

PIPE LINE CONSTRUCTION AND DRILLING COMPANY

A. L. Powers No. 1

Topographic Location: 3.1 miles West of 82° 00'; 3.86 miles South of
37° 20'.

15' Hurley, Virginia and Kentucky Quadrangle, Grundy
District; Buchanan County, Virginia.

Elevation: 1509.25' (ground).

Grundy Quad. 7 1/2'

Total Depth: 3725'.

Interval

- | | |
|---------|---|
| 121-128 | Siltstone, medium dark gray (N4), micaceous, sandy with carbonaceous partings. |
| 128-134 | Like 121-128. |
| 134-140 | Shale, medium dark gray (N4), silty, micaceous. |
| 140-147 | Like 134-140. |
| 147-152 | Like 140-147. |
| 152-158 | Siltstone, medium dark gray (N4), argillaceous, micaceous. |
| 158-165 | Sandstone, light gray (N7), very fine-grained, subangular, poorly sorted, very silty, micaceous, abundant black mineral, 1/2 quartzose. |
| 165-171 | Sandstone, light gray (N7), fine-grained to medium-grained, subangular to subrounded, poorly sorted, slightly porous, silty, slightly micaceous, abundant black mineral, little green mineral, 3/4 quartzose. |
| 171-178 | Like 165-171. |
| 178-183 | Like 171-178. |
| 183-189 | Like 178-183. |
| 189-194 | Like 183-189. |
| 194-200 | Siltstone, medium dark gray (N4), micaceous. |
| 200-206 | Shale, dark gray (N3), fissile, micaceous. |
| 206-215 | Like 200-206. |

Interval

- 215-221 Like 206-215.
- 221-227 Like 215-221.
- 227-232 Like 221-227.
- 232-240 No sample.
- 240-250 Like 227-232.
- 250-260 Siltstone, sandy, micaceous.
- 260-270 Like 250-260.
- 270-280 Sandstone, very light gray (N8), fine-grained to medium-grained, subangular to subrounded, well sorted, porous, micaceous, all sideritic nodules, 90% quartzose.
- 280-290 Sandstone, very light gray (N8), conglomeratic, medium-grained to coarse-grained, subangular to subrounded, fairly well sorted, little green mineral, and few sideritic nodules, 90% quartzose.
- 290-300 No sample.
- 300-304 Sandstone, very light gray (N8), very fine-grained to fine-grained, subangular to subrounded, well sorted, slightly porous, little green mineral.
- 304-312 Shale, dark gray (N3), fissile, micaceous.
- 312-319 Sandstone, light brownish gray (5YR 6/1), fine-grained to medium-grained, subangular, fairly well sorted, slightly porous, calcareous, very sideritic, zones, little green mineral, 3/4 quartzose.
- 319-327 Like 312-319.
- 327-334 Shale, dark gray (N3), fissile, micaceous to silty, very micaceous.
- 334-344 Siltstone, medium gray (N5), sandy, micaceous, with carbonaceous partings.
- 344-356 Siltstone, like 334-344; and shale, dark gray (N3), silty, carbonaceous.
- 356-366 Shale, dark gray (N3), like 344-356.

Interval

- 366-373 Sandstone, light gray (N7), very fine-grained to fine-grained, subangular, poorly sorted, very slightly porous, very silty, slightly calcareous, micaceous, abundant black mineral, abundant iron stain.
- 373-380 Siltstone, medium dark gray (N4), sandy.
- 380-388 Like 373-380.
- 388-395 No sample.
- 395-404 Shale, dark gray (N3), fissile, micaceous.
- 404-410 Like 395-404, with little brownish gray (5YR 4/1), sideritic shale.
- 410-424 Shale, medium dark gray (N4), silty, very micaceous.
- 424-432 Shale, medium dark gray (N4), silty, fissile, slightly micaceous.
- 432-447 Like 424-432.
- 447-454 Shale, medium dark gray (N4), micaceous.
- 454-460 Sandstone, medium gray (N5), very fine-grained, subangular, poorly sorted, slightly porous, silty, micaceous, abundant black mineral, 3/4 quartzose.
- 460-463 No sample.
- 463-471 Like 454-460.
- 471-479 Like 463-471.
- 479-485 Sandstone, light gray (N7), fine-grained to medium-grained, subangular to subrounded, poorly sorted, slightly porous, silty, micaceous, abundant black mineral, 3/4 quartzose.
- 485-492 Shale, dark gray (N3), carbonaceous; and coal.
- 492-496 Siltstone, medium gray (N5), sandy, micaceous.
- 496-502 Siltstone, medium light gray (N6) to medium dark gray (N4), sandy, micaceous.
- 502-513 Sandstone, light gray (N7), very fine-grained to fine-grained, subangular, fairly well sorted, very slightly porous, silica cement, little black mineral, little iron stain, 90% quartzose.

Interval

- 513-519 Like 502-513.
- 519-528 Siltstone, medium dark gray (N4), very micaceous, slightly sandy.
- 528-535 Sandstone, very light gray (N8), very fine-grained to medium-grained, subangular, poorly sorted, slightly porous, calcareous, slightly silty, little black mineral, 90% quartzose.
- 535-543 Like 528-535.
- 543-548 Like 535-543.

- 3535-3545 Siltstone, grayish red (10R 4/2), micaceous.
- 3545-3554 Like 3535-3545; and siltstone, medium gray (N5), sandy, with abundant green mineral.
- 3554-3560 Siltstone, grayish red, like 3535-3545.
- 3560-3567 Like 3554-3560.
- 3567-3574 Siltstone, like 3560-3567.
- 3574-3582 Siltstone, like 3567-3574; and medium gray (N5), sandy, slightly micaceous.

Samples examined by Allen D. Williamson.
Geologist, U.S. Geological Survey.
Lexington, Kentucky.
April, 1950.

