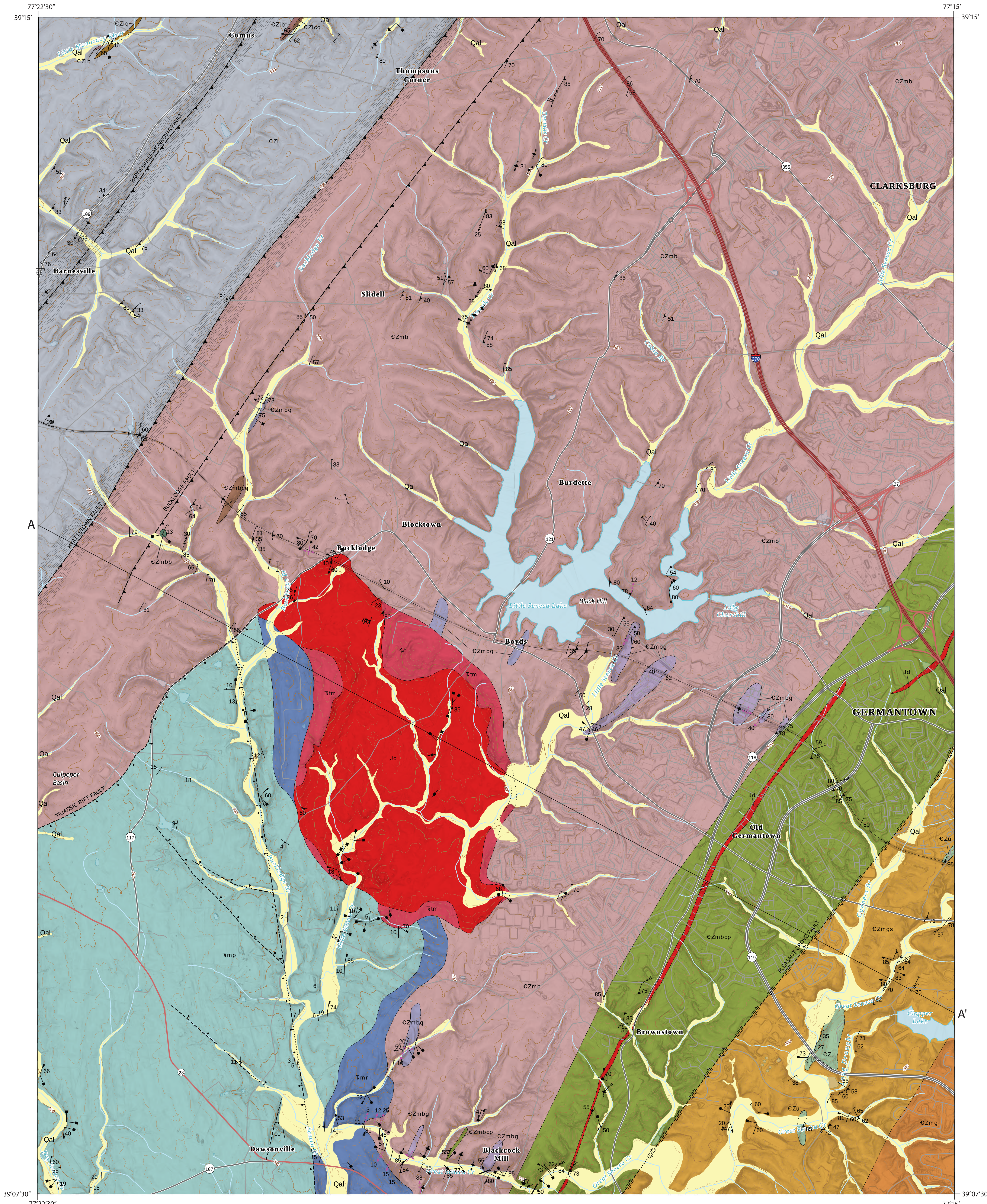


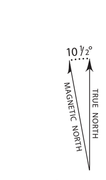
U.S. Geological Survey (USGS) US Topo 7.5-minute series
Coordinate System: NAD 1983 (2011) StatePlane Maryland FIPS 1900 (US Feet)
Projection: Lambert Conformal Conic
Horizontal Datum: North American Datum 1983 (2011) [NAD 1983 (2011)]
Vertical Datum: North American Vertical Datum 1988 (NAVD88)
Geographic coordinates (latitude-longitude) shown near corners

