

30-143

OPERATOR: Columbia Gas Transmission Corporation
FARM: Josh Deel, et al.
WELL NO. 20006
LOCATION: Buchanan County
4000' S of 37° - 15'
2800' W of 82° - 12' - 30"
ELEVATION: 1727.65' GR.
TOTAL DEPTH: 4633'
DRILLING COMMENCED: September 4, 1975
WELL COMPLETED: May 4, 1976
RESULT: Gas Well

WELL LOG

DEPTH
(feet)

0-123 No samples.

123-138 Shale, Silty - grayish black (N2), hard; sparse fragments of brownish gray (5YR 4/1).

138-160 Siltstone - as 123-138.

160-172

172-182

182-194

194-207 Siltstone - medium gray (N5); 20% sandstone, very light gray, fine, moderate sorting, clear quartz grains; iron grains; local mica.

207-216 As 194-207.

216-225 As 194-207.

225-237 As 123-138; coal.

237-249 As 123-138; 10% sandstone.

249-260 Sandstone - light olive gray (5Y 6/2) ("Dirty White") - fine to medium grained, poorly sorted, subangular, clear quartz grains; siliceous; soft; moderately porous; accessor minerals - mica; rounded fragments of black siltstone; green "hydo-mica".

260-270 As 248-260.

270-280 As 248-260; fragments grayish black siltstone.

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(feet)

- 280-291 Sandstone (graywacke) - pale yellowish brown (10YR 6/2), as 248-260 but cemented by dark colored siderite; calcareous (from siderite); local masses of siderite; hard; also black unknown mineral (iron?); calcite grains.
- 291-302 Sandstone/Siltstone-Shale (interbedded) - as 280-291; fragments (1%) dusky brown (5YR 2/2) shale and micaceous grayish black siltstone, 10%±.
- 302-312 As 291-302.
- 312-323 Shale - dark gray (N3); hard.
- 323-333 Siltstone - ("Dirty White") light olive gray (5Y 7/1); hard; 30% pyrite "peppered" on surfaces of fragments; micro-stringer of coal in large fragment; graywacke fragments; coal; 10% shale fragments.
- 333-345 50% as 323-333; 50% dusky brown.
- 345-353 Siltstone/Shale - dusky brown (5YR 2/2); trace fragments siltstone as 323-333.
- 353-365 As 345-353.
- 365-377 Sandstone (crushed) - dark yellowish brown (10YR 4/2), medium to coarse, poorly sorted, angular and subangular, clear grains calcareous cement? and grains; 10% fragments of graywacke/sandstone; 10% siltstone-shales, grayish black and dusky brown; Coal; mica locally.
- 377-389 Sandstone/Siltstone - as 345-353 (siltstone) and 365-377 (sandstone).
- 389-400 As 377-389.
- 400-410 No sample.
- 410-420 Sandstone - pale yellowish brown (10YR 6/2); then as 365-377; large fragment coal; mica; 10% siltstone/shale, grayish black.
- 420-430 Siltstone/Shale - as 345-353.
- 430-442 As 420-430.
- 442-455 Sandstone - as 365-377; locally carbonaceous on shale; 25% shale - as 345-353; coal; not calcareous.
- 455-477 No samples.
- 477-488 As 442-455.
- 488-500 As 442-455.

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500-512 Siltstone - dusky brown (5YR 2/2); hard.

512-523 As 500-512.

523-535 As 500-512.

535-556 No samples.

556-566 As 500-512.

566-575 Siltstone (50%)/Sandstone (50%) - as 500-512/442-455 for sandstone;
Coal.

575-586 As 566-575.

586-598 Sandstone - as 442-455; 30% finely crushed siltstone/shale -
grayish black and grayish red; fossil plant carbon film on shale.

598-610 As 442-455; no carbon.

610-621 As 442-455; iron staining.

621-632 As 442-455.

632-645 As 442-455.

645-656 As 442-455.

*123-656 - oil film is distorting color; pale yellow brown color
is due to oil film; actual color "dirty white"/pale brownish gray.

656-662 Sandstone (crushed) - as 442-455; 20% siltstone/shales. (No more
oil film).

662-667 Sandstone - yellowish gray (5Y 7/2); very fine to coarse, largely
coarse, moderately sorted, clear subangular quartz grains,
siliceous, soft; porous; iron stains; fragments of siltstone/shale;
mica.

