

Box 120
Van Sant

OPERATOR: Columbia Gas Transmission Corp.
FARM: Landon R. Wyatt, et al
WELL NO. 9721-T
LOCATION: Buchanan County
4250' N of 37°-07'-30"
2050' E. of 82°-05'-00"
ELEVATION: 1717.91 GR.
TOTAL DEPTH: 6739'
DRILLING COMMENCED: September 23, 1972
WELL COMPLETED: October 7, 1972
RESULT: Dry Hole

WELL LOG

DEPTH
(feet)

0 - 30	Clay, dark yellowish gray (5YR 6/2); moderate amount quartz grains - fine to coarse, subangular and poorly sorted; mica; leaf debris; fragments of siltstone (medium dark green (N4)); hard and sandstone - as below, at 20-30'.
30--40	Sandstone, variable medium gray (N5) highly variable - fine to medium grained, subangular, moderate to poorly sorted; some fragments argillaceous; 10% micaceous; locally carbonaceous and rare siltstone (as above) fragments.
40 - 50	Siltstone - medium light gray (N6) hard; mica; carbonaceous; - plant fossils.
50 - 60	As 40 - 50'; coal.
60 - 70	Sandstone - as 30 - 40'; light gray N7.
70 - 80	No sample.
80 - 90	Sandstone - light gray (N7) - fine to medium, subangular, moderate sorting; 50-60% siliceous; feldspathic; slight porosity; 1-3% mica-muscovite/hydromuscovite (brown-green); carbonaceous film (plant fossils?) on few fragments; and - siltstone/shale, medium dark gray (N4); coal.
90 - 100	Siltstone - medium gray (N5) as 40 - 50'.
100 - 110	No sample.

DEPTH
(feet)

- 110 - 120' Sandstone - interbedded as 80-90'; coarse grained; 10% mica; and heavy concentrations of biotite locally (cleavages?).
- 120 - 130 As 110 - 120'.
- 130 - 140 Shale - medium gray (N5); hard; fissile; and 10% sandstone as 110 - 120'.
- 140 - 150 As 130 - 140'; decreasing amounts of sandstone.
- 150 - 160 As 130 - 140'; rare or local calcareousness; grading into Siltstone - some color, fine grained.
- 160 - 170 Siltstone/Shale - as 150 - 160'.
- 170 - 180 As 160 - 170'.
- 180 - 190 As 160 - 170'; pyrite.
- 190 - 200 As 160 - 170'; increasing siltstone.
- 200 - 210 Siltstones - medium dark gray (N3) - 60% with coarse quartz grains, some with finer grains; 1-3% shale - as 150 - 160'; 1% sandstone - white fragmented; calcareous; and sandstone - light gray (N7); fine to medium, poorly sorted, subangular; micaceous.
- 220 - 230 Shale - dark gray (N3); hard, fissile, very rare micaceous.
- 230 - 240 Shale - As 220 - 230'; local carbonaceous; coal.
- 240 - 250 Sandstone (crushed) very light gray (N8) - "white" medium to coarse grained (sorting not discernable), subangular and subrounded; rare feldspar; mica; ? calcareous cement? and shale (2%) dark gray; fragments in sandstone.
- 250 - 260 As 240 - 250'.
- 260 - 270 (not crushed) as 240 - 250'.
- 270 - 280 As 240 - 250; angular grains; poor sorting; calcareous in some fragments; feldspar; many quartz fragments granule size and angular; clean; porous-moderately.
- 280 - 300 As 270 - 280'; coarse grained smaller grains also.
- 300 - 310 As 270 - 280'; 25% shale - dark gray (N3); fossiliferous - plant, carbonaceous; coal fragments.
- 310 - 320 Shale - medium gray (N5); hard; mica rare; carboniferous locally; silty in 1% fragments - medium grayish brown (5YR 4/2); hard (3%); and sandstone; as 270 - 280'; fine to granular in size.
- 320 - 330 No sample.

DEPTH
(feet)

330 - 340 As 310 - 320'.

340 - 350 Sandstone/Shale - 50% each - interbedded; as 310 - 320'; churned surface on 1 shale fragment; sandstone - fine to medium.

350 - 360 Shale/Limestone - shale - as 310 - 320'; limestone?

360 - 370 Siltstone/Sandstone - interbedded siltstone - medium gray; hard - grades into shale; 1% ⁺ grayish brown shale - as 310 - 320'; sandstone - dirty - light gray (N7); fine to medium, moderate sorting; calcareous film; micaceous - brown hydro-musc; coal; limestone-"white". Light gray (N7) - micrograined; very fine black grains; mixed sizes of quartz grains.

370 - 380 Shale - as 310 - 320'; porous; silty rare calcareousness (from above).

380 - 390 As 370 - 380'; 20% crushed sandstone - as 360 - 370'.

390 - 400 Shale - as 310 - 320; no mica, silty* or carbon fossils.

400 - 410 As 210 - 320'.

410 - 420 As 310 - 320'.

420 - 430 As 310 - 320'.

430 - 440 Shale - medium dark gray (N4) hard; rare mica; and sandstone -(5%) very light gray (N8); fine to granule size, subangular, moderate - sorting; micas - brown green; feldspathic.

440 - 450 Sandstone/Shale - interbedded as 360 - 370'.

450 - 460 As 440 - 450'.

460 - 470 As 440 - 450'.

470 - 480 As 440 - 450' 1 60% shale.

480 - 490 As 470 - 480'.

490 - 500 As 470 - 480'.

500 - 510 As 470 - 480; iron oxide grains 1%.

510 - 520 Shale - as 390 - 400'.

520 - 530 As 510 - 520'.

530 - 540 As 510 - 520'.

550 - 560 As 510 - 520'.

560 - 570 As 510 - 520'.

570 - 580 As 510 - 520'.

580 - 590 As 510 - 520'.

