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BLACKSBURG QUADRANGLE

GEOLOGY OF THE BLACKSBURG QUADRANGLE, VIRGINIA

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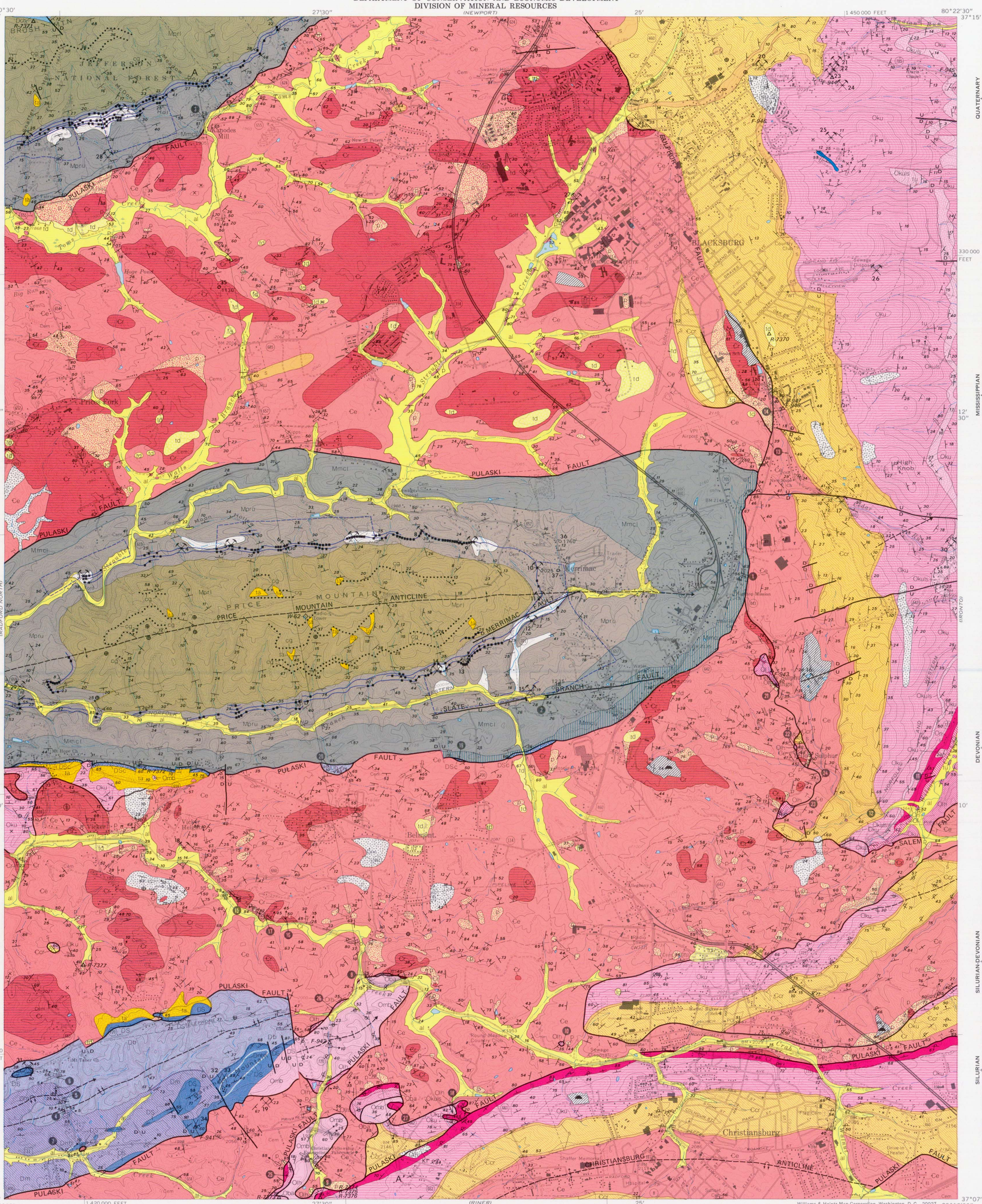
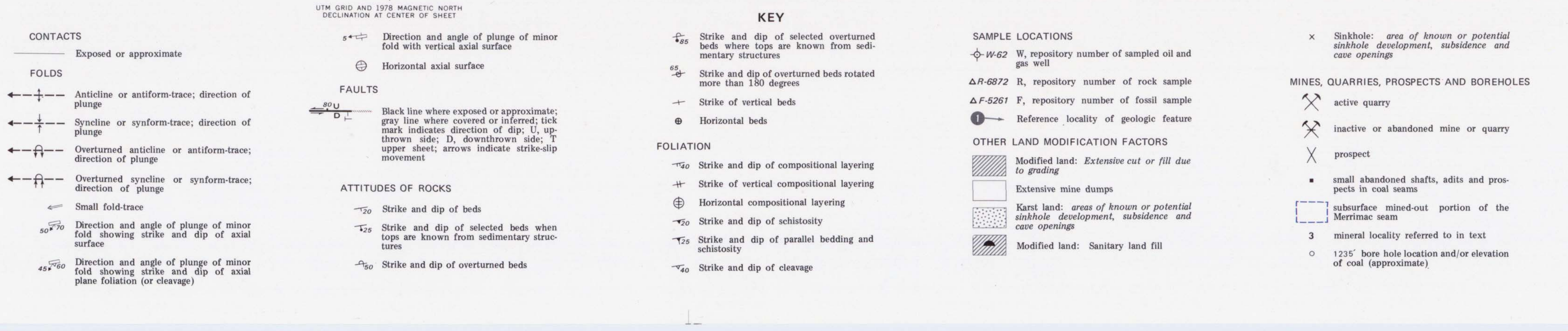




