

EXPLANATION OF MAP UNITS

I. SEDIMENTARY ROCKS AND THEIR METAMORPHIC EQUIVALENTS

- Carbonate-rich rocks (acid neutralizing and soluble, form thin alkaline clay soils)
 - 11: limestone, dolomite, limestone-pebble conglomerate; includes calcareous mudstones
 - 12: marble and some calc-silicate rock
- Siliclastic sedimentary rocks (moderately acid-neutralizing (s) to reducing-acidic (s), bedded and permeable, form neutral to slightly acid soils)
 - 21: tan and red mudstone; includes some sandstone
 - 21c: calcareous, locally sulfidic, gray mudstone
 - 22: sandstone and interbedded sandstone and conglomerate; minor carbonate cement may contain mudstone
 - 23c: carbonaceous, graphitic, or sulfidic slate and shale
 - 24c: coal beds and zones containing abundant coal beds
- Metamorphosed clastic sedimentary rocks; includes some metagraywacke layers (moderately acid-neutralizing (s) to acidic (s), recrystallized and foliated, forms neutral to slightly acid soils)
 - 31c: graphitic and sulfidic slate; includes some metagraywacke
 - 32: pelitic schist and phyllite; locally quartzofeldspathic
 - 32c: sulfidic schist and minor quartzofeldspathic schist
 - 32c: calcareous schist and gneiss
 - 33: metasedimentary, quartz, quartz-granulite, and gneiss; locally schistose
 - 34: coarse-grained felsic gneiss locally contains schist and amphibolite; typically embayed in granitic composition (silt and sh)

II. IGNEOUS ROCKS AND THEIR METAMORPHIC EQUIVALENTS

- Mafic igneous rocks and their metamorphic equivalents (moderately acid-neutralizing, massive, has interlocking grains, forms smectitic clay soils)
 - 41c: gneissose, gneiss-schist facies metabasalt, schistose metamorphosed mafic rocks with dispersed carbonate
 - 41: hornblende-plagioclase amphibolite
 - 42: mafic volcanic rocks mixed with lesser felsic volcanics and mafic-clastic rocks; metamorphic, schist-matrix melange
 - 43: massive, mafic plutonic rocks; includes diorite, gabbro, monzonite, diabase, and basalt
- Ultramafic rocks
 - 50c: metamorphosed ultramafic rocks; includes ultramafic melanges, serpentinite, tremolite-talc schist; includes minor carbonate soils
- Felsic igneous rocks and their metamorphic equivalents (forms neutral to moderately acidic, sandy soils)
 - 61: granitoid plutonic rocks; includes granite, quartz monzonite, granodiorite, rhyolite, monzonite, and equigranular gneiss
 - 61c: fine-grained felsic rocks (volcanic and shallow plutonic); cryptocrystalline to very fine-grained
 - 62: quartz-poor plutonic rocks; includes syenite, quartz-syenite, nepheline syenite, and monzonite

III. UNCONSOLIDATED SEDIMENTS (primary porosity is high)

- 73: mud and clay (>15% clay and silt size particles)
- 74: quartz silt, sand, and gravel; weathered residuum from which iron and carbonate have been removed
- 75: organic-rich deposits, including peat
- 76: mixtures of 73, 74, 75
- Iron-rich sediment
 - 77: green sand, silt in places; magnetite and ferromanganese beach sand; bog iron ore

CARBON-RICH SOILS (From U.S. Department of Agriculture, 1994)

- 11,000 - 17,199 g/acre meter total soil carbon
- > 17,199 g/acre meter total soil carbon

MINERAL DEPOSIT (From USGS, National Mineral Resource Database)

- sulfide deposit

Base for Maryland from the Army Map Service Sheets, 1:250,000, 1967. Geology for Maryland from Cleaves and others, 1968.

Base and geology for Virginia from the Virginia Division of Mineral Resources, 1993, Geologic Map of Virginia: Virginia Division of Mineral Resources, scale 1:500,000.

County boundaries from the Chesapeake Bay Program GIS Datasets at <http://www.chesapeakebay.net/data/index.htm>.

This plate was created from digital geologic information for Maryland and Virginia using Adobe Illustrator version 8.0. The database was digitally compiled in ABIGAS and ARC/INFO version 8.0.2.

Digitized by Reddy¹, Brennan Snyder¹, P.J. Olsen¹, and John Teeter¹, 1999.

