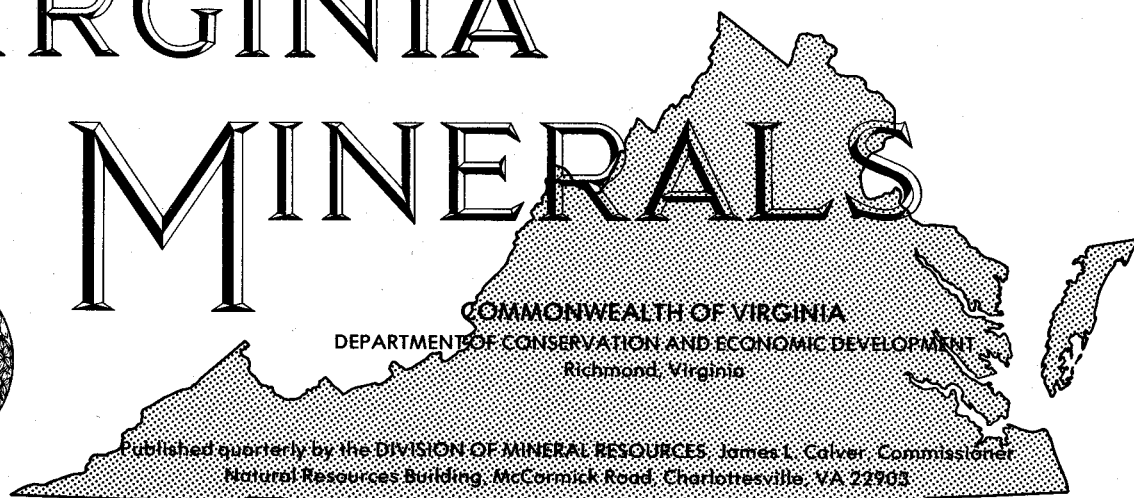


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ABANDONED COPPER MINES AND PROSPECTS IN THE VIRGINIA DISTRICT, VIRGINIA

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The Virgilina district (Figure 1) was a source of copper in Virginia from the late 1800's until about 1917. It is estimated that about 750,000 pounds of copper (Table 1) was produced from the Virgilina district in Virginia. Silver, which is reported to occur in four mines in the district, was produced from the High Hill copper mine and gold and silver from the Red Bank (Goldbank) gold mine in Halifax County (Sweet, 1976, p. 9-10). Up to 1912 it is reported that approximately 1,065 ounces in gold was produced from the Red Bank mine (Sweet, 1971, p. 31). The district is composed of mostly igneous and metamorphic rocks including acid and basic volcanic rocks, volcanic clastics and volcano-sedimentary material, and acid and basic intrusive rocks such as syenite, granite, diorite, and gabbro. Acid volcanics that were originally rhyolite and rhyolitic tuffs or quartz porphyry are presently sericite schists whereas rocks that were originally andesitic ash and tuff with varying amounts of land waste intermixed during deposition are now the Aaron slate of Laney (1917). This unit is basically a sandy chloritic slate, ranging from nearly pure sandstone and conglomerate to nearly pure greenstone that is similar and not distinguishable from the Virgilina greenstone of Laney (1917). The greenstone was originally andesite and andesitic tuffs that have, through metamorphism, become chlorite-epidote or greenstone schists and are the rocks most closely associated with the copper deposits.

Quartz and minor, varying amounts of epidote, calcite, chlorite, hematite, sericite, plagioclase felds-

pars, and orthoclase comprise the gangue material in the veins. Part of the bornite, chalcocite, and chalcopyrite and all of the pyrite, klaprothite (?), argentite, native copper, and gold are primary ore minerals, whereas part of the chalcocite, bornite, and chalcopyrite and all the native silver, cuprite, malachite, azurite, and chrysocolla are secondary according to Laney (1917, p. 68-69).

The locations and brief descriptions of 21 abandoned copper mines and prospects (Figure 1) in the Virgilina district of Virginia follow.

Abbott prospect is located in Halifax County, 1.55 miles (2.50 km) west of Red Bank and 0.1 mile (0.2 km) off the south side of State Road 602 approximately 0.1 mile (0.2 km) by road east of its intersection with State Road 737. Bornite in quartz veins in Virgilina greenstone is noted in Luttrell (1966, p. 6) and indicated on the geologic map by Laney (1917) as being the basic ore mineral. Presently there are no outcrop exposures at the site and only a shallow pit, 10 x 6 feet (3 x 2 m) remains with a small dump of greenstone schist and white quartz; some malachite mineralization was seen on the quartz.

Anaconda mine is located in Halifax County, 1.15 miles (1.85 km) north-northeast of Virgilina and 0.025 mile (0.040 km) off the east-southeast side of State Road 734 approximately 0.05 mile (0.08 km) by road south of its intersection with State Road 735. Before 1907 a shaft and drifts from it were present (Watson, 1907, p. 498; Weed, 1911, p. 83). The mineralization has