667-674 As 662-667.

674-682 As 662-667.

682-691 No sample.

691-727 As 662-667.

727-734 As 662-667.

734-742 As 662-667.

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742-750 Sandstone (20%)/Siltstone (80%) - sandstone as 662-667 and siltstone-shale, grayish black (N2); sandy to shaley in texture.

750-755 As 742-750.

755-767 Sandstone - pale yellowish brown (10YR 6/2); medium to coarse, poorly sorted, clear quartz grains; calcitic grains - cement? wood fragment; iron stains; 10% fine fragments siltstone/shale; mica.

767-778 As 755-767.

778-789 As 755-767.

789-818 As 755-767.

818-828 As 755-767.

828-838 As 755-767.

838-850 Shale - disturbed bedding; dusky brown (5YR 2/2); massive; fissile; hard.

850-861 As 838-850.

861-872 As 838-850.

872-884 As 838-850.

884-888 As 838-850.

888-910 No samples.

910-922 Sandstone - as 755-767; Coal; 30% siltstone/shale - as 838-850.

922-932 As 755-767; local mica; magnetite - large crusts.

932-943 As 922-932.

943-955 As 922-932.

955-967 As 755-767.

967-978 As 755-767.

978-989 As 755-767.

989-1000 As 755-767.

1000-1010 As 755-767.

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1010-1047 Shale/Siltstone - dusky brown to grayish black (N2), hard; massive; fissile (shale).

1047-1057 As 1010-1047.

1057-1067 As 1010-1047.

1067-1075 Siltstone/Shale - as 1010-1047; 60% siltstone.

1075-1087 Siltstone/Sandstone - grayish black; 10% sandstone as 755-767; siliceous; hard and calcareous grains; siltstone as 1010-1047.

1087-1096 Shale/Sandstone - as 1075-1087.

1096-1139 Shale-Siltstone/Sandstone - as 1075-1087; siltstone and shale are intergrading.

1139-1150 Siltstone/Shale - as 1010-1047.

1164-1177 Siltstone/Sandstone - as 1075-1087.

1177-1181 Sandstone - moderate yellowish brown (10YR 6/6); medium to coarse, poorly sorted; clear subangular; siliceous; iron stained; rare calcite grains; some fragments darker in color - and 20% siltstone, as 1010-1047; quartz fragments, angular, 2-4 mm.

1181-1190 As 1177-1181.

1190-1200 As 1177-1181; pebble fragments.

1200-1211 iron stains from drilling contamination.

1211-1222 No sample.

1222-1230 As 1177-1181; 20% black shale - fissile; coal on partings; coal fragments; fossil imprint fragments; pebble fragments.

1230-1239 As 1222-1230.

1239-1245 Sandstone (crushed) - moderate yellowish brown (10YR 5/4); medium grained, subangular, clear, moderately well sorted quartz; no cement discernible; 10% siltstone; iron stained.

1245-1256 No sample.

1256-1262 Sandstone - as 1177-1181; fragments of sandstone - siliceous cement.

1262-1268 As 1256-1262.

1268-1273 As 1256-1262.

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1273-1278 As 1256-1262.

1278-1289 No sample.

1289-1298 As 1256-1262; pale grayish orange (10YR 7/4); pebble fragments.

1298-1307 As 1289-1298.

1307-1323 No samples.

1323-1326 As 1289-1298.

1326-1335 Siltstone - grayish black (N1), hard; massive; large fragment iron oxide/magnetite crust; grains of sandstone from above.

1335-1344 No sample.

1344-1352 Siltstone/Sandstone, interbedded - as 1326-1335; micaceous; "grainy" - approaching sandstone in nature; iron crust fragments; 20% sandstone - white (N9), as 1177-1181.

1352-1361 As 1344-1352.

1361-1370 As 1344-1352; coal fragments.

1370-1380 Siltstone/Sandstone - as 1344-1352; coal fragments; 50% sandstone now.

1380-1392 Sandstone - light olive gray (probably high gray) (5Y 6/1); fine to coarse, moderate sorting, angular and subangular clear grains; siliceous; brittle; feldspar - local and saprolitic; local mica; local worn fragments of siltstone.

1392-1404 As 1386-1392; coal fragments.

1404-1411 As 1386-1392.

1411-1418 As 1386-1392.

