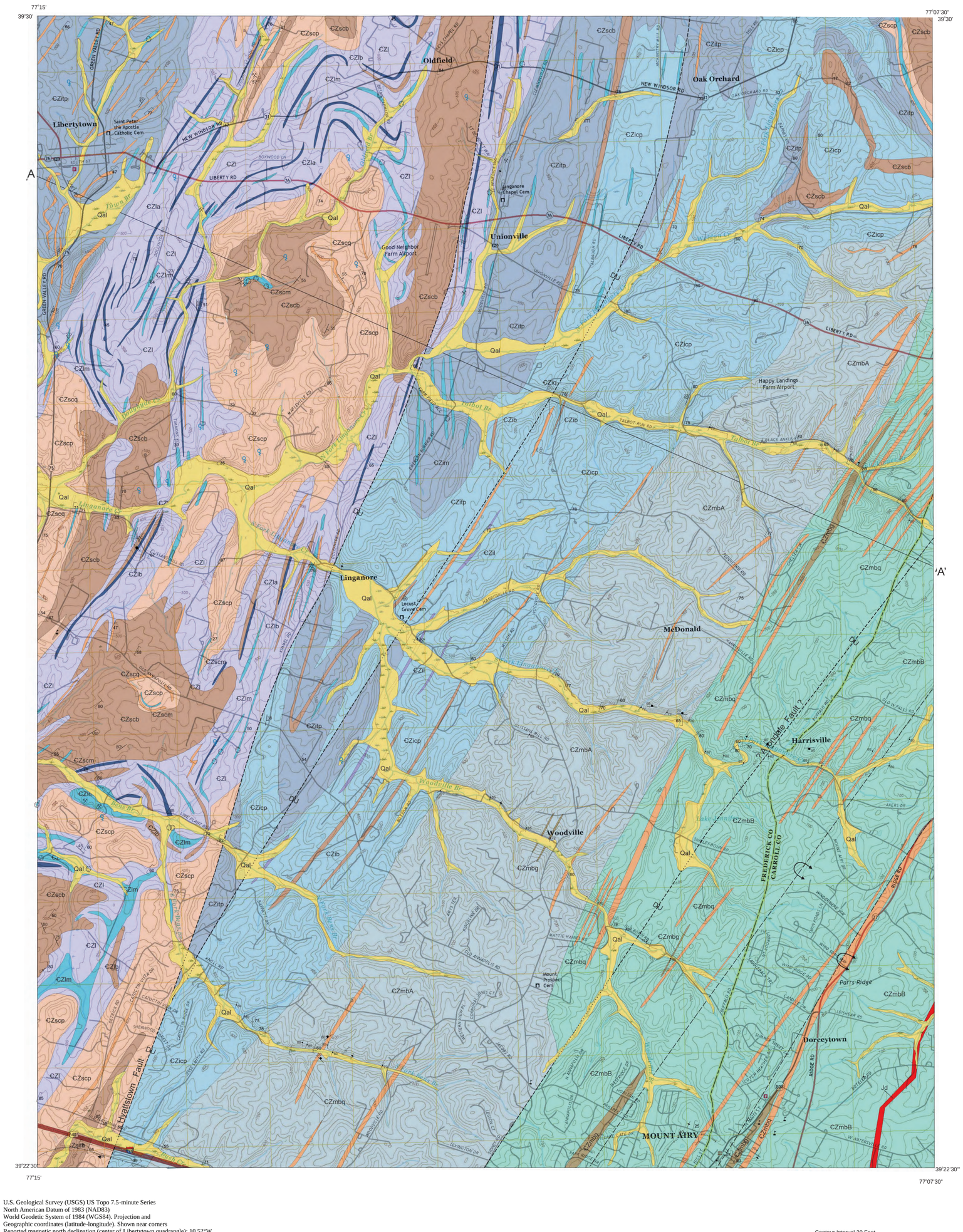
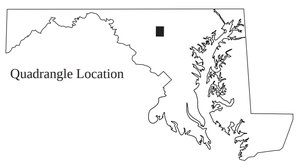


U.S. Geological Survey (USGS) US Topo 7.5-minute Series
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and
Geographic coordinates (latitude-longitude). Shown near corners
Reported magnetic north declination (center of Libertytown quadrangle): 10.52°W
To determine current magnetic declination see: (http://www.ngdc.noaa.gov/geomag/declination.shtml)