PIPE LINE DRILLING AND CONSTRUCTION COMPANY

Powers No. 1

Elevation: 1509.25
Location: 231' S. 52°30'W. of Lynn and 602' S. 77°30'W.
Latitude 37°20', Longitude 82°00'
Hurley Quadrangle, Virginia and Kentucky
Buchanan County, Virginia

Sample descriptions by: Mary Beth McFarlan
U. S. Geological Survey
Lexington, Kentucky
March-May, 1949

Sample Description

Powers No. 1

Pipeline Construction Company

Interval

- 559-562 Sandstone, white to yellowish, fine-grained, angular to subangular, scattered black and few light green minerals, limonite staining, some pieces with calcareous cement; shale (1%), dark gray (N3).
- 554-562 Sandstone, white, fine-grained, angular to subangular, clustered, non-calcareous to slightly calcareous cementing material, limonite stain, some scattered black and green (glauconite?) minerals; shale (2%), dark gray (N3), very finely micaceous, one or two pieces white amorphous non-calcareous mineral.
- 562-570 Sandstone, white, fine to medium-grained, angular to sub-angular, little limonite stain, occasional pieces glauconite (?), very little magnetite (?); shale (1%) grayish black (N2), occasional piece mica (muscovite), trace coal, trace pyrite.
- 570-575 Sandstone, white, very fine to fine-grained, few larger fragments, few scattered black and green (glauconite?) minerals, trace magnetite (?) limonite staining; shale (1%) grayish black (N2) to dark gray (N3), trace coal, occasional piece mica (muscovite).
- 575-580 Same as 570-575.
- 580-585 " " " " more very fine-grained sandstone grading into siltstone.
- 585-592 Sandstone, white to yellowish, fine to medium-grained, occasional larger fragment of quartz, angular to subangular, free, occasional cluster, several pieces coal, trace grayish black shale.
- 592-598 Sandstone, white, medium to very coarse-grained, conglomerate, angular, limonite staining, several pieces coal, little glauconite (?), occasional piece dark gray shale.
- 598-603 Sandstone, medium to fine to coarse-grained, large fragments of quartz-conglomerate, very poorly sorted, little silty material, limonite staining, scattered black minerals, dirty sample, very slightly micaceous; shale (5%), dark gray to grayish black, trace coal.
- 603-608 Same as 598-603, siltstone 25%.
- 608-615 Sandstone, white to gray, very fine-grained, clustered, scattered black minerals, slightly micaceous, shaly, little limonite staining; shale (1%), medium dark gray (N4) to dark gray (N3), some sandy.
- 615-625 Same as 608-615.

Interval

- 625-635 Shale, medium dark gray (N4), silty, slightly finely micaceous; sandstone (1%) gray, very fine-grained, shaly.
- 635-642 Sandstone, white to gray, very fine-grained, one or two larger fragments (cavings?), shaly, slightly micaceous, little limonite stain, scattered black minerals; shale (40%) medium dark gray (N4), silty to non-silty, some pieces very micaceous.
- 642-647 Shale, medium dark gray (N4), silty to sandy, occasional piece not silty, slightly micaceous, little limonite staining; sandstone (25%) gray, very fine-grained, shaly, slightly micaceous.
- 647-657 Shale, medium dark gray (N4) to dark gray (N3), some pieces silty, slightly micaceous; sandstone (5%), very fine-grained, shaly, few scattered black minerals.
- 657-667 Same as 647-657.
- 667-674 " " " " more sandstone - 50%, shale more silty, trace coal.
- 674-685 Sandstone, light gray (N7) to some medium dark gray (N4), very fine-grained, clustered, scattered black minerals, slightly calcareous cement, very slightly micaceous; shale (1%), medium dark gray (N4), slightly micaceous and silty.
- 685-695 Same as 674-685, sandstone shaly, darker.
- 695-705 " " " " sandstone non-calcareous.
- 705-715 " " " " " " some shale very micaceous.
- 715-724 Sandstone, white to few brownish gray, fine-grained to some very fine-grained, angular to subangular, free and some clustered, few scattered black and green (glauconite?) minerals, some pieces shaly and micaceous, occasional piece medium dark gray shale.
- 724-741 No samples.
- 741-750 Shale, medium dark gray (N4) to dark gray (N3), some silty and slightly micaceous; sandstone (40%), white to gray, fine-grained, some shaly, scattered black and few green minerals, little limonite stain.
- 750-756 Same as 741-750, only little shale is silty, sandstone about 50%.
- 756-764 Sandstone, white, fine-grained, angular to subangular, free and clustered, scattered black and few green minerals, little limonite stain, few pieces shaly; shale (1%), medium dark gray (N4), trace coal.

Interval:

- 764-771 Sandstone, white to very light gray, fine-grained to very fine-grained to siltstone, free and clustered, some scattered black minerals, little limonite stain, occasional piece slightly calcareous, trace dark gray shale (N3).
- 771-778 Sandstone, white to very light gray, medium to fine-grained, little very fine-grained, free and clustered, some scattered black and few green minerals, occasionally slightly calcareous, little limonite stain, occasional piece shaly; trace dark gray shale.
- 778-781 Same as 771-778, some siltstone, few more green minerals (glauconite?), mostly free.
- 781-791 Siltstone, very light gray, mostly free, some clusters, very little limonite stain; sandstone (30%), white, fine to medium-grained, clustered and free, few black and green minerals, several fragments coal, occasional piece mica (muscovite).
- 791-808 Shale, medium dark gray (N4) to dark gray (N3), some brownish gray slightly silty shale; sandstone (40%), very light gray to gray, very fine-grained, scattered black minerals, trace limonite stain, coal fragment.
- 808-818 Same as 791-808, very occasional piece brownish gray shale, trace pyrite, coal about 2%.
- 818-827 Sandstone, light gray, very fine-grained, few scattered black minerals, some pieces shaly, trace limonite stain; shale (15%), very slightly micaceous.
- 827-836 Sandstone, white-gray, very fine-grained, few scattered black minerals, trace limonite stain; shale (35%), medium dark gray, slightly micaceous, some pieces silty, trace coal.
- 836-846 Sandstone, very light gray, fine to very fine-grained, scattered black and few green (glauconite?) minerals, trace limonite staining; shale (5%) medium dark to dark gray shale, some slightly silty, very slightly micaceous, trace coal.
- 846-853 Same as 836-846, no coal, two or three pieces brownish gray shale.
- 853-861 Sandstone, white, fine grained, mostly free, some clusters, few black and green (glauconite?) minerals, very little limonite stain.
- 861-869 Same as 853-861, few more clusters.
- 869-880 Shale, medium dark gray (N4), finely micaceous, little limonite stain; sandstone (2%), gray, very fine-grained.