1418-1430 Sandstone/Siltstone (interbedded) - as 1386-1392; 50% siltstone - as 1344-1352.

1430-1445 Shale - grayish black (N2); hard.

1445-1460 No sample.

1460-1472 Shale/Sandstone - as 1386-1392 and 1430-1445.

1472-1484 Sandstone - as 1177-1181; 10% siltstone.

1484-1497 Sandstone/Siltstone - sandstone as 1386-1392 and siltstone as 1344-1352.

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1497-1507 Shale - as 1430-1445.

1507-1518 Sandstone - as 1380-1392; 10% shale.

1518-1530 Sandstone/Shale - 50% each as 1380-1392 and 1430-1445; coal fragments; local (?) calcareousness; porous.

1530-1540 Sandstone - as 1380-1392; 20% siltstone; local mica -"hydro-green"; calcareous.

1540-1549 As 1530-1540.

1549-1567 As 1530-1540.

1567-1577 As 1530-1540.

1577-1586 (crushed) - as 1530-1540; 10% siltstone.

1586-1600 Siltstone (60%)/Sandstone (40%) - as 1518-1530.

1600-1612 Sandstone - as 1380-1392.

1612-1623 Siltstone/Sandstone - 50% each as 1518-1530.

1623-1633 As 1612-1623.

1633-1643 Siltstone - as 1430-1445; abundant coal.

1643-1653 As 1633-1643; large fragments coal.

1653-1663 As 1633-1643; coal.

1663-1674 As 1633-1643; coal.

1674-1684 Siltstone/Sandstone - as 1518-1530; sandstone not calcareous.

1684-1695 As 1674-1684.

1695-1710 Sandstone - as 1380-1392; 25% siltstone.

1710-1716 As 1695-1710.

1716-1726 Sandstone - as 1380-1392.

1726-1736 As 1380-1392.

1736-1745 As 1380-1392.

1745-1754 Sandstone/Siltstone - 10% - as 1380-1392/1518-1530 (hard; siliceous, "white or light gray").

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1754-1766 Sandstone/Siltstone - as 1518-1530; 50% each.

1766-1775 Sandstone (crushed) - yellowish gray (5Y 8/1) (or light gray
1775-1785 with iron stains), coarse grained, well sorted, subangular,
1785-1792 clear; no cement. At 1792, level - iron staining and sparse
1792-1800 siltstone fragments; at 1800-1811 and 1811-1822, fine sandy
1800-1811 clay-like coating.
1811-1822

1822-1830 As 1766-1775.

1830-1838 No sample.

1838-1845 As 1766-1775.

1845-1860 As 1766-1775.

1860-1868 As 1766-1775.

1868-1898 Sandstone/Siltstone - as 1518-1530; 50% each.

1898-1917 Siltstone - medium gray (N5), hard.

1917-1924 Sandstone - light to medium light gray (N7-N6), fine to coarse,
moderate sorting, subangular clear quartz grains; siliceous;
hard to brittle; coal.

1924-1931 Sandstone/Siltstone - sandstone, 65% as 1917-1924; siltstone,
35%± dark gray (N3).

1931-1942 Sandstone - as 1917-1924.

1942-1953 As 1917-1924.

1953-1964 As 1917-1924.

1964-1986 Siltstone (oily) - dusky brown (5YR 2/2) to grayish black (N2);
hard; carbonaceous.

1986-1999 Siltstone (not oily) - medium dark gray to dark gray (N4-N3);
sandy; hard; locally carbonaceous.

1999-2012 As 1986-1999; becoming finer grained; massive.

2012-2023 As 1999-2012.

2023-2034 As 1999-2012.

2034-2045 As 1999-2012.

2045-2056 As 1999-2012.

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2056-2066 Shale - grayish red (10R 4/2); soft to hard fragments; fissile; with lens of gray within; some siltstone as 1986-1999 covered with powdered "red" shale; percentage difficult to estimate.

2066-2076 Shale/Siltstone - as 2056-2066; 40%± siltstone.

2076-2086 Siltstone/Shales - 30% grayish red shale; 20% medium dark gray (N4) shale with coal partings or locally carbonaceous; disturbed; fissile; and 50% hard medium dark gray siltstone, as 1986-1999.

2086-2095 Shale/Siltstone - shale - grayish red, as 2056-2066; siltstone - as 1986-1999; 50% each some grayish red siltstone also.