ROCK CHARACTERISTICS

QUATERNARY

al — Alluvium: *Flood-plain deposits of stratified light-gray to light-brown, unconsolidated sand, silt and clay with beds and lenses of pebbles and cobbles. Thickness: 0-30 feet (0-9.2 m).*

tu — Tufa: *Stratified deposits of light- to medium-gray, poorly consolidated, angular to subrounded pebbles and cobbles of dolomite, limestone and chert in an unsorted matrix of similar material; with calcareous cement. Thickness: 0-20 feet (0-6.1 m).*

ta — Talus deposits: *Unconsolidated, unsorted boulder fields composed of 1-6 foot (0.3-1.8 m) thick angular boulders of quartzite, siliceous sandstone and quartzose conglomerate. This detritus has been derived from nearby strata of Mississippian, Silurian and Devonian age. Thickness: 0-30 feet (0-9.2 m).*

td — Terrace deposits: *Unconsolidated, poorly stratified deposits of dark-brown to dark reddish-brown, 2-8 inch (5.1-20.3 cm) thick, well rounded cobbles (R-7370) of vein quartz, metaquartzite and feldspathic sandstone in an extensively weathered soil matrix. Vein-quartz cobbles are usually discolored in the interior, but have only a thin oxidized veneer; metaquartzite cobbles are discolored in the interior and have a 2 mm-1 cm oxidized rind; feldspathic sandstone cobbles are typically discolored and oxidized throughout. The upper few feet of the soil horizon are commonly light-brown, grading abruptly downward to darker colors. Thickness: 0-20 feet (0-6.1 m).*