Geologic Map of the Germantown Quadrangle, Montgomery County, Maryland

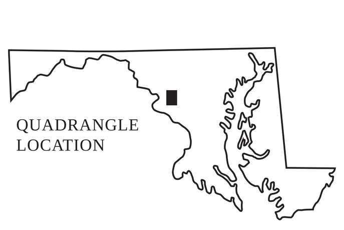
by

Rebecca Kavage Adams

2025



APPROXIMATE MEAN DECLINATION, 2024



QUADRANGLE LOCATION

1	2	3
4		5
6	7	8

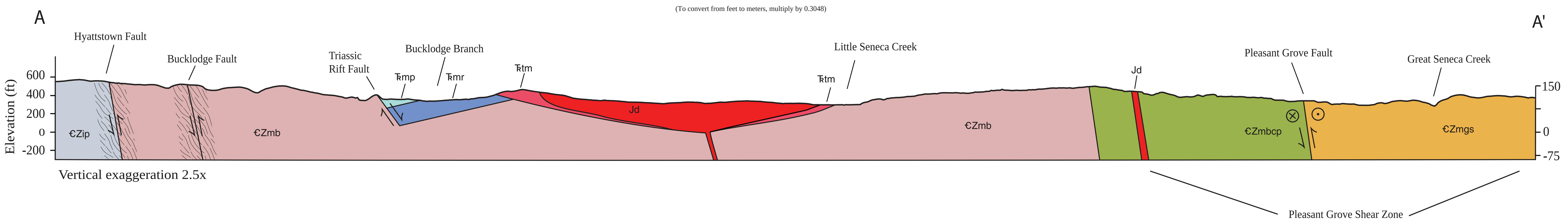
1. Buckeystown
2. Urbana
3. Damascus
4. Poolesville
5. Gaithersburg
6. Sterling
7. Seneca
8. Rockville

Adjoining 7.5' quadrangle names (Germantown quadrangle shaded)

SCALE 1:24 000

1 MILE — 1000 FEET — 1 KILOMETER

CONTOUR INTERVAL 20 FEET
(To convert from feet to meters, multiply by 0.3048)



Vertical exaggeration 2.5x

Pleasant Grove Shear Zone

Description of Map Units

Quaternary

Alluvium (Holocene)

Qal — Poorly- to well-sorted, stratified mixtures of unconsolidated clay, silt, sand, gravel, and cobbles underlying floodplains of nearly all rivers and tributaries. Channels of tributaries are commonly incised into bedrock with alluvium covering exposed along the banks. Thickness of alluvium is highly variable, and is a function of bedrock, topography, and land-use practices. Thick deposits of alluvium are present where eroded sediment, due to agricultural practices of the 19th century and recent suburban development, has accumulated (Southworth et al., 2008). Buildups of eroded sediment also occur above historic mill dams.

Jurassic

Diabase dikes and sheets (Early Jurassic)

Jd — Medium to dark gray, medium-grained, equigranular, massive diabase that weathers to characteristic rounded boulders with a rusty orange to brown surface. The Boyds sheet is saucer-shaped and fine-grained at the margin (Gottfried and Froelich, 1985). Linear dike southwest of Germantown is largely concealed by recent suburban development. Dikes are mapped on presence of rounded boulders and location on previous geologic maps (Cloos and Cooke, 1953 and Froelich, 1975).