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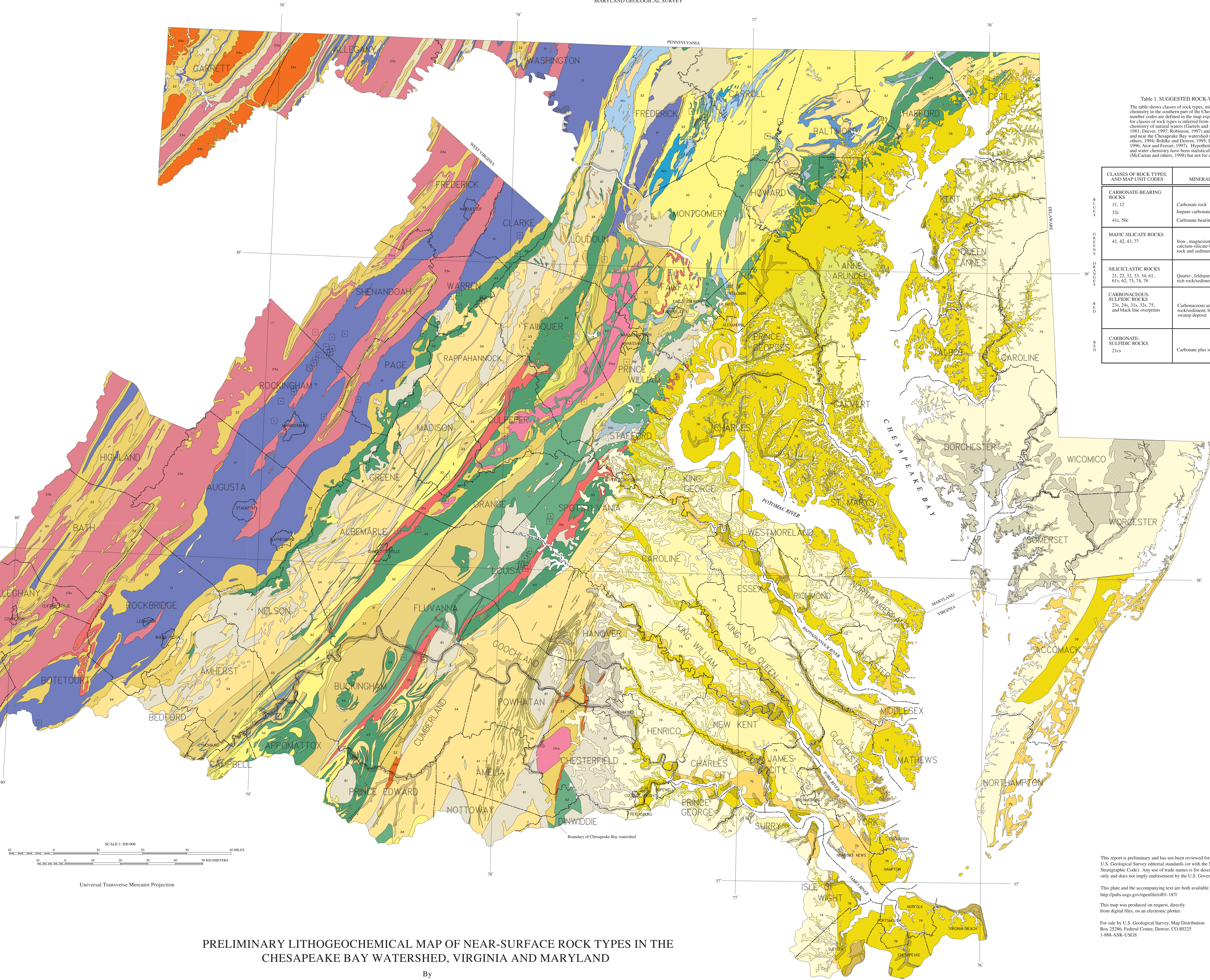


Table 1. SUGGESTED ROCK-WATER RELATIONSHIPS
The table shows classes of rock types, mineralogy, and suggested water chemistry in the southern part of the Chesapeake Bay watershed. Rock-type number codes are defined in the map explanation. Suggested water chemistry for classes of rock types is inferred from the general literature on the geochemistry of natural waters (Gardner and Mackenzie, 1971; Stamm and Morgan, 1981; Dever, 1997; Robinson, 1997) and from local and regional studies in and near the Chesapeake Bay watershed (Bricker and Rice, 1989; Webb and others, 1994; Bohle and Denver, 1995; Langland and others, 1995; Senior, 1996; Ater and Ferrati, 1997). Hypothetical relationships between rock types and water chemistry have been statistically tested for most rock-type classes (McCartan and others, 1998) but not for each map unit.

| CLASSES OF ROCK TYPES, AND MAP UNIT CODES | MINERALOGY | SUGGESTED WATER CHEMISTRY |
|--|--|---|
| CARBONATE-BEARING ROCKS 11, 12 32c 41c, 50c | Carbonate rock Impure carbonate rock/sediment Carbonate-bearing mafic rock | Alkaline; abundant calcium; well-oxygenated, high nitrate with agricultural landuse |
| MAFIC SILICATE ROCKS 41, 42, 43, 77 | Iron-, magnesium-, and/or calcium-silicate-bearing mafic rock and sediment | Neutral to slightly acid; well-oxygenated; may be sulfidic to reducing in places |
| SILICICLASTIC ROCKS 21, 22, 32, 33, 34, 61, 61c, 62, 73, 74, 76 | Quartz-, feldspar-, and clay-rich rock/sediment | Low acid-neutralizing capacity; well-oxygenated |
| CARBONACEOUS-SULFIDIC ROCKS 23c, 24c, 31c, 32c, 75, and black line overprints | Carbonaceous and/or sulfidic rock/sediment; bog, marsh, swamp deposit | Reducing; acidic to neutral; anoxic; abundant dissolved organic carbon; iron, low or no nitrate |
| CARBONATE-SULFIDIC ROCKS 21c | Carbonate plus sulfide | Possibly neutral to alkaline; reducing; low nitrate; not tested |

PRELIMINARY LITHOGEOCHEMICAL MAP OF NEAR-SURFACE ROCK TYPES IN THE CHESAPEAKE BAY WATERSHED, VIRGINIA AND MARYLAND

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2001

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards (or with the North American Stratigraphic Code). Any use of trade names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

This plate and the accompanying text are both available from: <http://pubs.usgs.gov/of/01/of01-187/>

This map was produced on request, directly from digital files, on an electronic plotter.

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