Contour Interval 20 Feet
National Geodetic Vertical Datum of 1988
(To convert from feet to meters, multiply by 0.3048)

Geologic Map of the Libertytown Quadrangle, Frederick and Carroll Counties, Maryland

By
David K. Brezinski and Rebecca Kavage Adams
2023



UTM GRID AND 2014 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

Adjoining 7.5-minute quadrangles
(Libertytown quadrangle shaded)

1	2	3	1 Woodsboro 2 Union Bridge 3 New Windsor 4 Walkersville 5 Winfield 6 Urbana 7 Damascus 8 Woodbine
4		5	
6	7	8	

Scale 1:24 000

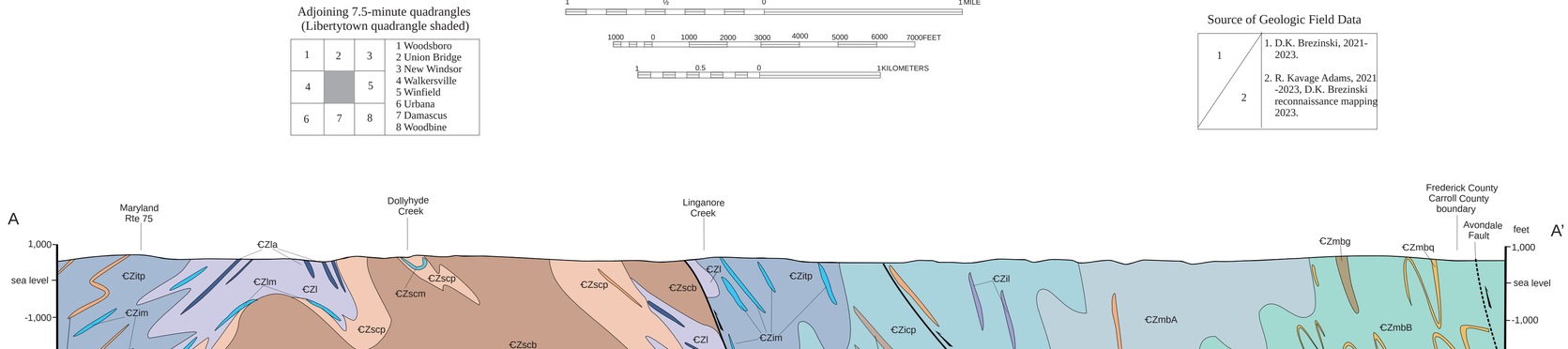
1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETERS

Source of Geologic Field Data

1	1. D.K. Brezinski, 2021-2023.
2	2. R. Kavage Adams, 2021-2023, D.K. Brezinski reconnaissance mapping 2023.



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Governor

Aruna Miller
Lieutenant Governor

DEPARTMENT OF NATURAL RESOURCES
Josh Kurtz
Secretary

MARYLAND GEOLOGICAL SURVEY
Stephen Van Ryswick
Director

DEPARTMENT OF NATURAL RESOURCES
Publication No. DNR 12-120823-1

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Geologic field mapping conducted 2021-2023.

Version: LIBRT2023.OF
Released December 2023

DESCRIPTION OF MAP UNITS

Quaternary

Qal

Alluvium
Grayish brown, light brown to reddish tan, poorly sorted, coarse to fine sand, silt, and clay with localized lenses of subrounded vein-quartz cobbles. Locally, chips and angular cobbles of local bedrock are included. Thickness of this material ranges from a thin veneer up to 10 feet (3 meters). In smaller tributary streams alluvium has not been shown but is present as a thin veneer overlying bedrock or saprolite channels.

Jurassic

Jd

Jurassic Diabase
Massive, medium to dark-gray, fine- to medium-grained diabase, weathering orange-brown. Occurs in dikes marked by linear trends of large, rounded, residual diabase boulders in the soil and at the surface. A dike mapped in the southeastern corner of the quadrangle is mapped as continuous but may be a linear dike swarm. The age of the dikes in central Maryland and northern Virginia is early Jurassic (Kunk and others, 1992).