2095-2103 As 2086-2095.

2103-2112 As 2086-2095.

2112-2122 Siltstone/Shale - dark greenish gray (5GY 4/1); (50%) siltstone; massive; and 50% grayish red siltstone to shale; soft.

2122-2131 As 2112-2122.

2131-2140 As 2112-2122.

2140-2150 As 2112-2122.

2150-2161 As 2112-2122.

2161-2171 As 2112-2122; 60% "red" shale.

2171-2185 Shale - grayish red; 80% and 10% siltstone as 2112-2122; and 10% Sandstone - greenish gray (5GY 6/1); medium grained, moderate sorting; clear to white grains; micaceous - green.

2185-2199 Shale grading to siltstone - grayish red; hard.

2199-2214 Shales - as 2056-2066; 10% dark gray (N3).

2214-2225 Shale/Siltstone/Sandstone - as 2171-2185.

2225-2239 As 2171-2185.

2239-2251 As 2171-2185.

2251-2265 As 2171-2185.

2265-2278 As 2171-2185.

2278-2290 As 2171-2185.

2290-2303 As 2171-2185.

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2303-2312 As 2171-2185; 20% sandstone, grayish green to white - siliceous; brittle.

2312-2321 Shales/Sandstone - shale grayish red, grayish green and medium gray (N5); 30% sandstone as 2171-2185.

2321-2331 As 2312-2321.

2331-2340 As 2312-2321.

2340-2350 Siltstone - dark gray (N3); hard, massive and grayish red; grayish red shale also.

2350-2357 As 2340-2350.

2357-2365 Siltstone - medium dark gray and dark gray (N3), hard, massive; 25% grayish red siltstone-shale.

2365-2374 Siltstone - as 2357-2365; 3% grayish red siltstone.

2374-2385 As 2357-2365.

2385-2395 As 2357-2365.

2395-2405 As 2357-2365.

2405-2415 As 2357-2365.

2415-2425 As 2357-2365; 20% grayish red siltstone-shale.

2425-2435 Shale - grayish black (N2); hard; fissile; 40% "red" shale.

2435-2450 No sample.

2450-2464 As 2425-2435; no "red" shale-siltstone.

2464-2478 As 2425-2435.

2478-2485 As 2425-2435.

2485-2500 As 2425-2435.

2500-2518 As 2425-2435; 1% "red" shale.

2518-2529 Sandstone/Shale - 50% sandstone, light brownish gray (5YR 6/1) (from coating of gray dust due to red shale) - as 2171-2185; no mica; hard; siliceous; 25% grayish black and 25% grayish red shales; as 2425-2435.

2529-2535 Sandstone/Shale - as 2518-2529.

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2535-2545 Sandstone/Shale - as 2518-2529; 80% sandstone; iron contamination.

2545-2554 As 2535-2545.

2554-2560 Sandstone, crushed - pinkish gray (5YR 8/1); as 2171-2185; no cement; 10% mixed weathered shale fragments.

2560-2565 No sample.

2565-2576 Sandstone/Siltstone - sandstone as 2554-2560; siltstone - 35% medium dark gray (N4); micaceous, variable in color and texture; sandstone has feldspar as cement in much of sample; brittle.

2576-2584 Siltstone/Sandstone - 95% siltstone as 2565-2576; 5% sandstone as 2554-2560.

2584-2592 Siltstone - as 2565-2576.

2592-2602 As 2565-2576.

2602-2612 As 2565-2576.

2612-2621 As 2565-2576.

2621-2629 Siltstone, calcareous - as 2565-2576; calcareous and (30%) limestone, argillaceous - crinoid stems; brachiopods; calcite crystals; pelecypod fragment; pyrite veins, calcite crystals.

* (Very difficult to distinguish siltstone/limestone in this area - only presence of fossils/XLS indicates limestone).

2629-2637 Siltstone (30%)/Limestone - as 2621-2629; 1% brownish gray limestone (5YR 6/1); vugs with spar crystals; Aviculopecten sp. at 2637-2645; ostracod; 10-20% limestone.

2637-2645 As 2621-2629.

2645-2655 As 2621-2629.

2655-2663 Shales/Sandstones - 50% gray and grayish red shales as 2425-2435 and 50% greenish gray and light gray sandstone as 2554-2560.