DEPTH
(feet)

590 - 600	Shale/Sandstone interbedded shale - as 390 - 400, sandstone - highly siliceous; micaceous; feldspathic; porous fine to medium, as 360 - 370'.
600 - 610	As 590 - 600'; coal.
610 - 620	Sandstone/Shale - as 590 - 600; 10% shale.
620 - 630	No sample.
630 - 640	As 590 - 600'; coal.
640 - 650	Shale - medium dark gray (N4); hard; fissile; local mica; local carbon film.
650 - 660	As 640 - 650'.
660 - 670	As 640 - 650'; no carbon 1-2 sandstone fragments.
670 - 680	Siltstone, sandy as 640 - 650; color; etc; abundant mixed quartz grains.
680 - 690	Shale/Siltstone - sandy as 670 - 680'; 3% shale.
690 - 700	As 670 - 680'.
700 - 710	As 680 - 690'.
710 - 720	Sandstone/Shale - as 590 - 600'; 1-3% shale; coal; churned.
720 - 730	As 710 - 720; fine grained, well sorted; siliceous; micaceous/shale - as 680 - 690'.
730 - 740	As 720 - 730'; 10% shale - carbonaceous film.
740 - 750	As 730 - 740'; very sparse amount grayish brown (5YR 3/1) shale; coal?
750 - 760	Sandstone - as 730 - 740'.
760 - 770	As 750 - 760'.
770 - 780	Siltstone, sandy/Sandstone/Shale - churned (80%) light gray (N7) hard; layers of quartz grains - medium to very fine; grading into sandstone and shales layered/quartz grains. sandstone - as 730 - 740'; some "dirty" (3%) shale - medium gray - fissile, micaceous.
780 - 790	As 770 - 780'.
790 - 800	As 770 - 780'; stringer of coal (between 2 sandstone layers with siltstone; sandy above/below sandstone); highly micaceous surface(s?); churned surface.
800 - 810	As 770 - 780'.

DEPTH
(feet)

810 - 820	Shale/Siltstone - as 640 - 650'; 10% mixed siltstone - as 770-780'.
820 - 830	Shale - as 640 - 650'.
830 - 840	Shale/Sandstone - as 640 - 650'; 730 - 740'.
840 - 850	As 830 - 840'.
850 - 860	Siltstone; siltstone,sandy/Sandstone/Shale - as 770 - 780; carbon film.
860 - 870	As 770 = 780'.
870 - 880	As 770 - 780'.
880 - 890	Sandstone/Shale - as 830 - 840'; ("white" sandstone/:black" shale) coal fragments.
900 - 910	As 880 - 890'; no coal.
910 - 920	Shale - as 880 - 890'; 10% sandstone.
920 - 930	As 910 - 920'.
930 - 940	Sandstone, crushed - as 880 - 890'; 10% shale.
940 - 950	Sandstone/Shale - as 880 - 890; coal fragments on "churned" surfaces"; iron staining; sandstone's grading into siltstone's = light gray (N7) 5% and shale's grading into siltstone, sandy 5% ± micaceous, carbon- aceous; laminated and wavy
950 - 960	Sandstone - as 930 - 940'; 10% shale - siltstone; grading and micaceous; sandstone is feldspathic, micaceous, coal.
960 - 970	Shale - medium gray (N3) hard, fissile, to medium dark gray (N4)
970 - 980	As 960 - 970'; fragments of sandstone - very light gray (N8) siliceous; hard.
980 - 990	Sandstone/Shale - as shale 960 - 970 and sandstone - fine to medium grained, well to moderately sorted, angular to subangular; siliceous; mica; feldspathic locally.
990 - 1000	As 980 - 990';
1000 - 1010	As 980 - 990'.
1010 - 1020	Shale - as 960 - 970' 20% light gray (N7) siltstone/sandstone as 980 - 990'; with siltstone; "sandy" sandstone is micaceous; coal; fossil plant imprints on shale.
1020 - 1030	Shale/Sandstone - as 980 - 990'; coal, crushed "white" sandstone.
1030 - 1040	Shale (70%) Sandstone & Siltstone, sandy - as 1020 - 1030'; limestone(?) fragment - white light gray(N7) fine grained; very fine quartz and dark

DEPTH
(feet)

grains (probably shale fragments) included within; hard-dolomite; sandstone - clean type of 980 - 990'; and coarse grained, poorly sorted; "dirty"; grading into sandy, siltstone ~~stones~~ (1%) - highly variable; coal.

- 1040 - 1050 Sandstone (50%)/Shale (50%) - shale - dark gray (N3); hard; fissile; locally fine mica; rippled and churned; grading into carbonaceous silty sandstone; sandstone - medium grained; siliceous. Iron oxide crusts - flat layered fragments; coal (5%).
- 1050 - 1060 Siltstone - medium gray (N5); hard, rippled; micaceous - grading into sandstone - fine to medium grained and as 1040 - 1050'; (3%); and shale - as 1040 - 1050'; (10%); medium gray (N5) to dark gray (N3); coal.
- 1060 - 1070 Sandstone/Shale - as 1040 - 1050'; siderite; iron crusts; coal; fossil plant fragments.
- 1070 - 1080 Sandstone, crushed - very light gray - (N8) - fine to medium, moderate sorting, subangular; moderately soft; mica, and (15%) shale - dark gray (N3); hard (10%) iron crust - brownish gray (5YR 4/1) and iron staining on sandstone.
- 1080 - 1090 Sandstone, finely crushed - as 1070 - 1080'; (10%) loose mica; some fragments coarse grained and "dirty" (graywacke) - included fragments coal, shale-dark gray and dark brown, and micas.
- 1090 - 1100 No sample.
- 1100 - 1110 As 1070 - 1080'; iron crusts; (5%) shale - dark gray fragments.
- 1110 - 1120 As 1100 - 1110'.
- 1120 - 1130 As 1100 - 1110'.
- 1130 - 1140 No sample.
- 1140 - 1150 Sandstone/Siltstone-Shale - dark gray (N3); hard and sandstone - as 1100 - 1110'.
- 1150 - 1160 As 1140 - 1150'.
- 1160 - 1170 As 1140 - 1150'; iron crusts; coal ; fossil-prints-plant.
- 1170 - 1180 As 1140 - 1150'; coal fragments'.
- 1180 - 1190 As 1140 - 1150'; coal with sulfur deposit.
- 1190 - 1200 As 1180 - 1190'; plant fossil.
- 1200 - 1210 Sandstone/Shale - as 1180 - 1190'; large, disturbed bed shale fragments; grayish black (N2); coal/sulfur; plant fossils; iron crusts; 1% siltstone sandstone; dirty.