MISSISSIPPIAN

Mmcu, Mmcl — Maccrady Formation: *Mmcu (upper member), interbedded medium-gray siltstone and mudstone and light- to medium-gray, sandy quartz-pebble (2 mm-1 cm) conglomerate and coarse-grained conglomeratic quartzose sandstone. Thickness: 200+ feet (61+ m). The member is characteristically covered by a thin (1-2 feet; 0.3-0.6 m), light-brown sandy soil. Contains a shallow-water fauna (***Reference Locality 1***) of Sinuitina, Euphemites, Chonetes, Nuculana and Palaeoneilo. Mmcl (lower member), cyclic deposits of sandstone overlain by mottled maroon and green mudstone. The mottled mudstone is in units that are commonly 20-50 feet (6.1-15.3 m) thick and are interbedded with 1-3 foot (0.3-0.9 m) thick beds of medium-gray, thinly bedded, fine- to medium-grained sandstone and medium- to coarse-grained crossbedded sandstone. In a few localities the sandstone cycles contain dark-gray to black mudstone with thin coal seams. The sandstone typically consists of 20-30 feet (6.1-9.2 m) of thick (1-4 feet; 0.3-1.2 m), crossbedded, medium-gray, medium- to coarse-grained beds of feldspathic and/or micaceous quartzose sandstone. Total thickness: about 1000 feet (305 m). The member is characteristically veneered by 1-3 feet (0.3-0.9 m) of maroon soil.*

Mpru, coal, Mprl, cg — Price Formation: *Mpru (upper member), a mottled maroon and green mudstone underlain by interbedded dark-gray to black mudstone and coal which in turn is underlain by a nonmarine cyclic sequence of quartzose sandstone. The thickness and amount of mottled mudstone increases upward, and the contact with the overlying Maccrady Formation is well exposed at* **Reference Localities 2 and 3.** *The coal measures are best developed near the base of this member. The coal is commonly laminated and interlayered with thinly laminated black mudstone. (See Campbell and others, 1925, and Stevens, 1959, for detailed information on coal measures, and Kreisa and Bambach, 1973, for discussion of environments of deposition). The quartzose sandstone is typically medium- to brownish-gray, medium- to coarse-grained, thick (1-4 feet; 0.3-1.2 m), crossbedded, frequently feldspathic and/or micaceous. The member is generally covered by a thin (1-3 feet; 0.3-0.9 m), light-brown sandy soil. Mprl (lower member), dominantly marine, interbedded sandstone and siltstone with 10-50 foot (3.1-15.3 m) thick beds of quartz-pebble conglomerate and quartzite in places. Laterally and vertically gradational into the nonmarine upper member. The sandstones are medium-gray, fine- to medium-grained, platy, well-layered or crossbedded, and in many places are feldspathic and/or micaceous. The siltstones are medium-gray, platy, well-layered, feldspathic and/or micaceous, and are sometimes associated with clayball conglomerates. cg, quartz-pebble conglomerates are typically massively bedded with 0.5-1 cm, well-rounded, well-sorted milky quartz pebbles and scattered rock fragments in a siliceous cement; these are interbedded with and laterally gradational into quartzite with 1-5 mm thick well-rounded, well-sorted quartz grains and random rock fragments in a siliceous cement. On Brush Mountain the Cloyd Conglomerate Member is absent locally. The base of the lower member is marked by a laterally equivalent fossiliferous quartzite (R-7371). Thickness: about 1500 feet (457.5 m). The Kipps No. 1 well (W-62) spudded in and penetrated 730 feet (222.7 m) of the lower member from 2470 feet to 1740 feet elevation. The member is generally overlain by a thin (1-3 feet; 0.3-0.9 m), light-brown, sandy soil.*

Dch — Chemung Formation: *Described in samples from W-62 as interbedded medium- to light-gray, slightly calcareous, fine-grained sandstone and fissile mudstone and siltstone. W-62 penetrated 710 feet (216.6 m) of Chemung from 1740 feet to 1030 feet elevation.*

Db — Brailler Formation: *Interbedded sequence of 2-6 inch (5.1-15.2 cm) thick, dark-gray to black mudstone beds and 2-6 inch (5.1-15.2 cm), medium-gray siltstone and fine-grained, commonly crossbedded sandstone.*

GEOLOGIC AND ECONOMIC FACTORS AFFECTING LAND MODIFICATION

Floodplains—are the level areas adjacent to streams which are covered by alluvium. Because they are subject to periodic flooding their use is generally restricted to agricultural or recreational development. The alluvium is easily removed and may be used as a source of sand and gravel. These excavations, however, are subject to landslides and collapse. Hard calcareous tufa deposits may underlie alluvium along some streams.

