 7040 - 7050'.
7100 - 7110	As 7040 - 7050'; more iron-staining; smaller fragments of limestone.
7110 - 7120	Shale - grayish red (5R 4/2); hard; quartz grains-iron oxide stained; iron oxide particles.
7120 - 7130	Siltstone - (pale red (5R 6/2);) medium gray (N5)-hard; shale-red, crushed and quartz grains; iron stained and iron oxide fragments.
7130 - 7140	As 7120 - 7130'.
7140 - 7150	As 7120 - 7130'.
7150 - 7160	As ; brownish gray. No shale.
7160 - 7170	Sandstone, crushed - dark yellowish brown (10YR 4/2); fine to medium grained, moderately sorted; subangular to subrounded, quartz grains; iron oxide.
7170 - 7180	As 7160 - 7170'.
7180 - 7190	As 7160 - 7170'; (10%) iron oxide particles; fragments of sandstone-intact; siliceous.
7190 - 7200	As 7180 - 7190'; (5%) shale-red, soft, fissile.
7200 - 7210	Siltstone - dark gray (N3); hard; calcareous; and sandstone (as 7160-7170'; crushed) and iron oxide particles.
7210 - 7220	Sandstone - moderate yellow brown (10YR 5/4); as at 7160 - 7170'.
7220 - 7230	As 7210 - 7220'; fine to very coarse grained; 20% iron fragments.
7230 - 7240	As 7220 - 7230'.
7240 = 7250	No sample.
7250 - 7260	As 7220 - 7230'.
7260 - 7270	As 7220 - 7230'; dark yellowish brown (10YR 4/2); 25% siltstone - dark gray.
7270 - 7280	As 7220 - 7230'; moderate brown (5YR 3/4) 1/3 each sandstone/iron particles siltstone.