Interval

880-890	Shale as in 869-880, trace very fine grained sandstone.
900-920	" " " " " " " " " " " no limonite stain.
920-930	" " " " " " " " " " "
930-940	" " " " " " " " " " " little silty material.
940-950	" " " " " " " " " " " " " " "
950-960	" " " " " " " " " " " piece coal.
960-969	" " " " " no sandstone.
969-975	Sandstone, light gray (N7), very fine to fine-grained, scattered black and few green (glauconite?) minerals, calcareous cement, some shaly; shale (5%) medium dark gray (N4) to dark gray (N3), trace coal.
975-980	Shale, dark gray (N3) to black; sandstone (15%), very light gray, very fine-grained, free and clustered, trace pyrite, several pieces coal.
980-985	No samples.
985-994	Shale, medium dark gray (N4) to dark gray (N3), few pieces slightly micaceous; sandstone (20%), light gray, very fine-grained, very little limonite stain, one piece magnetite (?).
994-1000	Sandstone, very light gray, very fine-grained, scattered black minerals clustered, limonite stain; shale (10%), medium dark gray (N4), some pieces micaceous.
1000-1010	Same as 994-1000, some sandstone free, one piece dark brownish gray shale.
1010-1020	Same as 1000-1010, sandstone more free than clustered; shale, dark gray (N3) to medium dark gray (N4).
1020-1030	Sandstone, white, very fine-grained, clustered, few black minerals, little limonite stain, few pieces shaly; shale (25%), medium dark gray (N4), some pieces slightly micaceous, one piece white amorphous non-calcareous mineral noted.
1030-1040	Same as 1020-1030.
1040-1050	Sandstone, white, fine-grained, free and clustered, one larger quartz fragment, few scattered black minerals, limonite stain; shale (5%) dark gray (N3), two or three with brownish tint, trace white amorphous non-calcareous mineral.

Interval

- 1050-1060 No samples.
- 1060-1070 Sandstone, white to yellow, fine-grained, free, much limonite stain; shale (1%), dark gray to black, two or three pieces coal, one piece brownish shale.
- 1070-1075 Sandstone, white to yellowish, fine to medium-grained, much limonite stain; shale (2%) medium dark gray (N4) to dark gray (N3), one or two pieces non-calcareous white amorphous material.
- 1075-1082 Sandstone, white, fine-grained, clustered, few free, few scattered black minerals, limonite stain; shale (30%), dark gray (N3), few pieces very micaceous.
- 1082-1090 Same as 1075-1082, more free sandstone, very occasional green mineral (glauconite?) two or three larger fragments of quartz.
- 1090-1100 Sandstone, white to light gray, very fine to fine to medium-grained, free, some clustered, angular to subangular, very occasional green mineral (glauconite?); shale (10%) medium dark gray (N4) few pieces slightly micaceous.
- 1100-1110 Same as 1090-1100, little limonite stain.
- 1110-1116 Shale, medium dark gray (N4), occasionally slightly micaceous, one piece banded; sandstone (15%), white, fine-grained, free and clustered, one or two pieces shaly, little limonite stain, one larger fragment of quartz.
- 1116-1123 Same as 1110-1116, no larger fragments of quartz.
- 1123-1130 Sandstone, white to some gray, fine-grained, clustered and free, limonite stain, some scattered black minerals; shale (2%) dark gray (N3) piece white; non-calcareous amorphous mineral.
- 1130-1136 Sandstone, white to gray, very fine to fine-grained, clustered, such limonite stain, few scattered black minerals, slightly calcareous; shale (2%) medium dark gray, occasionally very slightly micaceous.
- 1136-1142 Same as 1130-1136, more free sandstone, only very slightly calcareous.
- 1142-1146 Same as 1130-1136, only very slightly calcareous, very occasional green mineral (glauconite?).
- 1146-1151 Siltstone to very fine-grained sandstone to fine-grained sandstone, white to light tan, some limonite stain, mostly free, few clusters, occasional piece shaly, siltstone (30%), trace dark gray shale.

Interval

1157-1161 Same as 1146-1151.

1160-1170 Sandstone, white to yellowish, fine to medium to coarse-grained, pieces up to 3 mm., conglomerate, free, angular to subangular, limonite stain, few green minerals (glauconite?); shale (1%), dark gray (N3).

1170-1180 Same as 1160-1170, more coarse grained, more limonite stain.

1180-1190 Same as 1170-1180.

1190-1200 " " " "

1200-1208 " " " " not as much coarse grained.

1208-1216 Sandstone, white to yellow, fine-grained, few larger quartz fragments, free, much limonite stain, occasional green mineral (glauconite?): trace dark gray shale.

1216-1225 Same as 1208-1216.

1225-1235 " " " " more larger quartz fragments; shale about 1%.

1235-1245 Same as 1208-1216; shale about 1%.

1245-1250 " " " " " " "

Sample Description

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Pipeline Construction Company

Interval

1252-1260	Sandstone, white-yellowish (limonitic staining?), very fine-coarse grained angular-subangular, trace dark gray shale (cavings?).
1260-1266	Same as 1252-1260.
1266-1273	" " " "
1273-1281	" " " " few pieces medium gray shale.
1281-1288	Siltstone to medium grained sandstone, white -tan, some limonitic staining, siltstone-very fine grained sandstone \pm 80%, trace medium dark gray shale (N4) (cavings?).
1288-1294	Same as 1281-1288.
1294-1300	Sandstone, white-tan, medium-coarse grained, some siltstone and very fine grained sandstone (15%), subrounded-angular, some limonitic staining.
1300-1309	Sandstone, white-tan, medium-coarse grained, about 10% fine grained, angular-subangular, some limonitic staining, trace dark gray shale (cavings?).
1309-1319	Same as 1300-1309.
1319-1326	" " " "
1326-1334	" " " "
1334-1340	Sandstone, white, coarse grained, angular - subangular, 20% fine-medium grained, some limonitic staining, trace dark gray shale (cavings?).
1340-1347	Same as 1334-1340.
1347-1353	" " " " Shale 1%.
1353-1360	" " " " " "
1360-1367	Shale, medium dark gray (N4), very slightly micaceous; sandstone (50%), white-light gray, fine-medium grained, few larger pieces quartz, slightly shaly, several pieces coal.
1367-1375	Same as 1360-1367, scattered black minerals.