Areas of clastic rocks—Mississippian rocks crop out in the Price Mountain window and in the Saltville block, north of the leading edge of the Pulaski thrust (Figure 1). These rocks consist primarily of interbedded sandstone, siltstone and shale with local occurrences of coal. The land surface is gently rolling to hilly on the eastern end of Price Mountain. In contrast, the deeply dissected, steeply inclined flanks of Price and Brush mountains have abundant, gently sloping to flat spurs underlain by moderately dipping, resistant sandstone ledges. The top of Brush Mountain is relatively flat although narrow, whereas the top of Price Mountain is a broad, comparatively flat surface underlain by nearly horizontal strata. Soil is typically thin, except where the land surface is gently rolling or flat. The land is forested and suited for farming in only a few places. Residential development should be restricted to spurs and ridges because the narrow, V-shaped valleys may be subject to flash floods during major storms, and because landslides and collapse may occur where steep-sided slopes have been excavated or denuded. Ground water supplies from strata beneath the coal measures may be chemically and bacteriologically unacceptable because the dip of bedrock facilitates infiltration of acid mine waters and because waste effluent from drain fields and septic tanks along the upper slopes is likely to be a source of contamination. Depth to ground water is unknown at higher elevations, but is generally encountered at depths between 50 and 300 feet (15.3 and 30.5 m) at lower elevations. Numerous mine dumps and open or caved shafts and adits are along zones where the coal measures occur at the surface; known large-scale, subsurface, mined-out areas are shown on the geologic map.

Areas of clastic and carbonate rocks—the Barringer Mountain window and areas labeled A (Figure 1) are regions underlain by shales interbedded with some sandstone in the Brallier, Millboro, Martinsburg and Bays formations, or limestone in the Liberty Hall and Martinsburg formations. Local masses and narrow belts of resistant siliceous quartzite, cataclasite, chert and sandstone cap a number of hills and are likely to be encountered in some drill holes; excavation of these rocks will require blasting.

The land surface in the window is characterized by numerous narrow, steep-sided, flat-topped ridges separated by narrow, low-gradient stream valleys that are subject to flooding. Steep slopes may be subject to landslides when excavated or denuded. These lands are suitable for pasture and forestry uses. Residential development should be confined to the more stable flat-topped ridges and spurs. Shallow soil and rapid run-off may restrict the type and location of waste-disposal facilities. Small ground water supplies are usually available from depths between 50 and 100 feet (15.3 and 30.5 m). Large-scale development will necessitate sewage-treatment facilities and an outside water supply.

Areas of carbonate rocks—the Salem synclinorium, Christiansburg window, Crab Creek allochthon and area labeled B (Figure 1) are regions underlain by belts of (1) uniformly dipping dolomite and a few thin sandstone ledges of the Elbrook and Copper Ridge formations, (2) dolomite with considerable interbedded limestone in the upper part of the Knox Group, and (3) limestones of the New Market and Lincolnshire formations, and an undivided limestone unit (ls). The gently rolling land surface is covered by 5 to 20 feet (1.5 to 6.1 m) of light-brown residual soil which in places contains an abundant amount of gravel- and cobble-size chert and sandstone fragments derived from the underlying bedrock. The easily excavated colluvial veneer and saprolite may be as thick as 50 feet (15.3 m), but the saprolite is likely to contain bedrock pinnacles and, locally, chert and sandstone ledges and/or cavernous strata. The dip of these strata ranges from nearly flat in the northeast corner of the quadrangle to steeply dipping or vertical in the southeast corner. This land is suitable for agricultural and residential development, but sewage-treatment facilities are essential for large-scale developments to prevent contamination of ground- and surface-water supplies. Ground water is usually obtained from depths between 100 and 1000 feet (30.5 and 305 m), and potential for wells of moderate to large yields is present in some areas. Zones of cavernous rock and karst terrane are common, in which the ground water reservoir is very susceptible to contamination from unsanitary surface sources.