2663-2678 As 2655-2663.

2678-2690 Shale/Siltstone/Sandstone - grayish red shale, 50%; 10%± sandstone, light gray, fine to medium and coarse; silty; poor sorting; clear grains; micaceous; and 30%± greenish gray siltstone; hard; silty to sandy grading to sandstone; calcite cleavage fragments.

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2690-2698 As 2678-2690.

2698-2710 As 2678-2690.

2710-2720 Siltstone - medium gray (N5); hard; sandy - grading to siltstone-shale as 2678-2690; and 15% grayish red siltstone-shale; calcareous.

2720-2730 As 2710-2720.

2730-2740 Siltstone/Shale - medium gray and medium dark gray (N5,N4), as 2710-2730; calcareous; 1%± sandstone fragments as 2678-2690 with calcareous cement; fragment grayish red shale with slickensides.

2740-2753 As 2730-2740.

2753-2772 Shale/Siltstone - 50% grayish red shale/50% medium dark gray shale and medium gray siltstone as 2710-2720.

2772-2791 Shale/Siltstone - medium dark gray and medium gray shales and siltstones with 1-3% greenish gray sandstone; as 2710-2720 and sandstone as 2171-2185; pyrite in local siltstone.

2791-2805 As 2772-2791; 5% grayish red shale, as 2171-2185.

2805-2820 As 2772-2791.

2820-2831 As 2772-2791.

2831-2845 Shale - medium dark gray (N4); hard, massive, fissile; local grading to siltstone; coal; fragments of grayish red shale and greenish gray sandstone.

2845-2860 As 2831-2845.

2860-2877 Shale/Sandstone - as 2831-2845; 20% sandstone; 1% grayish red shale.

2877-2882 As 2860-2877.

2882-2895 As 2860-2877.

2895-2901 Shale/Sandstone - 50% dark gray (N3) shale as 2831-2845 and 50% sandstone, crushed; light gray; fine to medium grained, moderate sorting, clear subangular quartz grains; siliceous; brittle; and Siltstone fragments; underclay fragments with slickensides.

2901-2912 Shale/Sandstone - as 2895-2901; 35% sandstone.

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2912-2922 Sandstone (crushed) - light brownish gray (5YR 6/1), as 2895-2901; iron contamination; 20% fine shale fragments, dark gray.

2922-2932 As 2912-2922.

2932-2942 As 2912-2922.

2942-2951 As 2912-2922.

2951-2967 As 2912-2922; 30% shale fragments.

2967-2974 Shale/Sandstone - 50% each, as 2895-2901.

2974-2983 As 2895-2901, sandstone and shale only.

2983-2990 As 2895-2901; siltstone, medium gray, sandy, with local carbon/disturbed bedding surfaces.

2990-3000 As 2983-2990.

3000-3010 As 2983-2990.

3010-3020 As 2983-2990.

3020-3030 Shale - as 2831-2845.

3030-3037 As 2831-2845.

3037-3047 Shale/Sandstone - 50% each, as 2895-2901.

3047-3057 As 3037-3047; pyrite, local carbon.

3057-3067 As 3037-3047.

3067-3078 As 3037-3047.

3078-3090 Siltstone - dark gray (N3); hard, massive.

3090-3098 As 3078-3090.

3098-3105 Siltstone/Sandstone - as 3078-3090 and 2895-2901.

3105-3115 Shale, calcareous - medium dark gray and dark gray shale grading to siltstone and sandstone as 2895-2901.

3115-3125 As 3105-3115.

3125-3133 Siltstone/Sandstone - as 3078-3090.

3133-3150 As 3078-3090.