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1200 - 1220	Sandstone, crushed - as 1070 - 1080'; 20 % fine shale fragments as above.
1220 - 1230	Sandstone/Shale→Siltstone - as 1070 - 1080'; shale - medium gray (N5) and grading into siltstone fossil plant/coal in small amounts.
1230 - 1240	As 1220 - 1230'; disturbed bedding siltstone micaceous.
1240 - 1250	As 1220 - 1230'.
1250 - 1260	Siltstone (80%) - Shale (10%)/Sandstone (10%) - siltstone medium light gray (N6) - grading to medium dark gray (N4) shale and light gray (N7) sandstone - largely clean and siliceous.
1260 - 1270	Sandstone, crushed - very light gray (N9) - fine grained, well sorted, subangular; clean; brittle in fragments (very few); sparsely micaceous; and shale (40%) - dark gray (N3); iron fragments.
1270 - 1280	As 1270 - 1280'.
1280 - 1290	Sandstone - as 1270 - 1280'; <u>hard</u> , resistant fragments - clean and sparse mica; 5% shale; coal with sulfur.
1290 - 1300	Sandstone/Shale - as 1260 - 1270'; 1-3% iron crusts.
1300 - 1310	As 1290 - 1300'.
1310 - 1320	As 1290 - 1300'.
1320 - 1330	As 1290 - 1300'.
1330 - 1340	Shale/Sandstone - as 1290 - 1300; 60/40%.
1340 - 1350	05/50% - as 1330 - 1340'; coal; sparse.
1350 - 1360	As 1430 - 1450'; iron crusts.
1360 - 1370	As 1340 - 1350'.
1370 - 1380	Sandstone (crushed) - white - N9; clean, crushed sandstone - coarse, subangular, clear, well to moderately well sorted grains quartz; no cement-fragments of isolated, weathered feldspar; 1% magnetite - flat fragments; mica - sparse, fresh muscovite.
1380 - 1390	As 1370 - 1380'.
1390 - 1400	As 1370 - 1380'.

DEPTH
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1400 - 1410	As 1320 - 1380'.
1410 - 1420	As 1370 - 1380'; 10% fine shale fragments.
1420 - 1430	Sandstone/Shale - as 1370 - 1380; 50% fine dark gray (N3) shale fragments (grayish black N2) also.
1430 - 1440	As 1420 - 1430'.
1440 - 1450	As 1420 - 1430'.
1450 - 1460	As 1420 - 1430'.
1460 - 1470	As 1420 - 1430'.
1470 - 1480	As 1370 - 1380'; fragments coal.
1480 - 1490	As 1370 - 1380; magnetite crust fragments; coal.
1490 - 1500	No sample.
1500 - 1510	Silty/Shale/Sandstone - 80% shale, silty - medium dark to dark gray (N 4-3), - sandstone as 1370 - 1380; coal fragments.
1510 - 1520	As 1500 - 1510'; incl. coal. $\rho 3$
1520 - 1530	Sandstone/Shale - shale as 1500 - 1510'. Sandstone - as 1370 - 1380'.
1530 - 1540	Sandstone - as 1370 - 1380'.
1540 - 1550	Sandstone/Shale - as 1520 - 1530'.
1550 - 1560	As 1520 - 1530'; iron crusts.
1560 - 1570	Shale - grayish black (N2); soft, fissile.
1570 - 1580	As 1560 - 1570'.
1580 - 1590	As 1560 - 1570'.
1590 - 1600	As 1560 - 1570'.
1600 - 1610	Siltstone - as 1560 - 1570'; hard; very fine siltstone/shale, fining upward.
1610 - 1620	As 1560 - 1570'.
1620 - 1630	As 1560 - 1570'.

DEPTH
(feet)

1630 - 1640	As 1560 - 1570'.
1640 - 1650	As 1560 - 1570'.
1650 - 1770	No samples.
1770 - 1780	Sandstone - white (N9) fine to medium grained, subangular clear, moderately sorted, quartz grains; calcareous; iron stained grains. 5% shale, soft; grayish black (N2).
1780 - 1790	Sandstone (50%)/Shale - as 1770 - 1780; coal; not calcareous.
1790 - 1800	As 1790 - 1790'.
1800 - 1810	Shale (60%)/Sandstone (40%) - as 1780 - 1790'.
1810 - 1820	As 1800 - 1810'.
1820 - 1830	Sandstone/Shale - as 1780 - 1790'; fine fragments.
1830 - 1840	As 1780 - 1790'.
1840 - 1850	Sandstone/Shale/Siltstone - sandstone/shale - as 1780 - 1790'; shale moderate reddish brown (10R 4/6) (3%) - soft; and iron crusts - and siltstone - light gray.
1850 - 1860	As 1840 - 1850'; black shale.
1860 - 1870	As 1840 - 1850; shale is black and gray, grading to under-clay.
1870 - 1880	Siltstone/Shale-Clay - medium gray (N5); hard; grading to sandstone - as 1770 - 1780'; shale - as 1560 - 1570'.
1880 - 1890	As 1870 - 1880'; 10% shale - moderate reddish brown.
1900 - 1910	As 1880 - 1890; 30% <u>clay - with traces coal/plant imprints.</u>
1910 - 1920	Siltstone - medium gray (N5);=hard.
1920 - 1930	Shale - moderate reddish brown (10R 4/6); hard, large fragments as 1920 - 1930'.
1940 - 1950	Limestone - (coated with powder from above) crushed - 10% included material - shale fragments as above; siltstone as 1910 - 1920'.
1950 - 1960	As 1940 - 1950'.
1960 - 1970	As 1940 - 1950'.
1970 - 1980	As 1940 - 1950'.
1980 - 1990	As 1940 - 1950'.