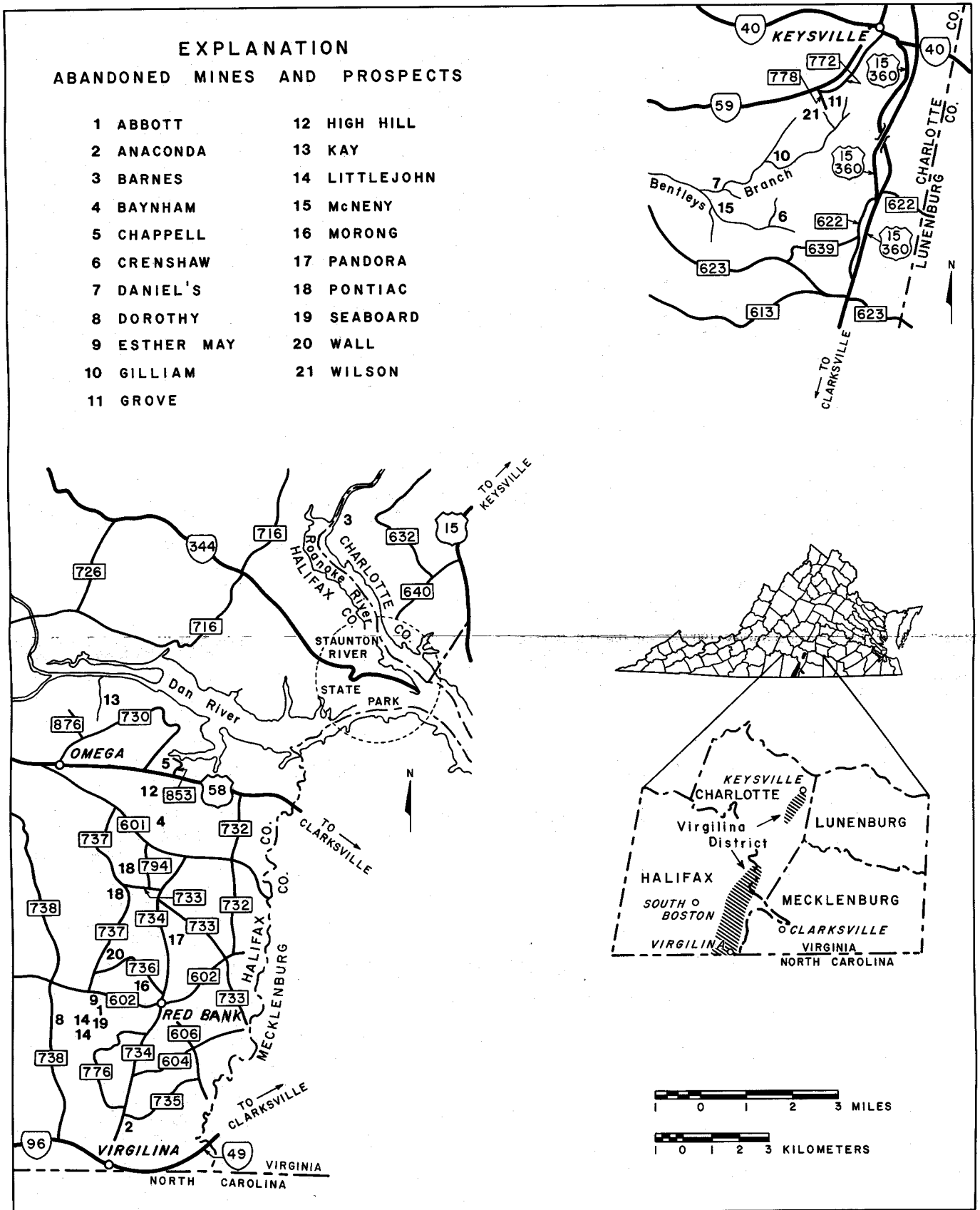


Figure 1. Locations of abandoned copper mines and prospects in the Virgilina district, Virginia (modified from 1975 Virginia Department of Highways and Transportation maps).

been described by Weed (1911, p. 83) as a "mixture of glance and gray copper in quartz." He described the epidotized Virgilina greenstone as containing a 12- to 24-inch- (31- to 61-cm-) wide quartz vein with a mineralized zone 4 to 18 inches (10 to 46 cm) wide which contains a 2- to 4-inch- (5- to 10-cm-) wide streak of 15 percent copper ore with the remainder being 4 percent copper ore. About seven carloads of copper ore ranging from 3 percent copper in the first carload to 12 percent copper in the last five carloads were reportedly shipped from the mine (Weed, 1911, p. 83-84).

Presently, a dump of 20 feet (6 m) in diameter and about 3 feet (1 m) high contains some light-green schist with minor malachite staining. Scattered white quartz fragments, some with iron-oxide staining, and a fist-sized piece of schist with a 0.4 inch (1.0 cm) quartz veinlet containing some malachite mineralization were seen on the dump, part of which has been used as road material locally. No outcrop exposure was seen at the site.

Barnes mine is located in Charlotte County, 2.5 miles (4.0 km) northeast of and across the Roanoke River from Dryburg, Halifax County and 0.3 mile (0.5

km) off the northwest side of a gravel road approximately 0.7 mile (1.1 km) by road southwest of its intersection with State Road 632. It is reported that copper ore from this mine may have been extracted and reduced between 1700 and 1750. During 1880 or 1881 some prospecting was done on the quartz vein (Laney, 1917, p. 144-145).

The vein is predominantly quartz with epidote and calcite gangue, and reportedly varies in width from a few inches to about 4.0 or 5.0 feet (1.2 or 1.5 m). This vein tends to follow the schistosity of the Virgilina greenstone-schist country rock, which has a strike of N.30° E. and a dip of 70 to 80° SE. Mineralization in the vein consists of bornite and chalcocite and supposedly small values of gold and silver (Laney, 1917, p. 145). Presently, there are numerous cuts in the hillside just northeast of a water-filled pit, 12 feet (4 m) in diameter, and a partly caved 15-foot- (5-m-) deep shaft. A large dump area is present and contains greenstone schist and bornite, chalcocite, and malachite in white quartz.

Baynham mine is located in Halifax County, 3.4 miles (5.5 km) southeast of Omega and 0.55 mile (0.89

Table 1. — Copper production in Virginia.

(Data from annual editions of "Mineral Resources of the United States" by the U.S. Geological Survey, 1907-23, and the U.S. Bureau of Mines, 1924-31; "Minerals Yearbook" by the U. S. Bureau of Mines, 1932-47; Luttrell, 1966, p. 64; Roberts, 1942, p. 424; Taber, 1913, p. 241; and Watson, 1907, p. 498.)

Year	Production		Main producing mine or district
	Mine returns (lbs)	Smelter output (lbs)	
1859-60	100 tons at \$80/ton		Lightfoot mine, Buckingham Co.
1880's	780 tons at 8% Cu.		Johnson mine, Buckingham Co.
1891-93 through	\$4,000 in Cu.		Johnson mine, Buckingham Co.
1905	600,000 lbs. of Cu.		High Hill mine*, Halifax Co.
1907	58,880	57,008	Seaboard mine*, Halifax Co.; Sulphur mine, Louisa Co.; Cabin Branch mine, Prince William Co.
1908	24,775	25,087	Seaboard mine*, Halifax Co.; Cabin Branch mine, Prince William Co.
1909	224,162	231,971	Virgilina district*; Cabin Branch mine, Prince William Co.
1910	5,402	105,313	Virgilina district*; Cabin Branch mine, Prince William Co.
1911	90,000	NA	Sulphur and Arminius mines, Louisa Co.
1912	112,835	96,753	Sulphur mine, Louisa County; Cabin Branch mine, Prince William Co.
1913	56,287	46,961	Sulphur mine, Louisa Co.; Cabin Branch mine, Prince William Co.

