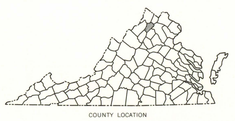
COMMONWEALTH OF VIRGINIA
DEPARTMENT OF MINES, MINERALS, AND ENERGY
DIVISION OF MINERAL RESOURCES

GEOLOGIC MAP OF WARREN COUNTY, VIRGINIA

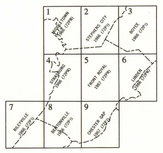
Eugene K. Rader and James F. Conley

1995

PUBLICATION 138
GEOLOGIC MAP OF WARREN COUNTY, VIRGINIA



INDEX TO 1:24,000 SCALE GEOLOGIC AND TOPOGRAPHIC MAPPING



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3. R. S. Edmundson and W. E. Nunan, 1973, Geology of the Berryville, Stephenson, and Boyce quadrangles, Virginia: Virginia Division of Mineral Resources Report of Investigations 34, 112 p.
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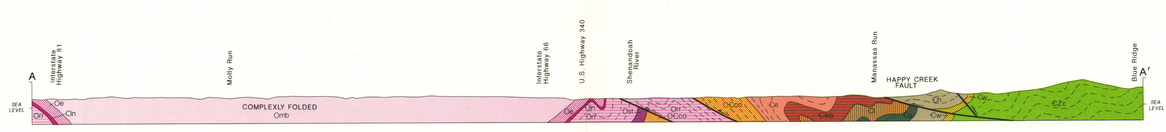
7. E. K. Rader
8. E. K. Rader, J. F. Conley, T, M. Gathright, II, and H. W. Webb, Jr.
9. J. F. Conley and T. M. Gathright, II

SCALE 1:50 000

1 0 1 2 3 4 MILES
3000 0 3000 6000 9000 12000 15000 18000 21000 FEET
1 0 1 2 3 5 KILOMETRES

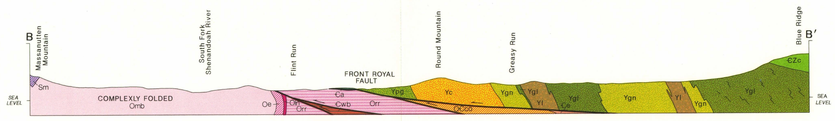
CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Base Map: U.S. Geological Survey, 1975
Warren County, Virginia



CROSS SECTION DESIGN:

1. No vertical exaggeration.
2. Subsurface structure interpreted from surface measurements.
3. Alluvial deposits not shown.



KEY

Contacts
- exposed, approximate
- inferred

Faults
- T – on the upper plate, tick mark indicates direction of dip

Folds
- Anticline
- Overturned anticline
- Syncline
- Overturned syncline

Attitude of rocks
- Strike and dip of bedding
- Strike and dip of overturned bedding
- Strike of vertical bedding
- Horizontal bedding
- Strike and dip of compositional layering
- Vertical compositional layering
- Strike and dip of schistosity
- Vertical schistosity

MINES, QUARRIES, AND PROSPECTS

Active quarry

3. Riverton Corporation (shale)
7. Riverton Corporation (limestone)
10. Riverton Corporation (limestone)
14. Rappawan Inc. (quartzite)

Prospect

18. Bailey (nickel)
20. Copper
21. Copper
26. Mills (Cove Farm) (copper)
27. Rudacill (copper)
28. Rudacill (copper)
32. Iron
33. Martin, R. A. (copper)
34. Empire (copper)
35. Hartley, F. C. (copper)

Abandoned or inactive mine or quarry

1. Patterson Construction (shale)
2. Riverton Corporation quarry (shale)
4. Riverton Corporation quarry (limestone and dolostone)
5. Riverton Corporation quarry (shale)
6. Shale quarry
8. Riverton Corporation quarry (limestone)
9. Riverton Corporation quarry (limestone)
11. Limestone quarry
12. Moore Brothers Company, Inc. quarry (limestone)
13. Rappawan Inc. (quartzite)
15. Quartzite quarry
16. Happy Creek (Seibel) mine (manganese)
17. Seibel Iron Mines, Inc. mine (iron)
19. Crushed-stone quarry
22. Sealoch (Sealock, Marshall, Ravenswood) mine (copper)
23. Cooney-Manor mine (copper)
24. Skyline Crushed Stone Company quarry (limestone)
25. Iron mine
29. Skyline Crushed Stone Company quarry (limestone)
30. Iron mine
31. Quartzite