Interval

- 1375-1380 Coal; sandstone (15%) light-medium gray, very fine grained.
- 1380-1388 Sandstone, light-medium gray, very fine grained, scattered black minerals few larger quartz fragments (cavings?), very slightly micaceous; shale (5%) medium dark gray (N4), several pieces coal.
- 1388-1396 Same as 1380-1388.
- 1396-1405 Shale, medium dark gray, finely micaceous, silty; sandstone (10%), light-medium gray, very fine grained, scattered black minerals, some shaly.
- 1405-1414 Shale, medium dark gray (N4), very slightly micaceous; sandstone-siltstone (5%), light gray.
- 1414-1422 Same as 1405-1414.
- 1422-1430 Shale, medium dark gray (N4) - medium gray (N5), very slightly micaceous.
- 1430-1438 Shale, medium dark gray (N4) - medium gray (N5), very slightly micaceous; trace sandstone as in 1405-1414 (cavings?).
- 1438-1448 Shale, medium dark gray, very slightly micaceous, some silty; siltstone (40%) light gray, tannish tint.
- 1448-1457 Same as 1438-1448, siltstone 50%, very slightly micaceous, few scattered black minerals.
- 1457-1465 Same as 1448-1457, some siltstone shaly.
- 1465-1472 " " " " " " " siltstone light gray.
- 1472-1480 Sandstone, white-tan, very fine grained, silty; some limonitic staining, scattered black minerals; shale (5%) medium darkgray (N4).
- 1480-1490 Sandstone, white, few pieces medium light gray, very fine grained, scattered black minerals, very slightly micaceous, some limonitic staining; shale (10%) medium dark gray (N4)-dark gray (N3), slightly micaceous.
- 1490-1500 Same as 1480-1490.
- 1500-1511 Sandstone, white, fine grained, angular-subangular, some limonitic staining, scattered black minerals, two or three larger quartz fragments; shale (5%), dark gray (N3), finely micaceous.
- 1511-1522 Same as 1500-1511, shale medium dark gray (N4)-dark gray (N3), no larger quartz fragments.

Interval

- 1522-1540 Sandstone, white, very fine-medium grained, angular - subangular, limonitic staining; shale (1%) medium dark gray (N4) - dark gray (N3), few pieces black magnetic mineral (magnetite?).
- 1522-1532 Same as 1522-1540.
- 1540-1550 Sandstone, white-yellowish tan, very fine-medium grained, angular - subangular - subrounded, limonitic staining; shale (1%) dark gray (N3) trace black magnetic mineral (Magnetite?).
- 1550-1560 Siltstone-fine grained sandstone, white-tan, limonitic staining; shale (1%) dark gray (N3), trace black magnetic mineral (magnetite?).
- 1560-1567 Same as 1550-1560.
- 1567-1575 Sandstone, white-yellowish, fine-medium grained, angular - subangular, limonitic staining; shale (1%) medium dark gray (N4) - dark gray (N3).
- 1575-1582 Same as 1567-1575, trace coal.
- 1582-1590 Sandstone, white-tan, medium grained - some fine grained (15%), angular - subangular, limonitic staining, little dark gray shale (1%).
- 1590-1600 Shale, medium gray (N5), noncalcareous to slightly calcareous; little sandstone (1%), white, fine-medium grained.
- 1600-1610 Shale, medium dark gray (N4)-pale reddish gray, slightly calcareous, gray shale covered by pale reddish gray shale (50%), soft earthy, slightly silty.
- 1610-1620 Same as 1600-1610.
- 1620-1630 " " " "
- 1630-1640 Shale, medium gray (N5)-medium dark gray (N4), covered with silty calcareous material, white-light gray, little sandstone (3%) white, very fine grained, calcareous.
- 1640-1650 Same as 1630-1640.
- 1650-1660 Shale, medium gray (N5)-medium dark gray (N4)-grayish red; grayish red (60%); sandstone, 20%, white-light gray-pinkish, few grains green, very fine grained.

Interval

- 1660-1670 Shale, reddish gray (60%)-medium gray (N4)-few pieces greenish; sandstone, greenish gray (35%), very fine grained, few scattered black and dark green (glauconite?) minerals, trace brownish limestone.
- 1670-1680 Sandstone, white-greenish gray, very fine grained, slightly calcareous, scattered green (glauconite?) and black minerals; shale (50%) reddish gray (30%)-medium dark gray (N4).
- 1680-1690 Shale, medium dark gray (N4)-reddish gray (35%)-greenish tint, very finely micaceous; sandstone (30%), white-greenish gray, very fine grained, slightly calcareous, scattered green (glauconite?) and black minerals, trace limestone, brownish.
- 1690-1700 Same as 1670-1680, sandstone, very slightly calcareous, reddish gray shale (20%).
- 1700-1710 Silty sandstone, white-light gray, very fine grained, some with greenish tint, very slightly micaceous, very slightly calcareous, silty shale, medium dark gray-grayish red (25%), little limonitic staining.
- 1710-1720 Calcareous sandstone to sandy limestone, white-gray, sandstone, very fine-fine grained, few scattered black minerals; shale (3%), dark gray-reddish gray, trace pyrite.
- 1720-1730 Sandstone, white-light gray, very fine grained, scattered black minerals, little limonitic staining; shale (1%), medium gray-medium dark gray-reddish gray, few pieces limestone, trace pyrite.
- 1730-1740 Sandstone, white-gray, some shaly, very fine grained, slightly calcareous, few scattered black minerals, very slightly micaceous; shale (30%), medium gray (N5)-medium dark gray (N4), slightly micaceous.
- 1740-1750 Same as 1730-1740, shale about 40%.
- 1750-1760 Shale, medium dark gray, very slightly micaceous; sandstone (25%), white-gray, very fine grained, few scattered black minerals.
- 1760-1770 No samples.
- 1770-1780 Shale, medium dark gray (N4), little silty material, very slightly micaceous.