1914	139,008	17,753	Sulphur mine, Louisa Co.; Cabin Branch mine, Prince William Co.
1915	27,744	50,008	Virgilina district*; Seaboard mine*, Halifax Co.; Carroll Co.; Sulphur mine, Louisa Co.; Cabin Branch mine, Prince William Co.; Lightfoot (?) mine, Buckingham Co.; Howard mine, Fairfax Co.
1916	553,800	1,066,143	Buckingham, Charlotte*, and Halifax* counties.
1917	36,630	146,912	Virgilina district
1918	NA	1,248	
1934	400	683	(from gold concentrates)
1935	700	683	(from gold concentrates)
1937	1,000	953	
1938	47,300	43,279	Floyd Co.
1939	NA	741	
1942	55,000	NA	
1943	200,000	102,000	Valzinco mine, Spotsylvania Co.
1944	582,000	520,000	Toncræ mine, Floyd Co.
1945	140,000	NA	Valzinco mine, Spotsylvania Co.; Toncræ mine, Floyd Co.
1947	10,000	NA	Toncræ mine, Floyd Co.

* Production from Virgilina district. NA, not available.

Mine return figures are based on estimated or actual recovery from copper ore shipped from the mines during the year; some of the copper ore was treated at company smelters and thus mine production (returns) and smelter output are reported simultaneously. Smelter output refers to the amount of actual crude copper metal recovered from ores of both high and low copper content during a particular period. Production-figure inconsistency is due to lag time between mining and smelting, smelter output usually reflecting a greater recovery than the amount for which the mine was paid, and the amount of copper ore held in stock at the smelters rarely being the same at the beginning as at the end of the year.

km) off the north side of State Road 601 approximately 0.40 mile (0.64 km) by road east-southeast of its intersection with State Road 794. This prospect was probably operated before 1900. In 1917 the mine area consisted of a small dump around a partially caved shaft (Laney, 1917, p. 152). Today, there are two caved pits present, both of which are about 12 feet deep. Scattered greenstone schist, epidote, and white quartz with a small amount of bornite and chalcocite mineralization are present in a small dump. No outcrop exposure was visible around the old mine. The area has been extensively logged.

Chappell mine is located in Halifax County, 1.7 miles (2.7 km) west-northwest of Aarons Creek near the bank of the Hyco River and 0.35 mile (0.56 km) down a private drive off the west side of State Road 853 approximately 0.4 mile (0.6 km) by that road north-northeast of its intersection with U. S. Highway 58. In 1917 development at this mine consisted of two shafts (Laney, 1917, p. 149). Country rock at the site was Virgilina greenstone schist containing bornite and chalcocite mineralization in a quartz vein (Luttrell, 1966, p. 33). Laney (1917, p. 149) describes the quartz vein as being narrow, but well mineralized. Presently, both old shafts can be seen at the site. Shaft No. 1, which has a diameter of 20 feet (6 m), is now debris-filled to about 20 feet (6 m). The wall of this shaft contains weathered greenstone schist, the schistosity of which has a north-south strike and a dip of about 65° to the east. A quartz vein, which appears to be about 5.0 feet (1.5 m) thick and contains some malachite mineralization, has a strike of N. 5° W. and is essentially vertical. The dump surrounding the shaft consists of greenstone schist and white quartz, both containing malachite mineralization, and is intermittently used as a source of local road metal. Minor amounts of bornite-chalcocite mineralization are also present. Several small caved pits, a large trench, and several leaf-covered dumps are located just north-northeast of this shaft toward the Hyco River. Shaft No. 2 is located farther south and presently consists of a 10-foot- (3-m-) deep, water-filled shaft with a large dump of greenstone schist and white quartz, both containing some malachite mineralization.

Crenshaw mine is located in Charlotte County, 4.15 miles (6.68 km) east of Drakes Branch and 0.5 mile (0.8 km) off the east side of a fire road approximately 0.2 mile (0.3 km) by road north of Reeses Creek and 1.6 miles (2.6 km) by road north-northeast of its intersection with State Road 623. Laney (1917, p. 147) reported that the mine consisted of several pits on a well-defined narrow quartz vein; bornite and chalcocite mineralization was present in the quartz.

In February 1976 a 25-foot- (8-m-) diameter pit; an 8-foot- (2-m-) diameter, water-filled shaft; and a small

trench were present at the site. An exposure of greenstone (?) in this pit has a strike of N. 55° E. and a dip of 80° SE.; azurite and malachite staining and a prominent joint surface (N. 70° W.) are present. Malachite and azurite mineralization is present in Virgilina greenstone schist that is in abundance in the large dump. Only small fragments of quartz with minor amounts of mineralization were seen. The area has recently been logged, especially to the northeast, and tree slashings and saplings are present over all of it.

Daniel's mine is located in Charlotte County, 3.15 miles (5.07 km) east of Drakes Branch and 0.15 mile (0.24 km) off the west side of a fire road approximately 0.05 mile (0.08 km) by road north of its crossing over Twittys Creek and 2.8 miles (4.5 km) by road north of its intersection with State Road 623. Laney (1917, p. 146) describes this mine as two shallow shafts on a quartz vein, about 2.0 to 4.0 feet (0.6 to 1.2 m) wide, with bornite and chalcocite mineralization. In April 1972 a 10-foot- (3-m-) wide, water-filled shaft containing some very large, white quartz boulders and a large dump of greenstone schist and quartz with malachite and chalcocite mineralization were present at the mine. In February 1976 the water-filled shaft was further caved and partly filled with tree stumps and limbs as the entire area has been cleared of trees. No outcrop exposures are present around the old mine.

Dorothy mine is located in Halifax County, 2.35 miles (3.78 km) west-southwest of Red Bank on the west side of the "Virgilina ridge" (Laney, 1917, p. 1-2) and 0.125 mile (0.200 km) off the east side of State Road 738 approximately 0.825 mile (1.327 km) by road south of its intersection with State Road 602. Weed (1911, p. 89) describes the mine as having two shafts and that bornite and glance (chalcocite) occur in a quartz vein. Presently, the mine consists of a 5-foot-square, water-filled shaft, one water-filled pit, and two shallow pits. Numerous small dumps of Virgilina greenstone schist, greenstone, and white quartz are present. About 0.3 mile (0.5 km) on the west side of the "Virgilina ridge" about 570 feet (174 m) east of State Road 738 and south of the pits an exposure of greenstone schist, the schistosity of which has a strike of N. 8° E., occurs in an old roadbed. The schist contains a 2.0-foot- (0.6-m-) wide, vertical, barren quartz vein. About 30 feet west of this exposure is an 8-inch- (20-cm-) wide, white quartz vein that has a north-south strike and cuts across the schistosity of the greenstone. The area has been cleared of trees within the last 15 years. No mineralization was seen at this mine.

Esther May prospect is located in Halifax County, 1.6 miles (2.6 km) west of Red Bank and 135 feet (41 m) off the south side of State Road 602 approximately 300 feet (91 m) by road east of its intersection with State Road 737. Laney (1917, p. 159) describes this prospect

as being very small and probably a continuation of the quartz vein seen at the Seaboard mine. Presently, there is a small water-filled shaft with a rim dump of greenstone schist and white quartz, some of which is vuggy and sugary in appearance. Minor malachite mineralization is present on some quartz.