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EXPLANATION

QUATERNARY

al — Flood plain, levee, and channel deposits, undifferentiated

Flood plain: unconsolidated sand, silt, and clay with pebble-size fragments of quartzite and sandstone. **Levee**: unconsolidated sand and silt, shell fragments common along the Shenandoah River. **Channel**: roundstones, pebble to boulder size, of quartzite, sandstone, and metabasalt. Thickness: highly variable, near Morgan Ford bridge thicknesses ranging from 15 to 20 feet were measured in drill holes.

td — Terrace deposits

Rounded, unsorted, pebbles to boulders of sandstone, quartzite, and conglomerate in a matrix of sand, silt, and clay size. Three distinct levels are recognized in Warren County associated with the present and ancestral forks of the Shenandoah River. Fragments tend to move down slope, making precise contact and thickness determinations difficult.

a — Talus, slope, fan, and valley fill deposits, undifferentiated

Talus, slope, fan, and valley fill deposits merge downslope so that mapping a definitive contact is not possible. **Talus deposits**: unconsolidated, angular blocks of quartzite, sandstone, metabasalt, and rare limestone and dolomite. Thickness: highly variable. **Slope deposits**: unconsolidated, subangular to subrounded fragments of quartzite, sandstone, and metabasalt in a matrix of sand, silt, and clay. Thickness: variable. **Fan deposits**: unconsolidated sand, silt and clay with subrounded to rounded quartzite, sandstone, and metabasalt fragments. Thickness: variable. **Valley fill deposits**: unconsolidated sand, silt, and clay with pebble- to boulder-size fragments of quartzite, sandstone, metabasalt, and metagranitic rocks. Thickness: variable. Thin, undifferentiated alluvial deposits occur along the interfluves and drainages on the east slope of Massanutten Mountain.

Ironstone — Ironstone breccia: light- to moderate-brown, very-fine-grained, angular fragments of dolostone and limestone replaced by iron oxide and silica, and cemented by iron oxide and silica. Approximately 50 percent of the silica is doubly terminated quartz crystals, often with three stages of overgrowths. This type of deposit is believed to result from the infiltration of iron- and silica-bearing water into carbonate rocks overlain by gravels (Rader and Biggs, 1975).

p- — Peridotite

Dark-gray to dark-greenish-gray peridotite composed of chlorite, phlogopite, hydrobiotite pseudomorphs after olivine and pyroxene with accessory garnet, rutile, and magnetite; secondary minerals include: dolomite, ankerite, ilmenite, magnetite, epidote, quartz, serpentine, talc, calcite, and perovskite (Rader and Biggs, 1976). Occurs as a dike in the Martinsburg Formation; age unknown.

SILURIAN

Sm — Massanutten Sandstone

White to medium-gray, fine- to coarse-grained, sandstone and quartzite, with lenses of quartz-pebble conglomerate; thin, black, sandy shale layers contain plant fossils (Pratt and others, 1978). Thickness: approximately 900 feet.

Omb — Martinsburg Formation

Lower 400 to 900 feet, Stickley Run Member of Epstein and others (in press): medium-gray to grayish-black, very-fine-grained, very-thin- to thin-bedded, argillaceous limestone with interbedded medium- to dark-gray, calcareous shale. Middle, approximately 3000 feet: olive-green, silty shale, dark-gray siltstone, and medium- to coarse-grained sandstone, locally contains pebbles. Upper 100 to 200 feet: brown, medium- to coarse-grained sandstone, lower portion fossiliferous. Thickness: 3500 to 4100 feet.

ORDOVICIAN

Oe — Edinburg Formation

Black, fine-grained to aphanic limestone with black shale partings, pyrite common (Liberty Hall lithofacies of Cooper and Copper, 1946), and medium- to light-gray, fine- to coarse-grained, nodular limestone with thin black shale partings (Lantz Mill lithofacies of Copper and Copper, 1946). Fossiliferous. Thickness: 425 to 500 feet.

On — Lincolnshire and New Market Limestones

Lincolnshire: light- to dark-gray, fine- to coarse-grained limestone with black to dark-gray chert nodules along bedding planes; locally contains light-gray, coarse-grained carbonate mounds. Upper contact gradational with the overlying Edinburg; lower contact unconformable with the underlying New Market . Fossiliferous. Thickness: 25 to 100 feet. **New Market**: lower unit: medium- to dark-gray, fine-grained, thin-bedded, argillaceous, bioturbated limestone, carbonate pebble conglomerate common at base; upper unit: medium-gray, aphanic, thick-bedded limestone with scattered, rhomboid-shaped sparry calcite crystals; high-calcium limestone quarried in the area. Contacts unconformable. Thickness: 0 to 40 feet.