Interval

1780-1790	Same as 1770-1780.
1790-1800	" " " "
1800-1810	" " " "
1810-1820	" " " " very little silty material.
1820-1830	" " " " " " " "
1830-1840	No samples.
1840-1850	Shale, medium dark gray, very slightly micaceous, very little silty material.
1850-1860	Same as 1840-1850.
1860-1870	" " " "
1870-1880	" " " " little silty material.
1880-1890	" " " " " " " trace coal.
1890-1900	Shale, medium dark gray (N4)-dark gray (N3), very finely micaceous, very slightly calcareous; sandstone (40%), gray, very fine grained, shaly, calcareous, slightly micaceous.
1900-1910	Same as 1890-1900.
1910-1920	Shale, medium gray (N5), very finely micaceous; sandstone (30%), fine grained, light-medium gray, calcareous, slightly micaceous, some shaly, little limonitic staining.
1920-1930	Shale, medium gray (N5), very finely micaceous.
1930-1940	" " " " " " " little silty material.
1940-1950	Shale, medium dark gray (N4), very finely micaceous, little silty material.
1950-1960	Sandstone, white-gray (mostly white), very fine grained, calcareous, few scattered black minerals, little limonitic staining; shale (40%), medium dark gray (N4), little silty material.

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Interval

- 1960-1970 Same as 1950-1960, no silty material.
- 1970-1980 Shale, medium dark gray (N4), very finely micaceous, few pieces sandstone as in 1950-1960 (cavings?), little silty material.
- 1980-1990 Same as 1970-1980, shale, dark gray (N3), sandstone 1%.
- 1990-2000 Shale, medium dark gray (N4)-dark gray (N3), very slightly micaceous, silty material, trace coal, few pieces sandstone (cavings?).
- 2000-2010 Same as 1990-2000, no coal.
- 2010-2020 " " " " " " shale, medium dark gray.
- 2020-2030 Same as 2010-2020.
- 2030-2040 " " " " much silty material.
- 2040-2050 " " " " " " "
- 2050-2060 " " " "

- 2060-2070 Sandstone, white-gray, very fine grained-fine grained, shaly, slightly calcareous, few scattered black minerals, slightly micaceous, little pyrite.
- 2070-2080 Sandstone, very light-medium gray-tan, very fine grained, calcareous, very slightly micaceous; shale (25%), medium dark gray, very slightly micaceous; limestone (25%), medium brownish gray-white-gray, crystalline-dense, trace pyrite.
(?)
- 2076-2080 Sandstone, white-yellowish (limonitic stain), very fine grained, scattered black minerals, slightly calcareous, shale (2%), medium dark gray (N4), some pyrite, black magnetic mineral (magnetites).
- 2080-2084 Same as 2076-2080.
- 2084-2089 Sandstone, white, very fine grained to siltstone, limonitic staining, black magnetic mineral (magnetite?), very slightly calcareous, trace dark gray shale (cavings?).
- 2089-2093 Sandstone, white-yellowish (limonitic staining), very fine-fine grained, little black magnetic mineral (magnetite?) (1%) trace dark gray shale, little pyrite.

Interval

- 2093-2096 Sandstone, white-yellowish (limonitic staining), very fine grained, black magnetic mineral (magnetite?) (1%), shale, (1%), dark gray (N3)-grayish black (N2), trace pyrite.
- 2096-2100 Sandstone, white-yellowish, very fine-fine grained, much limonitic staining, black magnetic mineral (magnetite?) (1%), trace shale, dark gray, trace pyrite.
- 2100-2104 Sandstone, white, very fine grained, limonitic staining, black magnetic mineral (magnetite?) (1%), trace dark gray shale.
- 2104-2109 No samples.
- 2109-2113 Same as 2100-2104, little siltstone.
- 2113-2118 Same as 2096-2100.
- 2118-2128 Shale, medium dark gray (N5), calcareous, finely micaceous, limestone (15%), medium dark gray-tan-white, shaly; little sandstone (1%), white, fine grained (cavings?), trace pyrite.
- 2128-2140 Same as 2118-2128.
- 2140-2155 " " " " limestone about 25%, no pyrite.
- 2155-2167 " " " " no sandstone.
- 2167-2177 Shale, medium dark gray (N4)-medium light gray (N6) (few pieces), calcareous, very finely micaceous.
- 2177-2185 Same as 2167-2177, several pieces shaly limestone.
- 2185-2195 Shale, medium dark gray-greenish tint; sandstone (30%), gray-greenish tint, very fine grained, scattered black and few dark green (glaucanite?) minerals, limestone, gray-white (3%), shaly, piece gypsum.
- 2195-2202 Sandstone, white-gray, very fine grained, two or three larger quartz fragments; shale (30%), medium dark gray-reddish brownish gray, very finely micaceous, little limestone (1%), gray-brownish gray, few pieces black magnetic mineral (magnetite?).

72113-2109?

Q59

Interval

- 2202-2207 Sandstone, white-gray-brownish, very fine grained, few scattered black minerals, slightly shaly, some limonitic staining; shale (10%), medium dark gray (N4)-brownish gray-greenish tint, trace limestone, brownish gray.
- 2207-2212 Same as 2202-2207, less shale (3%), no limestone.
- 2212-2218 Sandstone, white-very light gray (little), very fine grained, some limonitic staining, few scattered black minerals, trace minerals, trace medium dark gray shale, trace gray limestone.
- 2218-2227 Same as 2212-2218, no limestone.
- 2228-2235 Sandstone, white, fine-medium grained, subangular - angular, some limonitic staining, some pieces calcareous, few scattered black minerals; shale, medium gray (N5)-medium dark gray (N4) (3%), very finely micaceous.
- 2235-2245 Same as 2228-2235, trace shale.
- 2245-2253 " " " "
- 2253-2262 " " " " trace shale.
- 2262-2274 Sandstone, same as 2228-2235, shale (35%), medium dark gray, calcareous, some pieces noncalcareous.
- 2274-2285 Same as 2262-2274.