Gilliam mine is located in Charlotte County, 4.4 miles (7.1 km) east of Drakes Branch, just east-southeast of Twittys Creek and 0.8 mile (1.3 km) off the east side of a fire road approximately 1.2 miles (1.9 km) by road south of its intersection with State Highway 59. Laney (1917, p. 146) describes this mine as a few pits on a well-defined quartz vein that contains mineralization similar to that seen at the majority of the mines in the northern portion of the Virgilina district. Presently, there are several 4-foot- (1-m-) deep trenches on the hillside, most of which has recently been cleared for pulpwood. Several piles of white quartz are present on the hillside. Some malachite on greenstone schist and quartz fragments may be seen in Twittys Creek just west of the mine site.

Grove mine is located in Charlotte County, 3.3 miles (5.3 km) southeast of Eureka and 0.25 mile (0.40 km) off the south-southeast side of State Road 772 approximately 0.3 mile (0.5 km) by road east of its intersection with State Highway 59. Watson (1907, p. 500) stated that by July 1906 a shaft and several pits were abandoned. The main ore was malachite in the quartz lenses and stringers, parallel to the schistosity. By 1917 this mine was the largest and only producing mine in the northern portion of the Virgilina district. Three shafts were sunk within a distance of 300 feet (91 m) on a quartz vein in Virgilina greenstone. The schistosity of the greenstone schist had a northeast strike and a dip of 80° SE. The main ore minerals were bornite, chalcocite, malachite, azurite, and some chalcopyrite. The vein averaged 5.0 feet (1.5 m) in width and had a strike of N. 35° E. and a dip of 75° SE. (Laney, 1917, p. 147; Poole, 1974, p. 12). This vein probably follows the schistosity of the greenstone country rock. Approximately 2,500 tons of copper ore were produced (Poole, 1974, p. 12; United States Geological Survey, 1917, p. 737).

In April 1972 several water-filled pits at the level of a tributary to Bentleys Branch and a large dump were present. The dump, which partially blocks the flow of the tributary, contains greenstone schist with some malachite staining and an abundance of white and clear quartz with malachite and chalcocite mineralization. In February 1976 the entire area had been logged and the dump had been partially graded but a large 20-foot- (6-m-) diameter shaft, caved to a depth of about 20 feet (6 m), remained on the hillside. The schistosity of the weathered schist in the walls generally has a north-south strike. The rim dump contains greenstone

and greenstone schist with malachite staining and very little quartz.

High Hill mine is located in Halifax County, 2.85 miles (4.59 km) east-southeast of Omega and 0.85 mile (1.37 km) along a woods road off the northeast side of State Road 601 approximately 0.25 mile (0.40 km) by road northwest of its intersection with State Road 794.

In 1899 development began on the property with 14 pits and shafts sunk to depths of 25 to 125 feet (8 to 38 m) (Laney, 1917, p. 125). Two shafts were sunk in early 1900 to depths of 250 and 350 feet (76 and 107 m) respectively. Up to March 1904, 212,455 pounds of copper had been produced from the mine (Weed, 1911, p. 87). The mine was closed in 1904 when the price of copper dropped. In July 1905 Weed (1911, p. 88) states that the shafts were filled with water. Total copper production through 1905 was 600,000 pounds (Luttrell, 1966, p. 64). The mine was reopened in 1907 and another attempt was made to recover copper by roasting the sulphate ores in a specially designed furnace, which remains on the site today (Laney, 1917, p. 127) (Figure 2). The furnace, which is convex across the top, is 181 inches (460 cm) long, 87 inches (221 cm) wide across the front, and 54 inches (137 cm) high. Facilities for an acid leach and an electrolytic precipitation process were also set up; this plant was unsuccessful and operated for only a short time. From September 1942 until April 1943, the U. S. Bureau of Mines, as part of the strategic-minerals program, opened part of the old mine, did some hand trenching, diamond drilled 11 holes totaling 2,281 feet (707 m), and collected mine samples for assay as well as the drill samples. Basically the exploration work proved extension of the vein and persistence of known ore shoots at depth (Newberry and others, 1948, p. 8).

The Virgilina greenstone-schist country rock contains two persistent parallel veins at this site, with the western or High Hill vein being the best developed

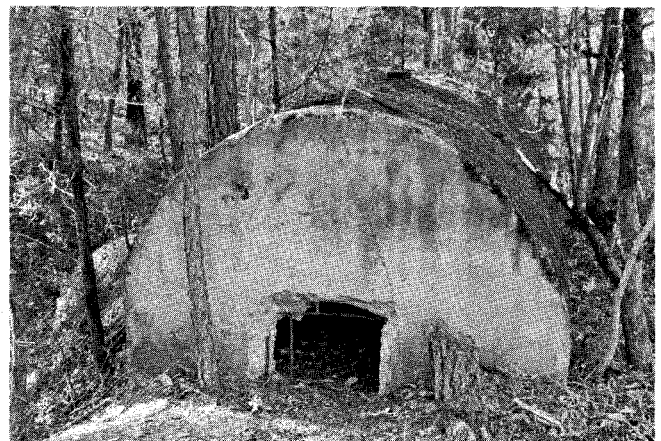


Figure 2. Old roasting furnace, High Hill mine.

(Weed, 1911, p. 88). This vein ranges in width from 2 to 15 feet (1 to 5 m) and has a strike of N. 6° W. The ore minerals are bornite, chalcocite, malachite, azurite, and argentite (?). Gangue minerals include quartz, epidote, chlorite, hematite, and calcite (Laney, 1917, p. 127-128).

Presently, three large openings at the top of the hill are encircled with barbed wire; two of these are caved pits and the southernmost opening is a 20-foot- (6-m-) diameter shaft that is about 40 feet (12 m) deep. The schistosity of the greenstone schist, which is almost a saprolite near the top of the shaft, has a strike of N. 15° E. and a dip of 80° SE. An exposed, vertical, 3-foot- (1-m-) wide quartz vein has a strike of N. 5° W.; several other small quartz stringers, from 0.7 to 2.0 inches (1.8 to 5.1 cm) are parallel to the large vein. The large rim dump around this shaft (Figure 3) has been partly utilized for road material on local access roads. Minor schist and large amounts of white quartz with malachite mineralization and some hematite staining are present. To the south of this large open shaft, there are caved pits, shafts, and trenches along strike for half a mile. To the north, down the hill toward the Hyco River, are the remains of the old mill site. Numerous concrete foundations, several wooden frames, many old timbers, and a large dump are present in the area. The partially collapsed headframe with the remains of several metal supports can be seen on the west side of an old shaft(?) with a high rim dump (Figure 4).