Orr — Rockdale Run Formation

Medium-gray, fine-grained, fossiliferous limestone; light- to medium-gray, fine-grained, laminated dolomitic limestone and dolomite with mottled beds. Thin lenses of calcareous sandstone east of Potomac Edison powerplant and near Rockland; thin lenses of gray chert common near the base of the formation. Amount of dolomite increases south of Front Royal. Upper contact unconformable; lower contact placed at the oldest thick bedded dolomite overlying dark-gray limestone of the Stonehenge Limestone. Thickness: approximately 2400 feet.

Beekmantown Group

Os — Stonehenge Limestone

Stoufferstown Member (lower Stonehenge): dark-gray to black, fine-grained limestone with thin, sheet-like partings; partings crinkly because of cleavage; and thin beds of coarse-grained, bioclastic limestone. Thickness: 100 to 150 feet. **Upper Stonehenge**: medium- to dark-gray and black, fine- to medium-grained limestone, thin beds of macerated fossil debris common. Thickness: 500 feet.

OCgo — Conococheague Formation

Big Spring Station Member (lower 200 feet of Conococheague): light-gray, fine-grained dolomite; medium- to dark-gray, fine-grained laminated limestone and dolomitic limestone; gray, brown-weathering, coarse-grained sandstone; beds of flat-pebble conglomerate in dolomite. **Upper Conococheague**: light- to dark-gray, fine-grained, laminated limestone, dolomitic limestone, and dolomite with flat-pebble conglomerate beds. The following lithologies occur as erosional-surface-bounded packages (from base to top): oolitic, coarse-grained calcarenite; stromatolitic limestone; ribbon-banded limestone and dolomite; interbedded fine-grained limestone and dolomite; and dolomite, commonly containing mudcracks. Thickness: approximately 2300 feet.

Ce — Elbrook Formation

Lower 300 to 400 feet: green to greenish-gray, fine-grained dolomite, dolomitic limestone, and shale; brown-weathering calcareous siltstone marks the top of unit. Bulk of formation: dark- to medium-gray, fine- to medium-grained limestone, dolomitic limestone, dolomite, and dolomitic shale. Lithologies commonly occur as erosion-surface-bounded sequences of algal limestone overlain by laminated dolomite. Ground surface frequently covered with decalcified, ocherous, shale-like chips. Thickness: approximately 2000 feet.

CAMBRIAN

Cwb — Waynesboro Formation

Lower 500 feet: dusky-red, olive-gray, and dark-gray shale and dusky-red to brownish-gray, fine- to medium-grained sandstone. Middle 400 feet: medium- to dark-gray, saccharoidal dolomite and fine-grained limestone. Upper 300 feet: dusky-red to olive-gray, fine- to medium-grained sandstone and dusky-red to gray shale. Thickness: approximately 1200 feet.

Cl — Tomstown Dolomite

Light- to medium-gray, fine- to coarse-grained, medium- to thick-bedded dolomite. Lower contact faulted. Thickness: 0 to 150 feet.

Ca — Antietam Formation

White to light-gray, fine- to coarse-grained, silica-cemented, vitreous quartzite and subarkose with phyllite partings. *Skolithos* common. Thickness: 400 to 600 feet.

Ch — Harpers Formation

Lower 900 feet: gray to olive-gray phyllite and sandy phyllite with interbedded lithic sandstone. Upper 1100 feet: gray, fine- to medium grained sandstone and quartzite, in part ferruginous. Thickness: 2000 feet.

Cw — Weverton Formation

Lower 150 feet: basal conglomerate composed of subangular to rounded quartz and flat shale clasts in a matrix of sand-size quartz and lithic grains (includes sericite and chlorite), quartz cement, overlain by light-gray, conglomeratic quartzite with interbedded greenish-gray sandy phyllite. Middle 200 feet: greenish-gray sandy phyllite and micaceous sandstone. Upper 150 feet: quartz-pebble conglomerate and micaceous sandstone. Thickness: 500 feet.

PROTEROZOIC Z

CZc — Catoctin Formation

Grayish-green to dark-yellowish-green, fine-grained, schistose metabasalt composed of albite, epidote, chlorite, actinolite, magnetite, hematite, sphene, and pyroxene; amygdule fillings of albite, quartz, calcite, epidote, chlorite, and jasper; tops of flows locally autobrecciated. Interbedded lithologies include: purple meta-arkose, phyllite, rhyolitic metatuff, epidosite, and lithic metasandstone. Thickness: 2000 to 2500 feet.