Late Proterozoic to Cambrian

CZlb CZlb / CZl / CZla CZlm

Libertytown Formation
Heterolithic interval of dark gray, purplish gray, and black, tuffaceous, fragmental, lapilli-rich, amygdaloidal phyllite, interlayered with thin intervals of dark gray andesite, reddish gray rhyolite, white to tan marble, and greenish gray basalt. Meta-andesite layers (CZla) are thin (20 to 100 feet) and discontinuous, medium to dark gray in color, flow-banded, chill-brecciated, commonly contain feldspar-filled orbicules, and can be interlayered with green-gray, lapilli-rich basalt (CZlb). Marble layers (CZlm) consist of white to purple, brecciated marble and tan, brecciated, dolomitic marble layers and lenses that are generally laterally discontinuous. Thickness of individual limestone and marble layers is estimated at 20 feet to 100 feet. The Libertytown Formation as used here is considered equivalent to the aggregate of lithologies mapped as metarhyolite and meta-andesite as well as the surrounding Ijamsville Phyllite of Jonas and Stose (1938b), and the Libertytown Metarhyolite of Jonas and Stose (1946). The thickness of the formation is indeterminable owing to poorness of exposure and tectonic deformation but may be up to several thousand feet thick.

Sams Creek Formation
The Sams Creek Formation is mapped as an extensive area of greenish gray to grayish green volcanic and volcaniclastic rocks. The two subdivisions recognized in the Libertytown Quadrangle are assessed to be equivalent to the greenstone (scgs) and chlorite phyllite (sccp) units of Fisher (1978) in the New Windsor Quadrangle, and the Sams Creek basalt (scb) and Sams Creek phyllite (scp) of Edwards (1986) in the Union Bridge Quadrangle.

CZscb

Metabasalt
Banded, thick-bedded, and massive, medium to dark greenish gray, locally medium bluish gray, metabasalt. Basalt intervals may be partially replaced by epidote and contain layers of vesicles and flattened lapilli. Some beds are sheared and schistose, contain dark purple to black phyllite, and are brecciated. Locally, metabasalt contains plagioclase phenocrysts up to 3/8 inch (1 cm) long.

CZscm / CZscp / CZscq

Tuffaceous chlorite phyllite
Light greenish gray to light gray, locally variegated, dull to lustrous, tuffaceous phyllite with interbedded lenses and layers of dark green, sheared phyllitic metabasalt. Greenish gray phyllite is locally interbedded with purplish gray phyllite that is composed of sericite and muscovite with small amounts of magnetite and hematite and may contain many thin calcite laminae or clasts. These greenish gray phyllites also contain scattered vesicles, flattened lapilli, and calcite-filled amygdules. Mappable within this unit are localized tuffaceous sandstone (CZscq) and thin, brecciated, white to purple marble (CZscm). Unit is deformed and cleavage and small-scale folds preclude estimation of depositional thickness.

Ijamsville Formation
Formation is composed of a diverse assemblage of lithologies dominated by purple, bluish gray, greenish gray, variegated, silvery, granular to fragmental, locally vesicular phyllite. Silty, banded, tuffaceous phyllite, discontinuous tuffaceous sandstone (CZiq), white to tan, brecciated marble (CZim), and green gray, vesicular metabasalt (CZib) intervals are present. Several interlayered units of phyllite were mapped.

CZiq / CZitp / CZim / CZib

Tuffaceous phyllite
Dark gray to grayish red, reddish purple, and bluish gray, variegated, silty, granular, fragmental tuffaceous phyllite locally containing light gray lapilli streaks and blebs. Intermixed with intervals of greenish gray to gray, tan-weathering, tuffaceous phyllite and silty tuffaceous phyllite. Locally, light gray, discontinuous, tuffaceous sandstone (CZiq), basalts (CZib), and brecciated marble (CZim) can be mapped. Corresponds to parts of the Urbana Formation of Edwards (1986), tuffaceous phyllite of Brezinski et al. (2004), and Ijamsville Phyllite of Reger and Edwards (2006). Due to deformation and inconsistent bedding indicators, thickness is undeterminable.