Areas of deformed rocks—the Blacksburg and Belmont synforms and areas labeled C (Figure 1) are regions underlain by chaotic, complexly folded, faulted and fractured bedrock of calcareous, polymictic breccia, shale of the Rome Formation, and dolomite with interbedded limestone and minor sandstone of the Elbrook and Copper Ridge formations. The gently rolling to moderately dissected land surface is covered by 5 to 20 feet (1.5 to 6.1 m) of light-brown residual soil that in places contains abundant gravel and cobble-size fragments of chert, sandstone, quartzite and vein quartz derived either from the underlying bedrock and/or from ancient terrace deposits. The colluvial veneer and saprolite ranges from 0 to 10 feet (0 to 3.1 m) above shale, but may be as thick as 50 feet (15.3 m) between pinnacles of dolomite and limestone. Inasmuch as surficial deposits do not always reflect the type and depth of underlying bedrock, borehole tests may be necessary prior to both deep excavations and the erection of large structures. The colluvial veneer and saprolite are easily excavated and the land is suitable for agricultural and residential development. Sewage-treatment

Figure 2. Block diagram showing deformation of bedrock in the Blacksburg quadrangle.

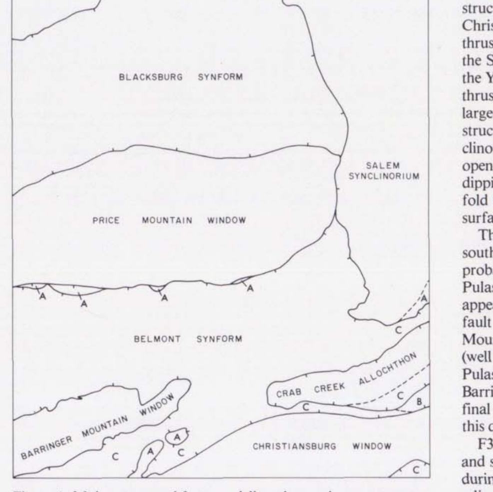


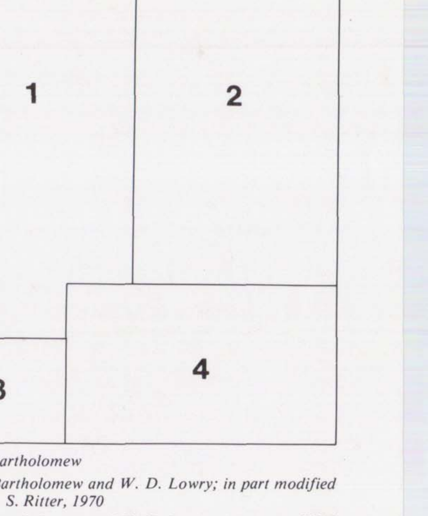
Figure 1. Major structural features delineating environment areas that affect land modification.

SUMMARY OF DEFORMATIONAL HISTORY

MINERAL RESOURCES SUMMARY

REFERENCES CITED

Credit for geologic mapping



1 - *M. J. Bartholomew*

2 - *M. J. Bartholomew and W. D. Lowry; in part modified after G. S. Ritter, 1970*

3 - *M. J. Bartholomew and W. D. Lowry; in part modified after J. D. Hergenroder, 1958*

4 - *F. R. Glass, 1970; slightly modified by M. J. Bartholomew and W. D. Lowry*

Fossil identification by: G. A. Cooper, W. D. Lowry, C. G. Tillman, Ellis Yochelson

REFERENCE NOTE

Portions of this publication may be quoted if credit is given to the Virginia Division of Mineral Resources. The following is the recommended reference form: Bartholomew, M.J. and Lowry, W.D., 1979, Geology of the Blacksburg quadrangle, Virginia: Virginia Division of Mineral Resources Publication 14 (GM81B), text and 1:24,000 scale map.