Kay mine is located in Halifax County, 2.3 miles (3.7 km) northeast of Omega, 0.1 mile (0.2 km) off the west side and 0.8 mile (1.3 km) down a private road to the Dan River Hunting Club off the north side of State Road 730 approximately 0.9 mile by road east-northeast of its intersection with State Road 876.

Two shallow shafts and several pits were developed at this site in the early 1900's. This mine is reportedly



Figure 3. Open shaft and rim dump, High Hill mine.



Figure 4. Collapsed headframe at northernmost shaft, High Hill mine.

the only one in the Virgilina district where copper mineralization occurs in the Aaron slate. Irregular, poorly defined quartz veins contain bornite and chalcocite as well as malachite, azurite, and some cuprite. Much of the mineralization appears to be in slate country rock that is atypical of most Virgilina district copper mines where mineralization is confined largely to the quartz veins in greenstone schist. Some selected ore has been assayed at 4 to 30 percent copper, 1 to 7 ounces of silver, and as high as .05 ounces of gold per ton (Laney, 1917, p. 148).

Presently, two prominent openings and a small caved pit are at the site. Weathered "slate" in the northernmost caved pit has a strike of N. 10° E. and a dip of 75° SE. The schistosity of several exposures of greenstone schist, exposed in the private drive to the Dan River Hunting Club 0.5 mile (0.8 km) southeast of the mine, has a strike of N. 6 to 12° E. with steep dips to the southeast. The small dump around this pit contains only weathered greenstone and small quartz fragments. Just to the south is a 10-foot- (3-m-) wide, water-filled shaft with a high rim dump of greenstone and greenstone schist; some sandy chloritic "slate" and white quartz were also seen. Malachite mineralization was noted on both the quartz and greenstone schist. The southernmost opening is a 12- x 6-foot- (4- x 2-m-) wide, 20-foot- (6-m-) deep, water-filled inclined shaft. The schistosity of the yellowish-brown, sandy chlorite schist and greenstone schist has a strike of N. 9° E. and a dip of 57° SE.; the inclined shaft follows approximately the dip of the rocks. Some conglomerate was present in the large dump of predominantly greenstone schist that has malachite staining. Malachite staining is also present on the "slate" in the north wall of the shaft.

Littlejohn mine shafts are located in Halifax County, 1.9 miles (3.1 km) west-southwest of Red Bank, 0.6 mile

(1.0 km) and 0.95 mile (1.53 km) respectively, south-southwest from the intersection of State Roads 602 and 637.

Three prospect shafts in the most promising of nine veins on the property were sunk in the early 1900's. The deepest shaft (100 feet) in the quartz vein in Virgilina greenstone showed mainly chalcocite with a little bornite mineralization (Laney, 1917, p. 159).

Presently, the northernmost shaft is about 15 feet (5 m) in diameter with a 5-foot- (2-m-) high rim dump of greenstone schist and white quartz, both of which contain malachite mineralization. An exposure of Aaron "slate" or tuffaceous greenstone schist is present in the east wall of the shaft; the schistosity of the material has a north-south strike and a dip of 65° E. Another shaft located about one-third mile to the south is caved to a depth of 7 feet (2 m). The 18-foot- (5-m-) wide shaft is surrounded by a large dump of greenstone schist containing some malachite stain and some white quartz with chalcocite mineralization. The schistosity of the greenstone schist in the south wall of this shaft has a north-south strike and a dip that seems to be vertical.

McNeny mine is located in Charlotte County, 2.85 miles (4.59 km) east of Drakes Branch, 0.75 mile (1.21 km) off the west side of a fire road approximately 1.8 miles (2.9 km) by road north-northeast of its intersection with State Road 623.

About 1894 a 60-foot- (18-m-) deep shaft was sunk just west of the present fire road. Located about a quarter mile to the west and just east of Reeses Creek, the Weaver shaft was sunk in a quartz vein (probably the same as the vein at the Daniel's mine) and mining was done during 1905 and 1906 (Watson, 1907, p. 500). The quartz vein is reported to be from a few inches to about 4 feet (1 m) wide and to follow the dip (30° SE.) of the schistosity of the enclosing greenstone schist (Laney, 1917, p. 146; Watson, 1907, p. 500). It was estimated that the vein carried between 2 and 3 percent copper in the ore minerals bornite and chalcocite; main gangue material includes white quartz and minor calcite, epidote, chlorite, and hematite (Laney, 1917, p. 146).

In February 1976 the 10-foot- (3-m-) wide Weaver shaft was water-filled; the surrounding dump contained greenstone schist with malachite staining and white quartz with bornite and chalcocite mineralization. Numerous other small dump piles of quartz, a small cut, and another small water-filled shaft (?) are present. Several feet north of this shaft, the schistosity of an exposure of greenstone schist has a strike of N. 29° E. and a dip of 32° SE. Quartz stringers, ranging from 0.25 to 4 inches (0.64 to 10 cm) in width, are present and are parallel to the schistosity of the enclosing schist. The entire area is covered with dead cattails and various

types of debris due to the periodic rising of the water level in the reservoir for the town of Drakes Branch.

Morong (Mother Lode) mine is located in Halifax County, 0.6 mile (1.0 km) northwest of Red Bank, 0.25 mile (0.40 km) off the north side of State Road 602 approximately 0.5 mile (0.8 km) by road west of its intersection with State Road 734.

Laney (1917, p. 152) reported that a 150-foot- (46-m-) deep shaft was present in a well-defined quartz vein in Virgilina greenstone schist. No commercial ore was found at this mine (Laney, 1917, p. 152). In February 1976 this shaft was caved to a depth of 12 feet (4 m) and had a diameter of 20 feet (6 m). The country rock appears to be the tuffaceous phase of the schistose Virgilina greenstone and the schistosity has a strike of N. 5° E. with a vertical dip; the 3-foot- (1-m-) wide quartz vein has essentially a north-south strike and is vertical. A very small dump contains some greenstone schist and quartz with minor amounts of chalcopyrite. About 300 feet (91 m) northwest of the shaft on the west side of a hill is a tunnel, 30 feet (9 m) long and 8 feet (2 m) high, cut into a tuffaceous phase of Virgilina greenstone schist (?). The schistosity of the rock has a strike of N. 3° E. and a dip of 65° SE. A 3-inch- (8-cm-) wide quartz vein is parallel to the schist and several quartz stringers are also present. Minor malachite staining is present on the schist.