Zsr — Swift Run Formation

Dark-greenish-brown, sandy and pebbly metagraywacke and meta-arkose; silver-gray and purple, tuffaceous phyllite; thin beds of metabasalt. Thickness: 0 to 150 feet.

g- — Metabasalt dike

Dark-grayish green, aphanitic metabasalt composed of plagioclase, chlorite, and magnetite; hydrothermal alteration of country rock observed near Boyds Mill.

am- — Amphibolite dike

Amphibolite composed of actinolite with or without plagioclase and accessory chlorite, epidote, and sphene (Lukert and Nuckols, 1976).

Yl — Leucogranite

Leucocratic yellowish-gray, coarse-porphyroblastic, gneissic granite composed of quartz, perthite, and microcline; accessory minerals include biotite and plagioclase; alteration minerals include epidote and sericite from feldspar; contains 1-3 cm augen composed of aggregates of feldspar in a finer-grained, quartz-feldspar matrix. Leucogranite occurs as ovoid bodies of varying size and as dikes that cut charnockite and granulite. Some of the rocks shown as leucogranite contain varying amounts of closely associated granulite.

Yc — Charnockite

Melanocratic grayish-blue-green- to dusky-blue-green, massive- to slightly foliated, coarse-grained, inequigranular- to porphyritic charnockite composed of perthite, plagioclase (perthite > palgioclase), and quartz; accessory minerals include biotite, orthopyroxene, opaque minerals, zircon, and locally, pargasite; alteration minerals are uralite, as kelephitic rims on orthopyroxene, and chlorite, that partially replaces biotite; develops rusty-brown rinds on weathered surfaces; feldspars are vitreous and greasy-green; rock is generally pristine in hand specimen, but may show development of retrograde minerals in thin section. Rocks mapped as charnockite occur as distinct masses, as mixed charnockite-granulite rocks, and as discrete interlayers (many of which are too small to map) in granulite. Mixed charnockite-granulite rocks and interlayered charnockite-granulite rocks could be a product of in situ melting (Passchier and others, 1990).

Ygl Ygn Ygg — Granulite

Ygl: Light-gray, medium-grained, compositionally foliated, generally garnetiferous, generally equigranular granulite composed of perthite, plagioclase (perthite to plagioclase ratio 3 to 1), and quartz; accessory minerals are biotite, microcline, orthopyroxene, garnet, and opaque minerals; alteration minerals are epidote and sericite from feldspar, uralite from orthopyroxene, and chlorite from biotite. Quartz-rich compositional layers alternate with feldspar-rich layers; compositional layers terminate abruptly, producing a dashed-pattern texture; much of the leucogranulite is equigranular xenomorphic, and it has a saccaroidal appearance; garnet porphyroblasts larger than the matrix and aggregates of garnet blasts are common; unit may locally contain 2 to 3 mm quartz and feldspar porphyroblasts.

Ygn: Olive-gray- to grayish-olive-green, medium-grained, inequigranular to locally porphyroblastic granulite composed of perthite, plagioclase (perthite > plagioclase), quartz, and microcline; accessory minerals are orthopyroxene and biotite; alteration minerals are uralite as alteration rims on orthopyroxene, sericite from alteration of feldspar, and chlorite from alteration of biotite. Compositional foliation is irregular and the rock has a spotted appearance caused by aggregates of white feldspar in a dark matrix.

Ygg: Dusky-yellow, coarse-grained, porphyroblastic granulite composed of perthite, plagioclase (perthite ≥ plagioclase), microcline, and quartz; accessory minerals are opaque minerals, ± garnet, biotite, and sphene; alteration minerals are sericite and epidote from plagioclase and uralite and chlorite probably from total alteration of pyroxene. Composition is defined by parallel-oriented elongated quartz-feldspar aggregates and elongated masses of dark minerals flattened in the plane of foliation; weathering rinds are pale yellowish orange.

Yfh — Flint Hill Gneiss

Light-gray to gray, medium- to coarse-grained, segregation-layered quartzofeldspathic biotite gneiss composed of quartz, plagioclase, microcline, green biotite, ilmenite, and titanite; accessory minerals include epidote, apatite, and zircon. Segregation layering defined by quartz-feldspar- and biotite-rich domains on the order of a few millimeters thick; migmatitic leucosomes of quartz and alkali feldspar cut segregation layering in places; veins of blue quartz common (Lukert and Nuckols, 1976).

Williams & Heintz Map Corporation