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- 3150-3159 Shale - grayish black (N2); hard, massive.
- 3159-3169 As 3150-3159.
- 3169-3181 As 3150-3159; grayish red siltstone fragments.
- 3181-3194 As 3150-3159.
- 3194-3209 As 3150-3159; 10%± limestone, light grayish brown (5YR 6/1); fine grained.
- 3209-3229 Shale-Siltstone/Sandstone - interbedded, rippled and disturbed bedding (large fragment), shale to siltstone as 3150-3159 and sandstone as 2895-2901 (dark gray (N3)).
- 3229-3240 Siltstone/Sandstone - as 2895-2901; 10% sandstone; slight calcareousness.
- 3240-3252 As 3229-3240.
- 3252-3290 Siltstone-Shale - grayish black (N2); hard.
- 3290-3305 As 3252-3290.
- 3305-3319 As 3252-3290; calcareous.
- 3319-3333 As 3252-3290.
- 3333-3348 Shale - medium dark gray; fissile, silty, as 3252-3290 with veins of pyrite; calcareous and with calcareous fossil fragments - crinoid; carbonaceous film/plant prints/calcite veins/crystals in shale.
- 3348-3360 As 3333-3348; small burrowing gastropods in shale - of pyrite; crinoid stem and top.
- 3360-3380 Shale/Limestone - as 3333-3348; limestone - medium gray, argillaceous; very fine grained; local disturbed bedding on shale; fossils. (Percentage of limestone difficult to estimate; powdered limestone covers shale/many fragments grading, etc.)
- 3380-3392 Limestone/Shale/Sandstone - grayish black (N2); fine to coarse grained; locally gritty, silty to quartz grains grading into shale, as 3333-3348, which also is grading into and interbedding with coarse grained silty, "dirty" sandstone; minute stringers of coal on edges of sandstone; fossils - bryozoa; blastoid; crinoids; pelecypod fragments; pyrite - in cavities, stringer and in calcite fossil matter; 3380-3388 heaviest concentration.
- 3392-3398 Limestone, argillaceous and sandy - as 3380-3392; calcite crystals and fragments, pyrite; 10% fossils.

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3398-3405 As 3392-3398; 5% fossils.

3405-3412 Limestone/Siltstone - as 3392-3398; 35% broken massive fossil fragments - calcite.

3412-3420 As 3392-3398; also medium dark gray and light gray; siltstone - dark gray; and siltstone of increasing amounts, less than 20%.

3420-3431 As 3412-3420; 10-20% siltstone-shale.

3431-3441 As 3412-3420.

3441-3451 Limestone - as 3412-3420; 50% fossil parts; sparse siltstone.

3451-3457 As 3412-3420.

3457-3469 Limestone - light olive gray (5Y 6/1); finely crushed, fine grained, highly fossiliferous; large crystalline fragments.

3469-3481 As 3457-3469.

3481-3495 As 3457-3469.

3495-3509 Limestone/Siltstone - medium dark gray (N4), fine to gritty, argillaceous limestone; sparsely fossiliferous; 3% crystals; siltstone - same color, hard; local disturbed bedding; slickensides; grades to shale - 5%±.

3509-3522 Siltstone/Limestone - as 3495-3509; partly oolitic.

3522-3534 Limestone - as 3457-3469; no fossils but highly crystallized.

3534-3546 As 3457-3469; fossiliferous - varies in % and locally.

3546-3567 As 3495-3509; medium dark gray; crystalline.

3567-3590 As 3457-3469; large fragment, very dark reddish brown (10R 2/4) to light olive brown (5Y 5/6) sandy shale.

3590-3599 As 3567-3590.

3599-3612 As 3457-3469.

3612-3624 As

3624-3636 Olive gray (5Y 4/1); light olive gray (5Y 6/1) and very light gray (N8); equal portions; fine grained; crystalline fragments; fragment of reddish brown shale.

3636-3647 As 3624-3636.

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3647-3666 Medium dark gray (N4), 50% and 50% above mixture.

3666-3676 As 3647-3666.

3676-3686 As 3647-3666.

3686-3697 As 3647-3666; sparse fossil fragments; 10% well worn and rounded crinoid stem fragments.

3697-3708 As 3686-3697; fossils as 3686-3697.

3708-3719 As 3686-3697.

3719-3734 Limestone - light olive gray (5Y 6/1) and very light gray (N8) - 50% each; very light gray is "sugary" in appearance; large fragment of medium dark gray (N4) shale - fissile and lightly calcareous.

3734-3745 Light olive gray limestone; 10% very light gray limestone.

3745-3760 As 3734-3745.

3760-3769 As 3734-3745.

3769-3781 Very light gray (N8) and light gray (N7) - 60%; fine grained, "sugary."

3781-3793 As 3769-3781.

3793-3806 As 3769-3781.

3806-3818 As 3769-3781.

3818-3830 As 3769-3781.

3830-3842 As 3769-3781.

3842-3854 As 3769-3781.