Triassic

Thermally metamorphosed rocks (Triassic)

Ŧtm — Includes dusky blue to medium dark gray cordierite-spotted hornfels; grayish red meta-arkose, and pale pink to medium gray meta-conglomerate occuring as zoned contact aureole adjacent to diabase sill.

Manassas Sandstone (Triassic)

Predominantly gray, grayish red, and reddish brown, fine- to coarse-grained, thick-bedded, arkosic, micaceous sandstone and reddish brown siltstone, shale, and conglomerate. Two members are mapped on the Germantown Quadrangle.

Poolesville Member

Ŧmp — Gray, grayish red, and reddish brown, fine- to coarse-grained, thick-bedded, arkosic, micaceous sandstone. Crossbeds and conglomeratic channel lags are present. Interbedded with reddish brown, thin-bedded, calcareous siltstone in fining-upward fluvial sequences. Thickness in Germantown area is estimated at 1700 ft (520 m). Contact with the underlying Reston Member is gradational.

Reston Member

Ŧmr — Light gray to grayish red and grayish pink conglomerate containing well-rounded to subrounded clasts of phyllite, schist, quartzite, metagraywacke, and quartz in a poorly-sorted, coarse-grained, arkosic sandstone matrix. Locally interbedded with pale reddish brown sandstone and siltstone. Clast angularity increases where basal conglomerate unconformably overlies metasedimentary rocks of the Marburg Formation along Great Seneca Creek. Thickness varies from approximately 20 to 250 feet (7-75 m).

Lower Cambrian and/or Neoproterozoic

Ijamsville Phyllite (Lower Cambrian? and Neoproterozoic?)

Grayish purple to grayish blue phyllite with minor slate and bodies of metabasalt, quartzite, and conglomerate. Four lithologies are mapped on the Germantown Quadrangle.

Undifferentiated

ꞒZi — Grayish purple, grayish blue, and dark greenish gray phyllite containing white vein quartz and minor slate. Folded and sheared phyllonite with abundant folded micaceous quartz veins and epidote deposits is present near Barnesville-Monrovia Fault and Hyattstown Fault. Faults are mapped along NE-SW trending ridges on Route 109 and Peach Tree Ridge Road. Shear zone around faults is marked with wavy lines as shown in lower half of symbol.

Metabasalt

ꞒZib — Greenish gray to dark greenish gray, schistose metabasalt. A small body is mapped in the northwest corner of the quadrangle along the Little Monocacy River and another mapped north of Comus is based on float.

Quartzite

ꞒZiq — Yellowish gray to olive green, fine- to medium-grained, massive quartzite locally intervening between phyllite and metabasalt. One body is mapped in the northwest corner of the quadrangle.

Conglomeratic quartzite

ꞒZicq — Greenish gray, medium- to coarse-grained conglomerate with glassy quartz pebbles and medium light gray phyllite chips. One small body is mapped north of Comus and is based on float.

Marburg Formation (Lower Cambrian? and Neoproterozoic?)

Light to dark olive gray phyllite and metasiltstone with bodies of metagraywacke, metabasalt, quartzite, and chloritic phyllite. Six lithologies are mapped on the Germantown Quadrangle.

Undifferentiated

ꞒZmb — Dark greenish gray to light olive gray, phyllitic metasiltstone containing thin, light gray, quartz laminae and ribbons; medium purplish gray to very pale orange, muscovite phyllite similar to that of the Ijamsville Phyllite with occasional siderite pseudomorphs after pyrite. Much of the unit is transposed, phyllonitized, and has abundant pods of white vein quartz with deposits of chlorite and epidote. Shear zone around fault is marked with wavy lines as shown in lower half of symbol.

Quartzite

ꞒZmbq — Light to medium bluish gray and light olive gray, coarse-grained, blocky to massive quartzite. Mapped south of Little Seneca Lake and along Bucklodge Branch.