<u>DEPTH</u> <u>(feet)</u>	
1990 - 2000	As 1940 - 1950'.
2000 - 2010	Siltstone to Sandstone - very light gray (N8) fine grained, well sorted, subangular, clear; quartz grains; hard; siliceous; and 10% each - shale - m. reddish brown and grayish black.
2010 - 2020	As 2000 - 2010'.
2020 - 2030	As 2000 - 2010'.
2030 - 2040	As 2000 - 2010; siltstone grading into fine sandstone - white; as above with mica.
2040 - 2050	(crushed) as 2030 - 2040'.
2050 - 2060	As 2030 - 2040'.
2060 - 2070	Siltstone - Sandstone - as 2000 - 2010'; 10% grayish black shale.
2070 - 2080	
2080 - 2090	
2090 - 2100	Siltstone (crushed) - dark gray (N3); <u>hard</u> ; "grainy" in local areas; 10% siltstone - white - as above; some shale.
2100 - 2110	As 2090 - 2110'.
2110 - 2120	As 2090 - 2110'.
2120 - 2130	As 2090 - 2100'; 90% white; locally micaceous.
2130 - 2140	Shale - grayish black (N2); hard.
2140 - 2160	No sample.
2160 - 2170	As 2130 - 2140'.
2170 - 2180	As 2130 - 2140'.
2180 - 2190	As 2130 - 2140'.
2190 - 2200	As 2130 - 2140'.
2200 - 2210	As 2130 - 2140'.
2210 - 2220	As 2130 - 2140'.
2220 - 2230	As 2130 - 2140'.
2230 - 2240	As 2130 - 2140'.

DEPTH
(feet)

2240 - 2250	As 2130 - 2140'.
2250 - 2260	As 2130 - 2140'.
2260 - 2270	50% White/50% Black Siltstone.
2270 - 2280	Sandstone - light olive gray (5Y 6/1 ^y yet "sand" is white), medium grained, subangular, well sorted, = clear grains quartz; very sparse mica; iron stains; no cement visible; and 10% shale - as above.
2280 - 2290	As 2270 - 2280'; 20% shale and shale grading into siltstone.
2290 - 2300	As 2280 - 2290'.
2300 - 2310	As 2270 - 2280'; 35% dark gray shale - siltstone; pyrite.
2130 - 2320	Shale/Siltstone - dark gray (N3); hard-locally "sandy"; 20% ⁺ sandstone - as above.
2320 - 2330	As 2310 - 2320'.
2330 - 2410	No sample.
2410 - 2420	Sandstone - light gray (N7.5); medium to coarse, sub- ^o angular to subrounded, well sorted, clear quartz grains; magnetite flakes; iron stains; 5% shale - as above.
2420 - 2430	As 2410 - 2420'.
2430 - 2440	As 2410 - 2420'.
2440 - 2450	As 2410 - 2420'.
2450 - 2460	Light olive gray (5Y 6/1); limestone, fine grained; crushed.
2460 - 2470	
2470 - 2480	
2480 - 2490	
2490 - 2500	
2500 - 2510	
2510 - 2520	
2520 - 2530	
2530 - 2540	
2540 - 2550	
2550 - 2560	

DEPTH
(feet)

2560 - 2570	No sample.
2570 - 2580	Shale - dark reddish brown siltstone (10R 3/4); hard; sandy locally with fine quartz grains - crushed shale - grading into
2580 - 2590	(no sample).
2590 - 2600	Siltstone/Shale - as 2570 - 2580'; shale of same.
2600 - 2610	Shale - color; soft; sandy locally with fine quartz grains.
2610 - 2620	Siltstone - light gray (N7) - (sample br. gr. color from sh ^{ls}) <u>hard</u> ; siliceous and 10% shales - dark reddish brown as above and medium dark gray - hard, carbonaceous in local and rare grains.
2620 - 2630	As 2610 - 2620'.
2630 - 2640	As 2610 - 2620; local mica; fragment <u>coal</u> ; pyrite; iron stains.
2640 - 2650	As 2610 - 2620'.
2650 - 2660	Sandstone (crushed) greenish gray (5GY 6/1) fine grained moderately sorted, subangular, clear to greenish quartz grains; calcareous; mica; grades locally to similar siltstone; and 10% dark reddish brown and medium dark gray shales.
2660 - 2670	Limestone, argillaceous - medium dark gray (N4); fine grained; argillaceous; fragment of calcite; and siltstone grains/fragments; shale - "red and black" fragments.
2670 - 2680	Shale, calcareous dark gray (N3); soft; micaceous locally calcareous.
2680 - 2690	As 2670 - 2680'.
2690 - 2700	As 2670 - 2680'.
2700 - 2710	As 2670 - 2680'.
2710 - 2720	Limestone - as 2660 - 2670'; calcite filled cracks.
2730 - 2740	Limestone/Shale/Siltstone - limestone as 2660 - 2670'. Shale - grayish red (10R 4/2) - crushed; siltstone - as 2610 - 2620'.
2750 - 2760	Sandstone (crushed as sand) light _____ gray (5Y 6/1) fine grained, well sorted, subangular, clear quartz grains; calcareous; 1% fine fragments of "red/black" shales; local mica.