Pandora mine is located in Halifax County, 1.6 miles (2.6 km) north of Red Bank, 0.05 mile (0.08 km) off the east side of State Road 734 approximately 1.45 miles (2.34 km) by road north of its intersection with State Road 736.

This prospect shaft was probably operated in the late 1800's in epidotized Virgilina greenstone schist. Copper minerals include bornite, chalcocite, cuprite, and malachite in the epidotized country rock as well as in quartz (Laney, 1917, p. 151). Presently, there remains a pit, 15 feet (5 m) wide and 6 feet (2 m) deep, with a surrounding dump of greenstone schist, some of which is epidotized, and quartz with malachite and some chalcocite and bornite mineralization. Schistosity has a north-south strike and essentially a vertical dip. There is no evidence of any quartz vein.

Pontiac mine is located in Halifax County, 3.55 miles (5.72 km) southeast of Omega, southwest and north of the intersection of State Roads 737 and 733. In the early 1900's development began on the old "Tuck property" that continued until the mine was abandoned in 1903. The Glasscock shaft was sunk on an eastern vein, which ranges from 2 to 6 feet (1 to 2 m) in width and appears to have a trend of 4 or 5° west of north. The Tuck shaft was sunk on a smaller vein about 1,000 feet (305 m) to the west. The Glasscock shaft was reported to be sunk into an irregular vein in the Virgilina greenstone schist. Mineralization includes a large

percentage of chalcopyrite, as well as bornite, chalcocite, covellite, cuprite, malachite, and azurite; gangue minerals include abundant epidote, quartz, chlorite, calcite, and minor amounts of hematite (Laney 1917, p. 150). Now about 10 feet (3 m) in diameter, the shaft is water-filled; there is a little chalcopyrite, bornite, and azurite mineralization in quartz in the scattered, leaf-covered dump.

The vein on which the Tuck shaft was sunk is narrow, from a few inches to about 3 feet (1 m) wide, and seems to extend along the strike and dip of the greenstone schist (Laney, 1917, p. 151). Just north of this shaft along State Road 737 the schistosity of an exposure of schist has a strike of N. 22° E. and a dip of 55° SE. Copper minerals at the Tuck shaft are about the same as in the Glasscock shaft, except with a smaller amount of chalcopyrite; the major gangue mineral is quartz. Presently, the Tuck shaft (Figure 5), located about 270 feet (82 m) S. 20° W. of the intersection of State Roads 733 and 737, consists of a 10-foot- (3-m-) diameter, water-filled shaft with a low surrounding dump. The dump contains greenstone schist with epidote and quartz with malachite and azurite staining. Some of the dump has apparently been removed, probably for local use as road material. About 180 feet (55 m) S. 80° W. of this shaft is another 16-foot- (5-m-) diameter, water-filled shaft with a 5-foot- (2-m-) high rim dump of dark-green greenstone schist with minor, white vein quartz. This is believed to be an exploratory or prospect shaft as there is almost no mineralization except for minor malachite stain and very little vein material present. A small dump pile to the south, consisting of azurite, malachite, and bornite-chalcocite mineralization in quartz is believed to have come from the shaft to the east-northeast.

Seaboard mine is located in Halifax County, 1.35 miles (2.17 km) west-southwest of Red Bank, 0.5 mile off the southwest side of State Road 602 approximately



Figure 5. Water-filled Tuck shaft in open field, Pontiac mine.

0.55 mile (0.89 km) by road east of its intersection with State Road 737.

It is reported that copper was first found on this property in 1899 and during the next 3 years two shafts were sunk, each about 100 feet (30 m) deep. In 1902 the No. 2 shaft was deepened to about 260 feet (79 m) and No. 3 shaft was sunk. Around 1907 No. 1 shaft was 110 feet (34 m) deep, No. 2 shaft was 350 feet (107 m) deep, and No. 3 shaft was 105 feet (32 m) deep (Laney, 1917, p. 99-100). The vein, ranging in width from 1.5 to 8 feet (0.5 to 2 m) in the tuffaceous greenstone-schist country rock, consists of quartz, epidote, and some calcite. A smaller vein, 200 feet (61 m) to the west, showed a small percentage of copper opened by a shallow shaft to the south. The veins have a strike of N. 5-10° W. and a dip of 80° E. whereas the schistosity of the greenstone schist has a strike of approximately north-south. Laney (1917, p. 97) believed these veins are true fissure veins, developed in fractures, which generally have a more northerly trend than the greenstone schist country rock in this area; in many cases the veins are parallel to the country rock. The ore minerals consist of bornite, chalcocite, and malachite and the gangue minerals include quartz, epidote, calcite, chlorite, albite, and hematite. In 1907 a new 50-ton mill that supposedly was better able to concentrate the copper ores was installed. Two thousand and two hundred tons of second-grade ore produced seventy-seven tons of concentrates. Smelter returns (table concentrates) according to Laney (1917, p. 102) contained as much as 23.85 percent copper, 2.89 ounces of silver, and 0.02 ounce of gold per ton. The mill was operated for only a short time. Total copper production from the mine is reported as approximately 40,000 pounds (Luttrell, 1966, p. 117).

As part of the strategic-minerals program, in 1942 the U. S. Bureau of Mines did 920 linear feet (280 m) of hand trenching and began rehabilitation of the No. 2 shaft. After going to a depth of 32 feet (10 m) in the old shaft, the work was abandoned. During the hand trenching, the maximum width of the vein seen was 1.5 feet (0.5 m) (Newberry and others, 1948, p. 5-6).

Today, a short, 90-foot- (27-m-), square, concrete wall contains the remnants of about 15 concrete foundations (Figure 6); these are the remains of the 50-ton mill and concentrating plant set up in 1907. A large pile of copper ore fines is spread out just east of this site and extends approximately 200 feet (61 m) to the south side of a small tributary of North Fork. Approximately 10 caved and water-filled pits and shafts are present on the property, as are old wooden timbers, probably used for shaft lining. The openings of one shaft and pit are encircled with barbed wire. One shaft, probably the main or No. 2 shaft, which has a small concrete foundation, is present just to the southwest of



Figure 6. Concrete foundations at plant site, Seaboard mine.

the shaft encircled with barbed wire, and is now about 40 feet (12 m) deep and 25 feet (8 m) in diameter at the top. Schistosity in an exposure of weathered greenstone schist in the wall of the shaft has a strike of N. 4° E. and an exposed 3-foot- (1-m-) wide, barren, white quartz vein has a strike of N. 8° W. and a dip of 75° NE. Several large dump piles (Figure 7) contain greenstone schist and quartz with the copper minerals bornite, chalcocite, malachite, and azurite. Material is occasionally removed from the dump for local road material.