CZiq / CZicp / CZim / CZil / CZib

Chlorite phyllite
Light greenish gray to grayish green, locally silvery and tan phyllite. The micas and chlorite are typically segregated into prominent pinstripe laminations spaced 0.4 to 1.2 inches (1 to 3 cm)apart and subparallel to cleavage. Crops out extensively and tends to form low ridges capped by a thin, sandy soil. Contains rare and localized dark gray, ribbony limestone beds (CZicpl) interpreted to be equivalent to the Silver Run Limestone of Edwards (1986). Unit corresponds to the Ijamsville mica-chlorite-quartz phyllite (ijqp) of Fisher (1978) that crops out west of the Avondale Fault and to parts of the Gillis Formation (gf) of Edwards (1986).

Marburg Formation
Predominately greenish gray, silvery gray, silty, sandy phyllite. Locally, intervals of dark grayish blue to purple phyllite, exhibiting pinstriped foliation, occur and are folded with light gray, quartz-rich layers. These intervals are similar to CZitp, but lack visible fragments of lapilli and compositional banding. Minute (>0.01mm) disseminated flakes of hematite and pyrite are abundant. Two major phyllite units are mapped (CZmbA and CZmbB). Formation contains localized layers of quartzite to quartz-rich sandstone (CZmbq) that vary from light to medium olive-gray, are medium- to coarse-grained, and can be foliated, blocky, or massive. Massive intervals are up to 3 feet thick and comprised of subrounded quartz grains in a foliated, fine-grained, recrystallized quartz and mica matrix. Coarse grains of quartz appear bluish in hand sample and euhedral limonite pseudomorphs after pyrite are occasionally present. Mappable bodies of metagraywacke (CZmbg) were also identified. These consist of dark grayish green, foliated graywacke comprised of very fine- to fine-grained quartz and plagioclase grains in a chlorite-rich matrix. The largest of these bodies occurs west of Mount Airy. In this location, dark green layers of graywacke are divided by mm-thick, parallel bands of muscovite and chlorite, forming a crenulation cleavage that indicates compressional folding. Most of the dark gray phyllite and light greenish metasiltstone corresponds to the Wissahickon (wap) of Fisher (1978). Most of the remainder of this formation is equivalent to CZmbs of Southworth et al. (2007).

CZmbq / CZmbA / CZmbg

Silvery muscovite phyllite
Silvery light gray, lustrous, tan-weathering, muscovite-chlorite phyllite. Coarsens gradationally to the east (toward CZmbB) with corresponding decrease in luster. This phyllite is not well-exposed and is preserved primarily as weathered chips in the clay residuum. This unit corresponds to most of the Gillis Group of Edwards (1994) and Gillis Formation of Edwards (2012), muscovite phyllite in the Sams Creek Formation of Reger and others (2004), and the muscovite phyllite (ijmp) in the Ijamsville Formation of Fisher (1978).

CZmbg / CZmbB / CZmbq

Sandy chlorite phyllite
Medium to dark greenish gray, sandy and silty, quartz-paragonite-muscovite-chlorite phyllite interlayered with metasiltstone. Chloritic laminae commonly alternate with mica-albite-quartz layers. Much of the apparent layering is clearly metamorphic cleavage, but some may be relict bedding. Corresponds to Ijamsville phyllite lenses within the Marburg Phyllite of Edwards (1986), the Ijamsville chlorite phyllite (ijcp) of Fisher (1978) that crops out west of the Avondale Fault in the New Windsor Quadrangle, and Sams Creek chlorite phyllite "b" of Reger and others (2004).

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Explanation of Map Symbols

A' Cross section line
A

Contacts
- Geologic contacts; definite or approximate, dotted where concealed

Faults and Folds
- Fault; approximately located. D refers U-D refers to relative up-thrown and down-thrown sides
- Anticlinal axis for overturned fold

Planar Features
- Inclined bedding, strike and degree of dip shown
- Inclined cleavage
- Vertical cleavage
- Inclined shear cleavage with sinistral shear
- Inclined shear cleavage with dextral shear
- Vertical shear cleavage with sinistral shear
- Inclined penetrative foliation
- Vertical foliation
- Inclined joint, strike and degree of dip shown
- Vertical joint, strike shown

Miscellaneous Features
- Quarry/mine
- Depression/sinkhole

Topography
- Topographic index contour (100- ft interval)
- Topographic intermediate contour (20-ft interval)

Transportation
- Primary route, class 1 (divided lanes)
- Number route, class 1 (undivided)
- Light duty road or street, class 3
- Railroad

Hydrography
- Stream
- Spring
- Water body (eg. lakes, ponds, rivers)