DEPTH
(feet)

2760 - 2770	As 2750 - 2760'.
2770 - 2780	As 2750 - 2760'.
2780 - 2790	Limestone/Siltstone - dark gray; micro grained; fossil im- prints; pyrite - siltstone - dark gray; hard; "grainy" locally.
2790 - 2800	As 2780 - 2790'.
2800 - 2810	No sample.
2810 - 2820	As 2780 - 2790'.
2820 - 2830	As 2780 - 2790'.
2830 - 2840	As 2780 - 2790'.
2840 - 2850	As 2780 - 2790'.
2850 - 2860	As 2780 - 2790'.
2860 - 2870	As 2780 - 2790'.
2870 - 2880	As 2780 - 2790'.
2880 - 2890	As 2780 - 2790'.
2890 - 2900	Shale - dark gray (N3); hard; fissile; locally silty.
2900 - 2910	As 2890 - 2900'; locally calcareousness.
2910 - 2920	As 2800 - 2910'.
2920 - 2930	As 2800 - 2910'.
2940 - 2950	Siltstone's/Sandstone - dark gray (N3); hard; "grainy"; locally calcareous; local mica; and sandstone - as 2750 - 2760' fragments shale ← "red", black and greenish gray sandstone.
2950 - 2960	Shale - as 2890 - 2900'.
2960 - 2970	Sandstone (crushed) - as 2750 - 2760; not calcareous; 5% very fine shale fragments.
2970 - 2980	As 2960 - 2970'.
2980 - 2990	As 2960 - 2970'.
2990 - 3000	As 2960 - 2970'.
3000 - 3010	As 2960 - 2970'.
3010 - 3020	As 2960 - 2970'.

DEPTH
(feet)

3020 - 3030	As 2960 - 2970'.
3030 - 3040	As 2960 - 2970'.
3040 - 3050	As 2960 - 2970'.
3050 - 3060	As 2960 - 2970'.
3060 - 3070	As 2960 - 2970'.
3070 - 3080	Sandstone/Siltstone - medium gray (N5) siltstone - dark gray (N3); hard; and pyrite local and rare mica. sandstone as 2750 - 2760'.
3080 - 3090	As 3070 - 3080'.
3090 - 3100	As 3070 - 3080'.
3100 - 3110	As 3070 - 3080'; 30% siltstone - getting lighter in color.
3110 - 3120	As 3100 - 3110'; 20% siltstone light gray (N7).
3120 - 3130	As 3110 - 3120'.
3130 - 3140	<u>Sandstone/Siltstone</u> as 3070 - 3080'.
3140 - 3150	As 3070 - 3080'.
3150 - 3160	As 3070 - 3080'.
3160 - 3170	Sandstone - as 2750 - 2760'.
3170 - 3180	As 2750 - 2760'.
3180 - 3190	As 2750 - 2760'.
3190 - 3200	As 2750 - 2760'.
3200 - 3210	As 2750 - 2760'.
3210 - 3220	As 2750 - 2760'.
3220 - 3230	As 2750 - 2760'.
3230 - 3240	As 2750 - 2760'.
3240 - 3250	As 2750 - 2760'.
3250 - 3260	Siltstone dark greenish gray (5G 4/1); hard; grainy; local calcareousness.
3260 - 3270	As 3250 - 3260'.
3270 - 3280	As 3250 - 3260'.

<u>DEPTH</u> <u>(feet)</u>	
3280 - 3290	As 3250 - 3260'.
3290 - 3300	As 3250 - 3260'.
3300 - 3310	Shale/Siltstone - medium dark gray (N4) - hard; local mica and siltstone as 3250 - 3260'. crushed as "sand".
3310 - 3320	As 3300 - 3310'.
3320 - 3330	As 3300 - 3310'.
3330 - 3340	Sandstone, crushed, very <u>light</u> brownish gray (5YR 7/1); "white" sand - as 2750 - 2760'.
3340 - 3350	As 3330 - 3340'.
3350 - 3360	Sandstone/Siltstone-Shale - brownish gray (4/1) sandstone as 3330 - 3340 and siltstone/shale as 3300 - 3310'.
3360 - 3370	As 3350 - 3360'; larger and darker fragments siltstone/shale.
3370 - 3380	Shale/Siltstone - as 3350 - 3360'; mostly ground fragments of shale/siltstone with 10 % - sandstone.
3390 - 3400	Sandstone - as 3330 - 3340'.
3400 - 3410	<u>No sample.</u>
3140 - 3420	As 3390 - 3340'.
3420 - 3430	Dark gray (N3); soft.
3430 - 3440	As 3420 - 3430'; locally calcareous.
3440 - 3450	As 3420 - 3430'.
3450 - 3460	As 3420 - 3430'.
3460 - 3470	Limestone - dark gray (N3); micro-grained; pyrite; rare calcite crystals; soft.
3470 - 3480	As 3460 - 3470'.
3480 - 3490	As 3460 - 3470'; medium gray, hard.
3490 - 3500	As 3460 - 3470'.
3500 - 3510	As 3460 - 3470'.
3510 - 3520	As 3460 - 3470'.

<u>DEPTH</u> <u>(feet)</u>	
3520 - 3530	As 3460 - 3470'; calcite crystals and fragments.
3530 - 3540	As 3460 - 3470'.
3540 - 3550	As 3460 - 3470'.
3550 - 3560	As 3460 - 3470'.
3560 - 3570	As 3460 - 3470'; crystalline fragments.
3570 - 3580	As 3460 - 3470'.
3580 - 3590	As 3460 - 3470'; fragment "red shale".
3590 - 3600	As 3460 - 3470'.
3600 - 3610	As 3460 - 3470'.
3610 - 3620	As 3460 - 3470'.
3620 - 3630	As 3460 - 3470'; dark gray crystalline fragments.
3630 - 3640	As 3460 - 3470'.
3640 - 3650	Dark gray (N3) as 3460 - 3470'; broken fossil fragments; iron stains and magnetite crusts; red shale fragments.
3650 - 3660	As 3460 - 3470'; medium gray and 30% light gray.
3660 - 3670	Soft; 10% dark gray; pyrite.
3670 - 3680	As 3660 - 3670'.
3680 - 3690	As 3460 - 3470'; medium dark gray.
3690 - 3700	As 3460 - 3470'.
3700 - 3710	As 3460 - 3470'.
3710 - 3720	As 3460 - 3470'.
3720 - 3730	As 3460 - 3470'; fossil fragments.
3730 - 3740	As 3460 - 3470'.
to	
3840 - 3850	As 3460 - 3470'; same.
3850 - 3860	As 3460 - 3470'.
3860 - 3870	(crushed) as 3650 - 3660'.
3870 - 3880	As 3650 - 3660'.