Wall mine is located in Halifax County, 1.7 miles (2.7 km) northwest of Red Bank, 225 feet (69 m) off the east-southeast side of State Road 737 approximately 0.4 mile (0.6 km) by road north-northeast of its intersection with State Road 736.

In the early 1900's a shaft was sunk to a depth of 135 feet (41 m), with drifts running north and south on a vein that ranges from 2.5 to 5.5 feet (0.8 to 1.1 m) in width (Weed, 1911, p. 82). Mineralization in the vein,

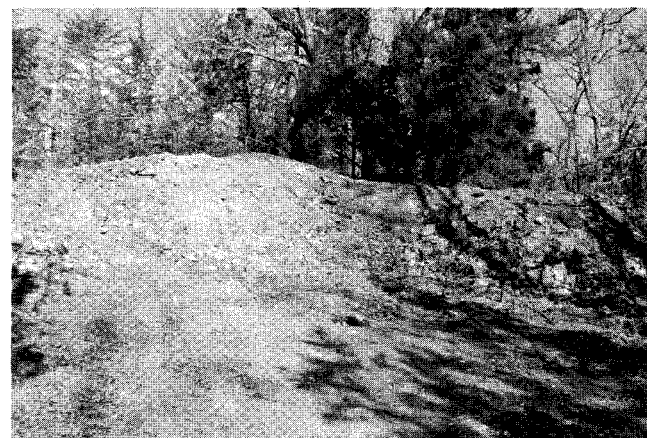


Figure 7. Large dump area, Seaboard mine.

0.2 to 3.0 percent copper (Weed, 1911, p. 82), consists of bornite and chalcocite with quartz, epidote, calcite, and chlorite gangue (Laney, 1917, p. 160). The vein, according to Laney (1917, p. 159), is in the tuffaceous phase of the Virgilina greenstone.

Presently, the old, almost completely debris-filled shaft, 15 feet (5 m) in diameter, is surrounded by a dump area of greenstone schist with azurite, malachite, and some surface iron-oxide staining. Bornite and chalcocite mineralization in quartz is also present. In a small exposure near the top of the shaft the schistosity of the country rock has a strike of N. 25° E. and a vertical dip; the partial exposure of the quartz has a strike of N. 12° W.

Wilson mine is located in Charlotte County, 2.95 miles (4.75 km) southeast of Eureka, 0.1 mile (0.2 km) off the west side of State Road 778 approximately 0.7 mile (1.1 km) by road south of its intersection with State Road 772.

In the early 1900's a narrow quartz vein with some copper staining was prospected. The country rock is the typical greenstone schist. In April 1972 a large, water-filled pit, 20 feet (6 m) in diameter, and two smaller water-filled shafts(?) were present. Small fragments of white quartz and loose pieces of malachite were seen in the dump area.

By February 1976 the area had been completely logged and small 1.0-foot- (0.3-m-) high pine seedlings were present on the mine property which had been completely graded over; several small piles of quartz and epidote were present. There is now no evidence of any pits or shafts.

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Report of Investigations 42. GEOLOGY OF THE DALEVILLE QUADRANGLE, VIRGINIA, by Odell S. McGuire; 43 p., 1 map in color, 7 figs., 3 tables, 1976. Price: \$3.50 plus \$0.14 State sales tax, total \$3.64.

The Daleville quadrangle is located in Botetourt and Roanoke counties, Virginia in the Valley and Ridge physiographic province. Bedrock, assigned to 21 formations, ranges in age from Early Cambrian to Early Mississippian. Mappable units are shown in color on a geologic map at the scale of 1:24,000 (1 inch equals approximately 0.4 mile or 0.6 km).

Thrust sheet B, located in the northeastern half of the quadrangle, contains Cambrian and Ordovician clastic and carbonate rocks which have been thrust over the Catawba syncline. Thrust sheet A in the southeastern part of the area has Cambrian rocks which have been thrust over sheet B. The Catawba syncline, located in the southwestern half of the quadrangle, contains Cambrian to Devonian clastic and carbonate rocks and lies beneath thrust sheets A and B. The eastern part of this syncline has been complexly folded and faulted.

Cement is being produced from limestones and calcareous shale is being quarried. Crushed stone, iron, coal, marl, and barite have been mined in the past. Potential mineral resources include construction sand and gravel, shale for decorative brick, high-silica sandstone, and carbonates for industrial use.

Report of Investigations 43. BOUGUER GRAVITY IN VIRGINIA, 36°30' TO 38°00' N., 80°00' TO 81°00' W., by Stanley S. Johnson; 25 p., 2 maps (1 in color), 2 figs., 1976. Price: \$2.00 plus \$0.08 State sales tax, total \$2.08.

An area of approximately 3,850 square miles (9,971 sq km) in Virginia, bounded by 80°00' and 81°00' west longitudes, the Virginia-West Virginia boundary to the north, and the Virginia-North Carolina boundary to the south, was surveyed using gravimeter methods. A total of 1,070 stations, such as bench-mark, checked spot, and bridge elevations were occupied. The reduced field data were computer contoured. The survey included areas in the Piedmont, Blue Ridge, and Valley and Ridge physiographic provinces. Precambrian and Paleozoic metamorphic and igneous rocks and Paleozoic sedimentary rocks are present.

A Bouguer gravity map in color at the scale of 1:250,000 (1 inch equals approximately 4 miles or 6 km) and a map showing major regional structures are included.

Bouguer values in the Valley and Ridge physiographic province had a range of 22 milligals and in the Blue Ridge and Piedmont provinces a range of 57

NEW PUBLICATIONS

(State sales tax is applicable only to Virginia addressees)

LIST OF PUBLICATIONS (1976), 38 p. No charge.

DIRECTORY OF THE MINERAL INDUSTRY IN VIRGINIA — 1976, by D. C. Le Van; 56 p. Price: \$0.50 plus \$0.02 State sales tax, total \$0.52.

Report of Investigations 41. GEOLOGY OF THE MULBERRY ISLAND, NEWPORT NEWS NORTH, AND HAMPTON QUADRANGLES, VIRGINIA, by Gerald H. Johnson; 72 p., 3 maps in color, 24 figs., 4 tables, 1976. Price: \$6.00 plus \$0.24 State sales tax, total \$6.24.

The Mulberry Island, Newport News North, and Hampton 7.5-minute quadrangles are located in the Outer Coastal Plain of southeastern Virginia. The quadrangles include portions of York and Isle of Wight counties and portions of the cities of Hampton, Newport News, and Poquoson.