3854-3862 Limestone/Shale, calcareous - very light gray (N8) limestone - 80%; oolitic; 20% medium gray (N5) shale; calcareous; fissile; iron stained; *grayish red weathered shale fragment.

3862-3871 As 3854-3862; shale is medium light gray (N6).

3871-3886 Limestone - as 3854-3862; no shale; sandstone fragment - iron stained.

3886-3896 As 3854-3862; medium light gray limestone and light olive gray.

3896-3910 As 3854-3862.

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3910-3923 Limestone - as 3854-3862; medium dark gray.

3923-3940 Siltstone - medium gray (N5); massive grading to shale; also brownish gray (5YR 4/1) in siltstone/shale; chert - fragments; dolomite?; 1-3% limestone fragments - as above.

3940-3950 As 3923-3940; no limestone; 60% brownish gray.

3950-3960 As 3923-3940; 90% brownish gray; locally micaceous.

3960-3970 As 3950-3960; 50% medium gray - 50% brownish gray; some light gray.

3970-3980 As 3960-3970.

3980-3998 As 3960-3970; medium gray and light gray - 50% each; grading into sandstone - fragments with coarse sized quartz grains giving a "conglomerate" appearance - 1%.

3998-4004 As 3980-3998.

4004-4020 As 3980-3998.

4020-4032 As 3980-3998.

4032-4041 Siltstone/Shale, silty - light olive gray (5Y 6/1); siltstone grading to fine to medium grained sandstones of medium and light gray (N5, N7); 10-20% light brownish gray shale, sandy - mixed sizes; soft; weathered.

4041-4050 As 4032-4041.

4050-4060 Siltstone - as 3980-3998.

4060-4070 As 3980-3998.

4070-4080 As 3980-3998; 30% brownish gray siltstone, locally micaceous; light gray siltstone - sandstone - argillaceous; local pyrite.

4080-4100 As 3980-3998.

4100-4111 As 3980-3998.

4111-4120 As 3980-3998.

4120-4129 Siltstone - as 3980-3998.

4129-4138 As 3980-3998.

4138-4148 Shale/Siltstone - medium gray (N4); siltstone hard, sandy; shale - hard, 30%±.

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4148-4170 Shale/Siltstone - as 4138-4148; leaf and shell impressions.

4170-4180 Shale - as 4138-4148; 20%± siltstone - some light gray and brownish gray, micaceous; chert fragments.

4180-4195 Shale/Siltstone - as 4170-4180; 50% each; no chert.

4195-4207 As 4180-4195; rippled shale surface.

4207-4217 Shale - grayish black (N2); soft; fissile.

4217-4219 As 4207-4217.

4219-4230 As 4207-4217.

4230-4242 As 4207-4217.

4242-4256 As 4207-4217.

4256-4280 As 4207-4217; hard.

4280-4300 As 4207-4217.

4300-4322 As 4207-4217.

4322-4350 As 4207-4217; brownish gray siltstone fragment.

4350-4375 No sample.

4375-4400 As 4207-4217; 1-5% siltstone. _____

4400-4420 As 4207-4217; dark gray and brownish gray.

4420-4438 As 4207-4217; some siltstone.

4438-4462 As 4207-4217; rippled bedding.

4462-4480 As 4207-4217.

4480-4498 As 4207-4217.

4498-4509 As 4207-4217; hard; rippled on bedding planes.

4509-4520 As 4207-4217; grading to siltstone in some places. at 4509-4520; local carbon/pyrite.

4520-4532 As 4498-4509.

4532-4541 Shale/Siltstone - grayish black (N2); hard, fissile; areas of disturbed bedding; and 15% medium gray (N5) siltstone grading to fine, moderate sorting, "dirty" sandstone with local pyrite.

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4541-4547 Shale/Siltstone - as 4532-4541; 25% siltstone; fragment of brownish gray siltstone and one of grayish red.

4547-4551 Shale/Siltstone - as 4532-4541; 50% each.

4551-4555 As 4547-4551.

4555-4560 Siltstone/Shale - 80% medium gray (N5) siltstone grading into fine sandstone and 20% shale as above.

4560-4565 As 4555-4560.

4565-4571 As 4555-4560.

4571-4577 Siltstone - dark gray (N3) siltstone - 40%; 40% light gray siltstone - sandstone; 20% shale - grayish black.

4577-4587. No sample.

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