DEPTH
(feet)

3880 - 3890	50% light gray limestone; soft and 50% medium gray limestone.
3890 - 3900	Same as above.
3900 - 3950	Same as above.
3950 - 3980	(crushed); light olive gray (5Y 6/1).
3980 - 3990	Same as above.
3990 - 4000	Same as above.
4000 - 4010	As 3950 - 3980'.
4010 - 4020	As 3880 - 3890'; medium light gray and light gray-soft.
4020 - 4030	Same as above.
4030 - 4040	Same as above.
4040 - 4050	As 3460 - 3470'; dark, medium and light gray; dark gray is hard, fine-grained; iron fragments.
4050 - 4060	As 4040 - 4050'.
4060 - 4070	As 4040 - 4050'.
4070 - 4080	As 4040 - 4050'.
4080 - 4090	As 3880 - 3890'; all medium light gray.
4090 - 4100	As 4080 - 4090'.
4100 - 4110	No sample.
4110 - 4120	As 4040 - 4050'; rare calcite.
4120 - 4130	As 4110 - 4120'.
4130 - 4140	As 4110 - 4120'.
4140 - 4150	As 3460 - 3470'; medium dark gray.
4150 - 4160	Medium dark gray and medium light gray; as 3460 - 3470';
4160 - 4170	As 4050 - 4060'.
4170 - 4180	No sample.
4180 - 4190	As 4050 - 4060'.

DEPTH
(feet)

4190 - 4200	Medium light gray and light gray; as 4040 - 4050; soft.
4200 - 4210	No sample.
4210 - 4220	Limestone/Siltstone - 4190 - 4200; and 35% \pm siltstone; sandy - light gray (N7); hard and 3% shale - moderate reddish brown.
4220 - 4230	As 4210 - 4220'.
4230 - 4240	Siltstone/Limestone/Shale - 50% light and dark 50% siltstone - medium dark gray (N4), hard; and light gray (N7) soft; limestone - as grains and stains; rare shale.
4240 - 4250	As 4230 - 4240'.
4250 - 4260	Siltstone (only) - as 4230 - 4240'; 50% dark and 50% light; calcareous.
4260 - 4270	As 4250 - 4260'.
4270 - 4280	(Sandstone?) - as 4250 - 4260'; 5% magnetic iron oxide fragments/crusts. Sandstone might be present instead of light colored siltstone - but crushed.
4280 - 4290	As 4250 - 4260'.
4290 - 4300	Sandstone/Siltstone (crushed) - as 4250 - 4260'; 90% sandstone fine, subangular, well sorted, clear grained quartz; crushed - no cement; calcareous probably from above formations; 10% siltstone - as 4250 - 4260; iron oxide fragments.
4300 - 4310	As 4290 - 4300'.
4310 - 4320	As 4290 - 4300; pyrite.
4320 - 4330	As 4290 - 4300'; pyrite.
4330 - 4340	As 4290 - 4300; rare fragments <u>shale</u> dark gray (N3).
4340 - 4350	Siltstone/Sandstone - dark gray (N3); locally granular sandy; 35% \pm sandstone grains from above.
4350 - 4360	As 4340 - 4350'; increasing amounts of fine, magnetic iron ore.
4360 - 4370	As 4350 - 4360'.
4370 - 4380	Siltstone (50%)/Sandstone (50%) - as 4340 - 4350; sandstone fine to very coarse; many coated with brownish stain; 50% of quartz grains - subrounded and lightly frosted; Fe cemented?; 1% pyrite; abundant magnetite; fragments of "red shale".

DEPTH
(feet)

4380 - 4390	Sandstone (crushed) - dark brownish gray (5YR 3/1); medium grained, subangular to subrounded, moderate to well sorted, clear to coated, quartz grains; mica; fragments of magnetite; pyrite; cement.
4390 - 4400	As 4380 - 4390'.
4400 - 4410	As 4380 - 4390'.
4410 - 4420	As 4380 - 4390'.
4420 - 4430	As 4380 - 4390'.
4430 - 4440	As 4380 - 4390'.
4440 - 4450	Siltstone/Sandstone - 50% each as 4370 - 4380'.
4450 - 4460	As 4370 - 4380'; rare mica; pyrite.
4460 - 4470	As 4370 - 4380'.
4470 - 4480	As 4370 - 4380'.
4490 - 4500	As 4480 - 4490'.
4500 - 4510	As 4480 - 4490'.
4480 - 4490	Sandstone, crushed/siltstone/shale/limestone - brownish gray (5YR 4/1); sandstone - fine to coarse, moderate sorting grading into very light gray siltstone; 30# shale - medium dark gray (N4); resistant; 1% shale - reddish gray (10R 4/2); soft, weathered; and limestone 1% ⁺ - medium light gray (N6) finegrained, soft, weathered; 25% ⁺ fragments including contamination - fragments of coiled tubules, crusts, rusted metallic fragments; layered magnetite with limonite oxidized crust.
4490 - 4500	As 4480 - 4490'.
4500 - 4510	As 4480 - 4490'.
4510 - 4520	Siltstones - medium dark gray (N4); resistant, grading into shale - same color; and siltstone - "dirty white" or light olive gray (5Y 7/1); 40% ⁺ ; iron oxide fragments and stains; pyrite; coal fragments.
4520 - 4530	As 4480 - 4490'.
4530 - 4540	Siltstone - medium gray (N5); resistant, some lighter and softer siltstone. 5% iron oxide - magnetite crust/umonite type and grains/stained quartz grains type.
4540 - 4550	"Dirty White"/medium gray siltstones - as 4530 - 4540'.
4550 - 4560	As 4540 - 4550'.