Metagraywacke

ꞒZmbg — Grayish green to black, schistose, blocky-weathering metagraywacke interbedded with dark gray phyllite. Mapped south of Little Seneca Lake and along Great Seneca Creek.

Chlorite phyllonite

ꞒZmbcp — Greenish gray, chlorite-sericite phyllite containing white vein quartz. Highly folded and sheared with abundant deformed quartz veins. It is mapped north of Great Seneca Creek on the western border of the Pleasant Grove Fault.

Metabasalt

ꞒZmbb — Grayish-green, aphanitic metabasalt. One small body mapped along a tributary to Bucklodge Branch.

Conglomeratic quartzite

ꞒZmbcq — Glassy, subangular, quartz pebbles, yellowish gray shale chips, and occasional euhedral magnetite grains (5 cm) in greenish gray matrix. Weathers moderate yellowish brown, blocky to massive.

Mather Gorge Formation (Lower Cambrian? and Neoproterozoic?)

Olive green to dark greenish gray schist and metagraywacke with bodies of metagabbro and serpentinite. Three lithologies are mapped on the Germantown Quadrangle.

Undifferentiated

ꞒZmg — Quartz-mica schist and quartzitic metagraywacke interbedded in layers and lenses on a millimeter to meter scale. Quartz-muscovite-chlorite-plagioclase-epidote-magnetite garnet schist is fine-grained, lustrous greenish gray to gray. Metagraywacke is light to dark olive gray, fine- to medium-grained, with quartz pebbles and graded bedding occasionally visible. Stringers and pods of isoclinally folded and boudinaged white quartz veins are abundant.

Sheared

ꞒZmgs — Interbedded quartz-mica schist and quartzitic metagraywacke with penetrative S-C metamorphic fabric, formed by the intersection of the dominant foliation (S) and the shear plane (C) near the Pleasant Grove Fault (Krol and Muller, 1995; Muller, 1994). Mapped on distinct appearance of rotated foliation; lithologically is similar to CZmg.

Ultramafic Rocks

ꞒZu — Undifferentiated serpentine, magnesian schist, and metagabbro that occur within rocks of the Mather Gorge Formation. Grayish green to black, fine- to medium-grained serpentinite weathers to a rounded, soft, light gray surface. Very light gray to dark greenish gray actinolite-tremolite-chlorite schist often contains euhedral bladed crystals from 0.1 to 0.4 inch (3 mm to 1cm) in length. 0.1 to 0.2 inch (3 to 5 mm) euhedral magnetite grains occur in abundance within the serpentinite and magnesian schist. Very light gray and dark gray to black, medium- to coarse-grained metagabbro is comprised of plagioclase feldspar, hornblende, epidote, can have a speckled appearance, and weathers blocky.

Explanation of Map Symbols

A — A' Cross section line

Contacts

Geologic contacts; approximately located, dotted where concealed

Faults

Strike-slip fault, location approximate. Arrows show dextral motion. Dotted where concealed.

Thrust fault, location approximate. Sawteeth on upper (tectonically higher) plate. Dotted where concealed.

Normal fault, location approximate. Ball and bar on downthrown block. Dotted where concealed.

20 Small, minor fault, showing strike and dip of fault plane

Shear zone (overlay on map units)

Strike-slip movement toward viewer

Strike-slip movement away from viewer

Folds

Small, horizontal anticline; showing strike

29 Small, plunging anticline, showing strike and plunge

57 Small, plunging syncline, showing strike and plunge

16 Small, inclined folds, showing strike and plunge

Other Features

Quarry or mine, inactive

Planar Features

	Planar Features	Multiple measurements at a single locality
42	Inclined bedding; showing strike and dip	20
75	Inclined joint; showing strike and dip	84
	Vertical or near-vertical joint; showing strike	
12	Inclined cleavage, showing strike and dip	12
	Vertical cleavage, showing strike	
4	Inclined foliation, showing strike and dip	4
	Vertical foliation, showing strike	
24	Inclined phyllonitic foliation, showing strike and dip	
	Vertical phyllonitic foliation, showing strike	
49	Inclined schistosity, showing strike and dip	49
	Vertical schistosity, showing strike	
21	Inclined shear band cleavage, right hand sense of shear, showing strike and dip	21
	Vertical, shear band cleavage, right hand sense of shear, showing strike	