The report includes three geologic maps in color at the scale of 1:24,000 (1 inch equals approximately 0.4 mile or 0.6 km). They show the surface geologic units consisting of the Yorktown, Windsor, Norfolk, Sand Bridge, and Tabb formations and alluvium, marsh sediment, and beach and dune sand. The age of the sediments is Pliocene, Pleistocene, and Holocene.

Sand and marl are commercially produced. Potentially economic deposits of clay and peat are present. However, the spread of suburban and urban development may preclude future mining of most of these mineral deposits.

milligals. Gradients in several areas of the Blue Ridge anticlinorium exceeded 2.0 milligals per mile (1.2 mgal/km).

Correlation was found to exist between gravity anomalies and geological structure. Large positive anomalies in the southeastern part of the area may be due to mafic rocks near the surface.

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NEW PRICES — TOPOGRAPHIC MAPS AND GEOLOGIC PUBLICATIONS

Effective July 15, 1976 the prices of topographic maps and products were increased to the following by the U. S. Geological Survey; these are the new prices for orders from the Virginia Division of Mineral Resources (sales tax is applicable only to Virginia addressees):

	Price	Sales Tax	Total Cost
7.5-minute topographic quadrangles, orthophotoquads, slope maps, 1:24,000-scale	\$1.25	\$0.05	\$1.30
Stafford County topographic map, slope map, 1:50,000-scale	2.00	0.08	2.08
Shenandoah National Park topographic map, 1:62,500-scale, per section	2.00	0.08	2.08
United States series topographic maps, 1:250,000-scale	2.00	0.08	2.08
State base map, 1:500,000-scale	1.50	0.06	1.56
State base map, 1:1,000,000-scale	1.50	0.06	1.56
State topographic map, shaded-relief map, 1:500,000-scale	2.00	0.08	2.08

Effective June 8, 1976 the prices of the following geologic publications of the Virginia Division of Mineral Resources were increased:

	Price	Sales Tax	Total Cost
Bulletins 10, 12, 13, 14, 16, 19, 21, 22, 24, 25, 26, 27, 32, 41, 45, 53, 59, 61, 67, 68, 69, 70	\$1.00	\$0.04	\$1.04
Information Circulars 1, 2, 10	0.50	0.02	0.52
Mineral Resources Circulars 1, 4, 5, 6	0.50	0.02	0.52

ORTHOPHOTOQUADS AVAILABLE

Unpublished 7.5-minute orthophotoquad reproducible at the scale of 1:24,000 are now available. These are rectified aerial photographs within a standard quadrangle format on which scale measurements can be seen. Differentiation of coniferous- and deciduous-tree types and interpretation of land use can be obtained by using these with the corresponding topographic map. These are available as ozalid copies for \$1.30 each (\$1.25 plus \$0.05 State sales tax); if unfolded copies are desired add an additional \$2.00 for orders of 10 or less maps:

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Chester Gap	Linden	Stephens City
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Corapeake	Midlothian	Strasburg
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Dutch Gap	Poquoson East	Walkers
Flint Hill	Poquoson West	Waynesboro West
Glen Allen	Prince George	West Point
Guinea	Providence Forge	Widewater
Hallsboro	Quantico	Yellow Tavern

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NEW MINERAL INDUSTRY REPORT

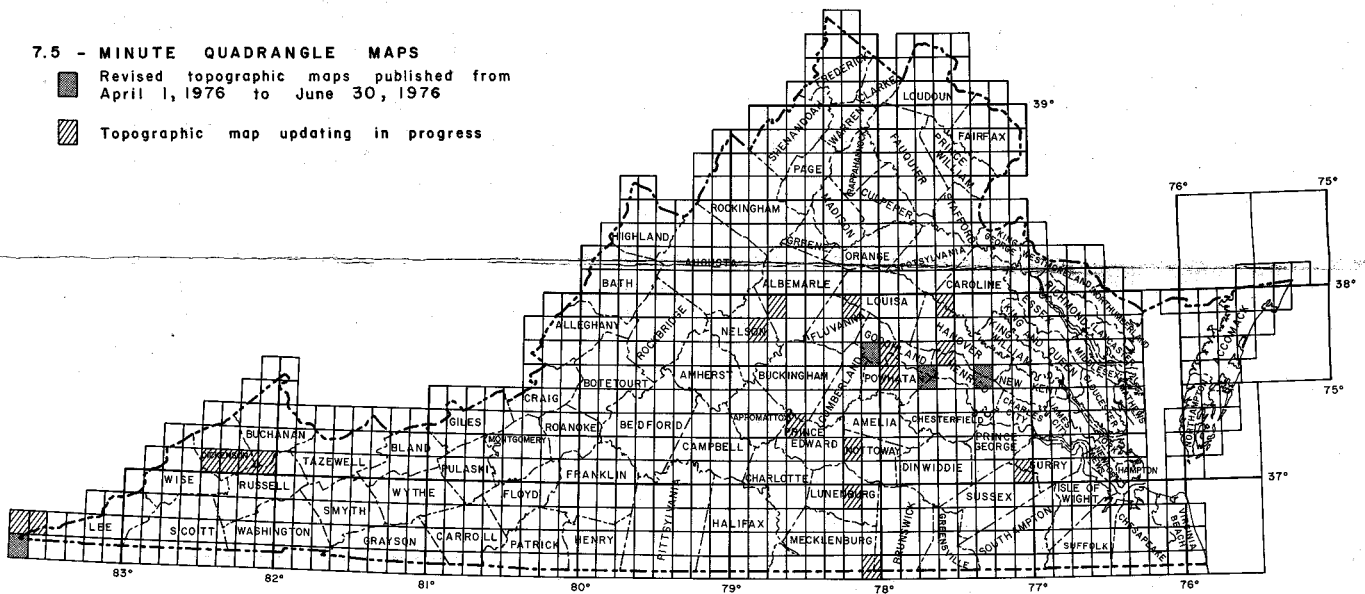
A recently released preprint from the 1973 U. S. Bureau of Mines Minerals Yearbook, "The Mineral Industry in Virginia," by C. E. Vannoy is available free from the Virginia Division of Mineral Resources, Box 3667, Charlottesville, Va. 22903. This 14-page detailed report on mineral production for 1973 includes 1 figure and 11 tables. A brief advance summary of this information was published in *Virginia Minerals*, vol. 20, November 1974, p. 29.

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7.5 - MINUTE QUADRANGLE MAPS

- Revised topographic maps published from April 1, 1976 to June 30, 1976
- ▨ Topographic map updating in progress



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Revised Maps

Cartersville Midlothian
Middlesboro South Seven Pines

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