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Interval

- 2285-2295 Shale, grayish red to medium gray (N5) to medium dark gray (N4), red shale 75%, very finely micaceous, some shale slightly calcareous; sandstone (15%) white to brownish, fine grained, slightly calcareous, few pieces limestone.
- 2295-2305 Same as 2285-2295, sandstone about 10%.
- 2305-2314 Shale, medium dark gray (N4), covered by much pale red silty material, very slightly micaceous, some pieces calcareous.
- 2314-2324 Shale, reddish gray to medium dark gray (N4), little pale red silty material, very finely micaceous (very slightly), few pieces very slightly calcareous, trace limestone.
- 2324-2334 Same as 2314-2324, more silty material, slightly calcareous; shale slightly calcareous, more limestone.
- 2334-2344 Shale, grayish red (5R 4/2) to medium gray to medium dark gray, red shale, 75%, some pieces slightly calcareous, very micaceous to \pm non-micaceous; sandstone (15%) pale reddish gray to gray, very fine grained calcareous, micaceous, shaly; little limestone, sandy.
- 2344-2350 Shale, medium dark gray (N4) to grayish red (5R 4/2) some slightly calcareous, silty material, tan, non-micaceous to finely micaceous; limestone (5%) gray to reddish gray, some silty.
- 2350-2359 Shale, medium dark gray (N4), few pieces reddish, some silty, finely micaceous; sandstone (40%), white to gray, very fine-grained to siltstone, slightly calcareous, few scattered black minerals, some shale, tan silty material throughout sample.
- 2359-2370 Shale, medium dark gray (N4) to dark gray (N3) to reddish gray, few pieces finely micaceous; sandstone (20%), white to gray, very fine-grained, some very shaly, calcareous (white) to very slightly calcareous; \pm 30% red shale.
- 2370-2380 Shale, medium dark gray, several pieces with reddish tint, very slightly calcareous, little tan silty material, few pieces gritty limestone (less than 1%).
- 2380-2392 Shale, medium dark gray (N4) to grayish red (5R 4/2) (30%), red shale is calcareous, gray shale is very slightly to non-calcareous, very finely micaceous; limestone (1%) tan to gray, gritty.
- 2392-2402 Shale, medium dark gray to grayish red (5R 4/2) to medium gray, non-calcareous to some calcareous, very slightly micaceous; sandstone (1%) white to gray, very fine-grained, some very calcareous, some shaly, trace limestone; some limonitic staining, little tan silty material.

Interval

- 2402-2412 Shale, medium dark gray to dark gray to reddish gray (20%), few pieces with greenish tint, calcareous to non-calcareous; sandstone (3%) white to gray, very fine grained to silty, very calcareous, few pieces limestone.
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- 2412-2423 *2412* Sandstone, white to gray, very fine-grained, angular, scattered black minerals, free, some pieces shaly; shale (15%), medium dark gray to reddish gray, very slightly micaceous.
- 2423-2435 Same as 2412-2423, shale about 20%.
- 2435-2442 Sandstone, white to few light gray, very fine grained, angular, free and in clusters, few scattered black minerals, some pieces calcareous, limonitic staining; shale (20%) medium dark gray to grayish red, some pieces slightly calcareous, some pieces finely micaceous.
- 2442-2450 Sandstone, white, very fine grained, angular to subangular, free, few clusters, limonitic staining; shale (3%), medium dark gray to dark gray to reddish gray.
- 2450-2463 Sandstone, white, very fine grained, free and clustered, slightly calcareous, few scattered black minerals, very little limonitic staining; shale (60%), medium dark gray, few pieces grayish red, slightly calcareous to calcareous.
- 2463-2473 Shale, medium gray (N5), some with reddish tint, some pieces sandy, very slightly micaceous; sandstone (1%), white to gray, very fine grained.
- 2473-2480 Shale, medium gray, about 1% reddish gray, one piece greenish gray sandstone, very fine grained, one piece conglomerate? with soft calcareous cementing material.
- 2480-2490 Shale, medium gray, 1% reddish gray shale, one piece white very fine grained sandstone with scattered black minerals, little tan silty material.
- 2490-2500 Shale, medium gray, few pieces reddish gray shale (less than 1%), little tan silty material.
- 2500-2512 Same as 2490-2500.
- 2512-2520 Shale, medium dark gray, 1% reddish gray shale; sandstone (3%) white, very fine grained, very few scattered black minerals, trace coal, trace pyrite.
- 2520-2530 Same as 2512-2520, sandstone 10%.
- 2535-2537 Same as 2520-2530, red shale about 30%, one piece conglomerate? with soft calcareous cement.

Interval

- 2537-2540 Sandstone, white, very fine grained, angular to subangular, free, some limonitic staining; shale (40%) medium dark gray to grayish red (5R 4/2) (15%), trace pyrite.
- 2540-2545 Same as 2537-2540, sandstone - 50%, shale - 50%.
- 2545-2548 Sandstone, white to tan to yellow, very fine-grained to silty, very much limonitic staining, free, few pieces slightly calcareous; shale (15%) medium dark gray to some grayish red, some sandstone and shale cemented together by light gray soft calcareous material.
- 2548-2550 Sandstone, white, very fine-grained to siltstone, much limonite staining, free, occasional piece calcareous; shale (25%) medium dark gray (N4) to grayish black (N2), few pieces reddish gray, few pieces slightly calcareous, trace limestone, trace coal, trace magnetite(?) few pieces non-calcareous white amorphous mineral.
- 2550-2552 Same as 2548-2550, shale, medium dark gray to dark gray and reddish gray, no coal, no limestone, trace pyrite.
- 2552-2558 Shale, medium dark gray, occasional piece reddish gray; sandstone (5%) white, very fine-grained, few pieces very slightly calcareous, some limonite staining, trace white chert, several pieces pyrite, one or two disseminated in shale.
- 2558-2568 Sandstone, white, very fine grained, free, few clusters, some limonite staining, occasional piece calcareous; shale (10%) medium dark gray to grayish red (mostly gray).
- 2568-2576 Same as 2558-2568, shale about 5%.
- 2576-2580 Sandstone, white to yellowish, very fine grained, much limonite staining, free, few clusters (some cemented with limonite); shale (3%) medium dark gray to some reddish gray, trace magnetite(?).
- 2580-2581 No sample.
- 2581-2585 Sandstone, white to yellowish, very fine-grained, limonite staining, free; shale (3%), medium dark gray to grayish black.
- 2585-2600 Same as 2581-2585; few pieces limestone (less than 1%), gray, sandy, trace chert.
- 2600-2608 Sandstone, white to yellowish, very fine grained, limonite staining, free and clusters; shale (1%) medium dark gray, one or two pieces white amorphous mineral.
- 2608-2618 Same as 2600-2608.