DEPTH
(feet)

4560 - 4570	Shale - medium gray to medium dark gray (N5/6); hard.
4570 - 4580	As 4560 - 4570'.
4580 - 4590	As 4560 - 4570'.
4590 - 4600	As 4560 - 4570'.
4600 - 4610	As 4560 - 4570'.
4610 - 4620	As 4560 - 4570'.
4620 - 4630	As 4560 - 4570'.
4630 - 4640	As 4560 - 4570'; black iron oxide fragments - layered and weathered.
4640 - 4650	As 4560 - 4570'; 20% dirty white siltstone fragments of black shale.
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.
4730 - 4740	As above.
4740 - 4750	As 4560 - 4570'.
4760 - 4770	As 4560 - 4570'.
4770 - 4770	As 4560 - 4570'.
4780 - 4790	As 4560 - 4570'.
4790 - 4800	As 4560 - 4570'.
4800 - 4810	As 4560 - 4570'.
4810 - 4820	As 4560 - 4570'.

DEPTH
(feet)

4820 - 4830	As 4560 - 4570'.
4830 - 4840	As 4560 - 4570'.
4840 - 4850	As 4560 - 4570'; pyrite.
4850 - 4860	Shale - grayish black (N2) hard pyrite; local rare mica.
4860 - 4870	As 4850 - 4860';
4870 - 4880	As 4850 - 4860; very rare iron oxide fragments.
4880 - 4890	As 4850 - 4890'.
4890 - 4900	As 4850 - 4860'.
4900 - 4910	As 4850 - 4860'.
4910 - 4920	As 4850 - 4860'.
4920 - 4930	As 4850 - 4860'.
4930 - 4940	As 4850 - 4860 ; light gray siltstone 20% \pm ; iron oxide.
4940 - 4950	Shale - medium gray; very rare amount grayish red shale; crushed siltstone.
4950 - 4960	As 4940 - 4950'.
4960 - 4970	As 4940 - 4950'.
4970 - 4980	As 4940 - 4950'; shale grading into siltstone.
4980 - 4990	As 4940 4950'.
4990 - 5000	As 4940 - 4950'.
5000 - 5010	Shale/Siltstone - shale as 4940 - 4950; siltstone light to medium gray (N7-N5); hard; 1% shale - grayish red (5R 4/2); mica - local in both shale and siltstone; moderate porosity in siltstone.
5010 - 5020	Siltstone/Shale/Sandstone 10% \pm as 5000 - 5010; siltstone grading into sandstone - light gray (N7); fine grained, well-sorted, clear subangular; siliceous; hard.
5020 - 5030	As 5000 - 5010'; siltstone increasing.
5030 - 5040	As 5000 - 5010'.
5040 - 5050	As 5000 - 5010'.

DEPTH
(feet)

DEPTH (feet)	(50%)	(50%)
5050 - 5060		
5060 - 5070	Siltstones (interbedded) light to medium gray (N7-N5); hard; micaceous locally. Iron staining; rare shale.	
5070 - 5080	As 5060 - 5070'.	
5080 - 5090	As 5060 - 5070'.	
5090 - 5100	Siltstone (60%) \pm Shale 40% \pm - as 5060 - 5070'; and shale as 4950 - 4960; feldspar (yes) cleavages weathered to clay.	
5100 - 5110	As 5090 - 5100'; shale increasing.	
5110 - 5120	As 5090 - 5100'.	
5120 - 5130	As 5090 - 5100'.	
5130 - 5140	As 5090 - 5100'.	
5140 - 5150	Siltstone/Shale - as 5090 - 5100'; shale decreasing 10% \pm ; ^{90%} siltstone.	
5160 - 5170	As 5090 - 5100'.	
5170 - 5180	5090 - 5100'.	
5180 - 5190	As 5090 - 5100'.	
5190 - 5200	As 5090 - 5100'.	
5200 - 5210	As 5090 - 5100'.	
5210 - 5220	Siltstone/Shale - 90% As 5090 - 5100; organic fragments; <u>Brachiopod mold/casts; pyrite; finely ground sandstone or siltstone - light gray; shale - reddish gray (10R 4/2); slickensides; carbonaceous locally; slumping visible in shale layers; iron-grains/tubes/crusts.</u>	
5220 - 5230	Siltstone/Shale - to medium light gray (N6-7) siltstones; hard and brittle; medium dark gray (N4) shale - grayish black (N2); - with local carbon; plant imprints; some deformation; no pyrite/iron.	
5230 - 5240	As 5220 - 5230; no fossils/deformation	
5240 - 5250	As 5220 - 5230';	
5250 - 5260	As 5220 - 5230'.	
5260 - 5270	Shale/Siltstone = as 5220 - 5230'.	

DEPTH
(feet)

5270 - 5280	(crushed) - as 5220 - 5230'.
5280 - 5290	As 5220 - 5230'.
5290 - 5300	As 5220 - 5230'.
5300 - 5310	As 5220 - 5230'; reddish gray shale.
5310 - 5320	As 5220 - 5230'.
5320 - 5330	As 5220 - 5230'.
5330 - 5340	As 5220 - 5230'.
5340 - 5350	As 5220 - 5230'.
5340 - 5350	As 5220 - 5230'.
5350 - 5360	As 5220 - 5230'.
5360 - 5370	As 5220 - 5230'.
5370 - 5380	As 5220 - 5230'.
5380 - 5390	Shale - medium gray (N5); soft.
5390 - 5400	As 5220 - 5230'.
5400 - 5410	As 5220 - 5230'.
5410 - 5420	As 5220 - 5230'; siltstone - light gray (crushed).
5420 - 5430	No sample.
5430 - 5440	No sample.
5440 - 5450	As 5380 - 5390'.
5450 - 5460	Siltstone - medium gray and light gray (N5 and N7); hard; and shale - grayish red (10R 4/2)- and dark gray (N3) - traces, fossils ! <u>Ostracod</u> .
5460 - 5470	As 5450 - 5460; no fossils.
5470 - 5480	As 5450 - 5460'.
5480 - 5490	As 5450 - 5460; grading into medium dark gray shale - fissile, hard.
5490 - 5500	As 5480 - 5490'.
5500 - 5510	Siltstone/Shale - 50% siltstone as 5450 - 5460'; shale as 5480 - 5490'.