Linear Features

67 Inclined lineation at intersection of bedding and cleavage, showing bearing and plunge

8 Inclined aligned deformed mineral lineation, showing bearing and plunge

11 Inclined lineation at intersection of two cleavages, showing bearing and plunge

Base Map Symbols

Transportation

Primary highway, divided by median strip

Primary route, class 1 (divided, lanes separated)

Primary route, class 1 (undivided)

Secondary route, class 2

Light duty road or street, class 3

Railroad

Topography

300 Topographic index contour (100-ft interval)

Topographic intermediate contour (20-ft interval)

Hydrography

Muddy Creek Stream

Deep Lake Water body (e.g. lakes, ponds, rivers)

Version: GERMA2025.1

References:

Cloos, E., and Cooke, C.W., 1953, Geologic map of Montgomery County (Maryland) and the District of Columbia: Maryland Department of Geology, Mines and Water Resources, scale 1:62,500.

Drake, A.A., Southworth, S., and Lee, K.Y., 1999, Geologic map of the Seneca quadrangle, Montgomery County, Maryland, and Fairfax and Loudoun Counties, Virginia: U.S. Geological Survey Geologic Quadrangle Map GQ-1802, scale 1:24,000.

Froelich, A.J., 1975, Map showing mineral resources of Montgomery County, Maryland: U.S. Geological Survey Miscellaneous Investigations Series, Map I-920-E, scale 1:62,500.

Gottfried, D., and Froelich, A.J., 1985, Geochemical and petrologic features of some Mesozoic diabase sheets in the Northern Culpeper Basin, in Robinson, G.R., Jr., and Froelich, A.J., eds., Proceedings of the Second U.S. Geological Survey Workshop on the early Mesozoic basins of the eastern United States, U.S. Geological Survey Circular 946, Reston, VA, November 14-16, 1984, p. 86-91.

Krol, M.A., and Muller, P.D., 1995, Microstructural evidence for dextral shearing within the Pleasant Grove Zone, Maryland: Northeastern Geology and Environmental Sciences, v. 17, no. 2, p. 151-161.

Muller, P.D., 1994, Geologic map of the Finksburg Quadrangle, Carroll and Baltimore Counties: Maryland Geological Survey, scale 1:24,000.

Smoot, J.P., and Robinson, G.R. Jr., 1988, Base- and precious-metal occurrences in the Culpeper Basin, Northern Virginia, in Froelich, A.J., and Robinson, G.R., Jr., eds., Studies of the early Mesozoic basins of the eastern United States: U.S. Geological Survey Bulletin, Geology of the early Mesozoic basins of eastern North America, Reston, VA, May 11-14, 1987, 1776, p. 31-39.

Southworth, S., 1998, Geologic map of the Poolesville quadrangle, Frederick and Montgomery Counties, Maryland, and Loudoun County, Virginia: U.S. Geological Survey Geologic Quadrangle Map GQ-1761, scale 1:24,000.

Southworth, S., 1999, Geologic map of the Urbana quadrangle, Frederick and Montgomery Counties, Maryland: U.S. Geological Survey Geologic Quadrangle Map GQ-1768, scale 1:24,000.

Southworth, S., Brezinski, D.K., Drake, A.A., Burton, W.C., Orndorff, R.C., Froelich, A.J., Reddy, J.E., Denenny, Danielle, and Daniels, D.L., 2008, Geologic map of the Frederick 30' x 60' quadrangle, Maryland, Virginia, and West Virginia: U.S. Geological Survey Scientific Investigations Map SIM-2889, scale: 1:100,000.

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