Interval

- 2618-2619 Sandstone, white to some yellowish, very fine to fine-grained, limonite stain, occasional piece calcareous, mostly free; shale (20%) medium dark gray to few pieces dark gray, occasional red piece, calcareous to non-calcareous (mostly calcareous) one pink mineral noted, trace coal.
- 2619-2621 Same as 2618-2619, more sandstone calcareous, no pink mineral no coal.
- ^{B/B} 2621-2630 Shale, medium dark gray to dark gray, very calcareous to non-calcareous; sandstone (15%), white, very fine to fine-grained, non-calcareous to calcareous, little limonite stain, trace pyrite.
- 2630-2635 Same as 2621-2630, except 10% sandstone, grades from calcareous shale to shaly limestone, slightly dolomitic.
- 2635-2640 Shale, medium dark gray to reddish gray (25%), few pieces slightly calcareous, slightly micaceous, some pieces silty (5%) two or three pieces tan chert.
- 2640-2650 Same as 2635-2640, one or two pieces yellowish brown rotten chert (?) about 15% silty.
- 2650-2658 Shale, grayish red (5R 4/2) to medium gray (slight greenish tint) (25%) about 2% silty, some pieces slightly micaceous, few slightly calcareous.
- 2658-2665 Same as 2650-2658, about 5% gray shale.
- 2665-2670 Shale, medium gray to grayish red (25%), non-calcareous to calcareous; limestone, gray to light gray, dolomitic, shaly (3%).
- 2670-2680 Same as 2665-2670, limestone about 5%, not dolomitic.
- 2680-2690 Shale, medium gray to grayish red (40%) non-calcareous to calcareous, very finely micaceous (slightly); few pieces dolomite, gray shaly (1% or less).
- 2690-2700 Shale, medium gray (N5), one piece with little banding of lighter shale.
- 2700-2710 Shale, medium gray (N5) to medium dark gray (N4), some pieces slightly silty and very slightly micaceous.
- 2710-2720 Same as 2700-2710, few pieces reddish gray shale (cavings?).
- 2720-2735 Sandstone, white to gray, very fine grained (dirty) few scattered black minerals, some pieces shaly, non-calcareous to calcareous; shale (40%) medium dark gray, one or two pieces reddish gray, one or two pieces limonite (?), trace pyrite, some pieces finely micaceous.

Interval

- 2735-2750 Shale, dark gray to medium dark gray (N4), non-calcareous to calcareous, occasional piece reddish gray; sandstone, white to gray, very fine-grained, very slightly to slightly calcareous; few pieces limestone, dark gray to white, shaly, very little limonite stain.
- 2750-2765 Shale, dark gray to medium dark gray, non-calcareous to calcareous (mostly non-calcareous) to little shaly limestone, occasional piece reddish gray; sandstone (1%) white to gray, very fine grained, calcareous, little limonite stain.
- 2765-2785 Same as 2750-2765, piece limonite(?).
- 2785-2795 Same as 2750-2765, no sandstone, more reddish (10%).
- 2795-2805 Shale, medium dark gray, non-calcareous to calcareous (mostly non-calcareous); some silty; sandstone to siltstone (2%) gray, shaly, calcareous; limestone (1%) gray, shaly.
- 2805-2817 Sandstone, white to gray, very fine grained, clustered and free, slightly calcareous, shaly; shale (40%) dark gray to some medium dark gray, non-calcareous to slightly calcareous, few pieces limestone, trace pyrite.
- 2817-2832 Same as 2805-2817.
- 2832-2844 Shale (25%) medium dark gray (N4); siltstone to sandstone, medium dark gray to lighter gray, very shaly, some pieces very slightly calcareous.
- 2844-2855 Sandstone, white to gray, very fine grained, clustered, gray is shaly, few scattered black minerals, little limonite stain, few pieces very slightly calcareous; shale (30%) medium dark gray to dark gray, some slightly silty, some pieces finely micaceous, trace pyrite.
- 2855-2865 Same as 2844-2855, more free sandstone, no dark gray shale.
- 2865-2875 Sandstone, white to gray, very fine-grained to siltstone, non-calcareous to calcareous, few scattered black minerals, some shaly; shale (15%) medium dark gray to dark gray, few pieces micaceous, little limonite stain.
- 2875-2885 Shale, medium dark gray to dark gray, occasional piece very finely micaceous; sandstone (25%) white to gray, free and clustered, much is shaly, occasional piece calcareous, little limonite stain, trace pyrite.
- 2885-2900 Shale, medium dark gray, some soft light gray slightly calcareous silty material.
- 2900-2912 Shale, medium dark gray, slightly calcareous; limestone (40%) medium dark gray to little white, very shaly, one or two crinoid stems noted, trace pyrite.

Interval

2912-2925	Same as 2900-2912, no pyrite.
2925-2927	" " " " " "
2927-2939	" " " " " "
2939-2950	" " " " " "
2950-2958	" " " " " " limestone 30%.
2958-2968	" " " " " " " "
2965-2977	" " " " " "
2977-2990	Shale, dark gray, non-calcareous to slightly calcareous; limestone (50%) white to gray to brownish gray, clastic, very oolitic zones, some shaly.
2990-3000	Same as 2977-2990, more limestone - 75%, more shaly.
3000-3007	" " " " shale - 40%.
3007-3014	Shale, 30%, medium dark gray, non-calcareous to calcareous; dolomite medium gray to light gray, very finely crystalline to some clastic, shaly; limestone (5%) gray to white, shaly.
3014-3026	Shale, medium dark gray, non-calcareous to calcareous, several pieces brownish shale; limestone (15%) gray to white, shaly.
3026-3040	Shale, medium dark gray, very calcareous.
3040-3050	" " " " " " some only slightly calcareous, trace fossil.
3050-3060	Same as 3040-3050.
3060-3072	Limestone, gray to white, shaly, clastic, moderately oolitic; shale (20%), dark gray to medium dark gray, non-calcareous to slightly calcareous.
3072-3081	Same as 3060-3072.
3081-3093	" " " " shale 10%.
3093-3104	" " " " " 5% no dark gray.
3104-3114	" " " " " " " "
3114-3125	" " " " " " " "