DEPTH
(feet)

5510 - 5520	As 5500 - 5510'.
5520 - 5530	Siltstone - as 5450 - 5460'; 10% \pm shales.
5530 - 5540	As 5520 - 5530'; local mica.
5540 - 5550	As 5520 - 5530'.
5550 - 5560	As 5520 - 5530'.
5560 - 5570	As 5520 - 5530'.
5570 - 5580	As 5520 - 5530'.
5580 - 5630	No samples.
5630 - 5640	As 5520 - 5530'.
5640 - 5650	As 5520 - 5530'.
5650 - 5660	As 5520 - 5530'.
5660 - 5670	As 5520 - 5530'.
5670 - 5680	As 5520 - 5530'.
5680 - 5690	As 5520 - 5530'.
5690 - 5700	No sample.
5700 - 5710	As 5520 - 5530'.
5710 - 5720	As 5520 - 5530'.
5720 - 5730	As 5520 - 5530'.
5730 - 5740	As 5520 - 5530'.
5740 - 5750	As 5520 - 5530'.
5750 - 5760	As 5520 - 5530'.
5760 - 5770	As 5520 - 5530'; increasing shale.
5770 - 5780	Shale (50%)/Siltstone (50%) - as 5520 - 5530; for siltstone; shale as 5480 - 5490'.
5780 - 5790	As 5770 - 5780'.
5790 - 5800	No sample.
5800 - 5810	As 5770 - 5780'.

DEPTH
(feet)

5810 - 5820	As 5770 - 5780'; 80% \pm shale.
5820 - 6030	No samples.
6030 - 6040	Siltstone - as 5450 - 5460'.
6040 - 6050	Shale? - grayish black (N2); soft; locally sandy, iron oxide grains.
6050 - 6060	(crushed) as 6040 - 6050'.
6060 - 6070	As 6040 - 6050'; pyrite.
6070 - 6080	As 6040 - 6050'.
6080 - 6090	As 6040 - 6050'.
6090 - 6100	As 6040 - 6050; 20% medium light gray siltstone.
6100 - 6110	Shale - black! (N1) soft; carbonaceous; fissile; porous; locally carbon films-fossils?; pyrite-chalcopyrite.
6110 - 6120	As 6100 - 6110'; no pyrite.
6120 - 6130	As 6100 - 6110'.
6130 - 6140	As 6100 - 6110'.
6140 - 6150	As 6100 - 6110'.
6150 - 6160	As 6100 - 6110'.
6160 - 6170	As 6100 - 6110'; pyrite.
6170 - 6180	As 6100 - 6110'.
6180 - 6190	As 6100 - 6110'.
6190 - 6200	Shale - dark gray (N3); moderately hard.
6200 - 6210	Shale - medium dark gray (N4); moderately hard to hard; some soft, dark gray shale; some fragments showing grading into siltstone.
6210 - 6220	Siltstone - medium light gray and medium gray (N6 & N5); hard; local grains of calcareous nature; 10% black shales.
6220 - 6230	As 6210 - 6220'.
6230 - 6240	Siltstone/Shale - as 6210 - 6220'; fragment "white" sandstone 30% \pm shale - grayish black (2).
6240 - 6250	As 6210 - 6220'.

DEPTH
(feet)

6250 - 6260	As 6210 - 6220'; light olive brown, (5 & 5/6) siltstone - 1%; pyrite.
6260 - 6270	As 6210 - 6220'.
6270 - 6280	As 6210 - 6220'.
6280 - 6290	As 6210 - 6220'.
6290 - 6300	As 6210 - 6220'.
6300 - 6310	As 6210 - 6220'.
6310 - 6320	Shales (50%)/(interbedded) - shales-medium lt. gray/black (N6,1) reddish gray shale - 1%; some siltstone of medium lt. gray and medium gray.
6330 - 6340	As 6210 - 6320'.
6340 - 6350	As 6310 - 6320'.
6350 - 6360	As 6310 - 6320'.
6360 - 6370	As 6310 - 6320'.
6370 - 6380	<u>As 6310 - 6320'.</u>
6380 - 6390	As 6310 - 6320'.
6390 - 6400	As 6310 - 6320'.
6400 - 6410	As 6310 - 6320'.
6410 - 6420	As 6310, - 6320'.
6420 - 6430	<u>As 6310 - 6320'.</u>
6430 - 6440	As 6310 - 6320'.
6440 - 6450	As 6310 - 6320'.
6450 - 6460	As 6310 - 6320'.
6460 - 6470	As 6310 - 6320'.
6470 - 6480	As 6310 - 6320'.
6480 - 4690	As 6310 - 6320'.
6490 - 6500	As 6310 - 6320'.
6500 - 6510	As 6310 - 6320'.

DEPTH
(feet)

6510 - 6520	As 6310 - 6320'.
6520 - 6530	As 6310 - 6320'.
6530 - 6540	Aa 6310 - 6320'; slickenslides; pyrite.
6540 - 6550	As 6310 - 6320'.
6550 - 6560	As 6310 - 6320'.
6560 - 6570	As 6310 - 6320'.
6570 - 6580	As 6310 - 6320'.
6580 - 6590	Shale - black, soft; slickenslides/fossil fragments pyrite and fragments as above.
6600 - 6610	As 6580 - 6590'.
6610 - 6620	As 6580 - 6590'.
6620 - 6630	As 6580 - 6590'.
6630 - 6640	As 6580 - 6590'.
6640 - 6650	As 6580 - 6590'.
6650 - 6660	As 6580 - 6590'.
6660 - 6670	As 6580 - 6590'.
6670 - 6680	As 6580 - 6590'.
6680 - 6690	As 6580 - 6590'.
6690 - 6700	As 6580 - 6590'.
6700 - 6710	As 6580 - 6590'.
6710 - 6720	As 6580 - 6590'.
6720 - 6730	As 6580 - 6590'.
6730 - 6740	As 6580 - 6590'.
6540 - 6550	As 6580 - 6590'.
6750 - 6759	As 6580 - 6590'.