clear

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Interval

- 3125-3140 Shale, dark gray to medium dark gray, very calcareous; limestone (2%) gray to white, clastic, shaly.
- 3140-3155 Calcareous shale to shaly limestone; limestone about 80%, dark gray to white, clastic, occasional oolite, few calcite crystals; shale, dark gray, few pieces non-calcareous.
- 3155-3168 Same as 3140-3155.
- 3168-3178 " " " " shale about 30%.
- 3178-3185 " " " " " " 60%.
- 3185-3190 Limestone, medium gray to white, clastic to finely crystalline to dense, slightly oolitic, shaly; medium gray shale 1%.
- 3190-3200 Same as 3185-3190; few pieces dolomitic.
- 3200-3212 Limestone, medium gray to white, some with brownish tint, dense to some clastic, several pieces white earthy looking, hard.
- 3212-3225 Limestone, brownish gray to white, dense, some very finely crystalline to some clastic; few pieces shale (1%) medium dark gray.
- 3225-3236 Same as 3212-3225.
- 3236-3247 " " " "
- 3247-3262 Limestone, gray to white to little brownish gray, clastic, some dense occasional oolite, little white silty material over sample, one or two calcite crystals; shale (1%) medium dark gray, trace pyrite.
- 3262-3270 Same as 3247-3262.
- 3270-3280 Limestone, medium dark gray to some white, very shaly, several calcite crystals; some very calcareous shale, medium dark gray, one or two pieces reddish gray shale.
- 3280-3290 Same as 3270-3280, no red shale.
- 3290-3300 " " " " " " " occasional piece very slightly calcareous shale.
- 3300-3312 Limestone, medium dark gray to white, gray is shaly, very oolitic zones, one or two calcite crystals.
- 3312-3322 Limestone, brownish gray to white to little gray, clastic to dense to some very finely crystalline, occasional piece oolitic (caving?) few pieces gray are shaly.

Interval

- 3322-3330 Same as 3312-3322, non-oolitic, several calcite crystals.
- 3330-3338 Limestone, brownish gray to white to gray, very finely crystalline to dense to clastic, slightly oolitic; few pieces shale (1%), medium dark gray, slightly calcareous.
- 3338-3348 Same as 3330-3338, several calcite crystals.
- 3348-3357 Limestone, brownish gray, very finely crystalline to dense, some clastic, some pieces oolitic, one or two crinoid stems; shale (1%) medium gray (N5) to medium dark gray (N4), very slightly calcareous, trace pyrite.
- 3357-3363 Limestone, white to light brownish gray, clastic, some dense to very finely crystalline, moderately oolitic; shale (1%) medium dark gray.
- 3363-3371 Same as 3357-3363.
- 3371-3380 " " " " trace pyrite.

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Interval

3380-3395 Limestone, white to light brownish gray (5YR 6/1), medium clastic, some ooliths, few fine to medium crystals.

3395-3410 Like 3380-3395.

3410-3425 Like 3395-3410, very oolitic.

3425-3440 Like 3410-3425.

3440-3455 Limestone, like 3425-3440; and limestone, light brownish gray (5YR 6/1), coarsely clastic, nodular.

3455-3467 Limestone, white to light brownish gray (5YR 6/1), like 3440-3455, with little pyrite.

3467-3472 Like 3455-3467.

3472-3481 Limestone, very light gray (N8) to medium gray (N5), finely clastic to medium clastic, oolitic.

3481-3490 Limestone, light gray (N7) to brownish gray (5YR 4/1), dolomitic, medium crystalline.

3490-3500 Missing.

3500-3510 Limestone, light olive gray (5Y 6/1), very silty with little siltstone, grayish red (10R 4/2), slightly calcareous.

MNE 3510-3518 Siltstone, medium gray (N5), calcareous, some with slightly reddish tint; and limestone, light gray (N7), medium clastic, nodular.

3518-3528 Sample dirty; probably same as 3510-3518.

3528-3535 Siltstone, medium dark gray (N4), slightly calcareous, micaceous, (muscovite?) with little shale, dark gray (N3), carbonaceous (?).

3582-3589 Siltstone, greenish gray (5GY 6/1); and siltstone, grayish red (5YR 4/1), both sandy, micaceous (muscovite?), non-calcareous.

3589-3596 Like 3582-3589.

3596-3605 Like 3589-3596, 50%; and shale, medium dark gray (N4), silty, 50%.

Interval

- 3605-3611 Siltstone, to very fine sandstone, greenish gray (5GY 6/1), micaceous, subangular grains, very slightly calcareous, little green mineral and little black mineral.
- 3611-3618 Like 3605-3611.
- 3618-3628 Siltstone, medium dark gray (N4) to light gray (N7), micaceous (muscovite?) with some sandstone, pale yellowish brown (10YR 6/2), very fine-grained to fine-grained, angular to subangular, very friable.
- ~~3628-3636~~ Sandstone, like 3618-3628 with some siltstone, like 3618-3628.
- ps* 3636-3644 Sandstone, medium gray (N5), very silty, very fine-grained to medium-grained, angular to subangular, abundant black mineral; and siltstone, medium dark gray (N4), micaceous, shaly.
- 3644-3654 Like 3636-3644, 50%; and sandstone, pale yellowish brown (10YR 6/2) as 3628-3636, 50%.
- 3654-3660 Siltstone, medium dark gray (N4), micaceous; and siltstone, medium light gray (N6), micaceous, thin-bedded.
- 3660-3670 Siltstone, medium dark gray (N4), like 3660-3670.
- 3670-3680 Like 3660-3670.
- 3680-3685 Like 3670-3680.
- 3685-3690 Like 3680-3685.
- 3690-3700 Sandstone, medium dark gray (N4) to medium light gray (N6), silty, very fine-grained to medium-grained, angular to subrounded, slightly calcareous, little pyrite, few rounded, frosted, medium quartz grains.
- 3700-3710 Sandstone, like 3690-3700.
- 3710-3718 Sandstone, pale yellowish brown (10YR 6/2), very fine-grained to fine-grained, angular, slightly calcareous, little pyrite, and few frosted quartz grains.
- 3718-3725 Like 3710-3718.

Samples examined by Allen D. Williamson
Geologist, U.S. Geological Survey
Lexington, Kentucky
April, 1950.