Table 1.—*Selected properties of rock units in the Culpeper basin and vicinity, Virginia and Maryland*

[Based in part on, and modified from, U.S. Geological Survey, 1967; Lee, 1979, 1980; Lindholm, 1979; Drake and Froelich, 1977; Drake and others, 1979; and Froelich, 1975]

LITHOLOGIC CHARACTERISTICS			ENGINEERING CONSIDERATIONS							
			PHYSICAL PROPERTIES[2]				EVALUATION OF ROCK FOR CONSTRUCTION[3]			REMARKS[1,9]
PRINCIPAL ROCK TYPES AND MAP SYMBOLS[1]	RESIDUUM (OVERBURDEN)	STRUCTURE AND PLANAR ELEMENTS (SPLITTABILITY)	Maximum Dry Density (Kg/m³)	Relative Drillability[4]	Unconfined Compressive Strength[5]	Young's Modulus of Elasticity[6]	Surface Excavatability[7]	Overbreak[8]	General Characteristics	
SILTSTONE S1 (Micaceous, feldspathic siltstone with minor sandstone and shale)	Very thin to moderately deep soil or weathered rock, commonly 0 to 10 m, rarely to 15 m; average 3 m.	Thin- to medium-bedded (0.1 cm to 1 m) siltstone yields platy to slabby fragments where intensely jointed. Joints vertical to sub-vertical commonly 1 cm to 10 cm apart, some in through-going intersecting sets.	2100–2490	6–7	Very low to medium	Very low to low	Easy to moderate, may require blasting.	Moderate to very large, depending on joint spacing and inclination of dipping beds to tunnel orientation.	Shales may slake rapidly on exposure to air and may break readily along bedding planes, yielding small flakes. May break down in fills even where compacted. Below limit of surface leaching (≤6 m), may be calcareous, with carbonate as cement, in veinlets, or in vugs.	Cement is commonly highly calcareous. Color dominantly red-brown, although green or gray beds are common. Unit corresponds to the Balls Bluff Siltstone (TRbb) of Lee (1977), the Bull Run Formation of Lindholm (1979), or the Bull Run Shales of Roberts (1928).
SANDSTONE S2 (Micaceous, arkosic sandstone with minor siltstone, shale, and conglomerate)	Very thin to moderately deep soil or weathered rock, commonly 0 to 6 m, average 3 m.	Thin- to thick-bedded (1.0 cm to 5 m); fine- to coarse-grained arkosic sandstone has interlocking grains; planar to cross-laminated; interbedded with 3 to 30 cm beds of siltstone, shale, or conglomerate. Vertical to sub-vertical joints commonly 10 cm to 1 m apart, in sets.	2340–2475	4–6	Medium to high	Low	Moderate, may require blasting.	Slight to moderate, depending on joint spacing and inclination of dipping beds to tunnel orientation.	Conglomerate and shale may ravel on exposure to air. Unit is locally porous and may contain large amounts of water, particularly in voids, joints, and along bedding plane partings.	Cement is commonly calcareous, but may be iron oxide or silica. Color dominantly red brown to purple, although yellow-brown to gray is common. Clay matrix common. In the east, unit corresponds to Poolesville Member of the Manassas Formation (TRmp) of Lee (1979), Manassas Sandstone of Lindholm (1979) and the Manassas Sandstone of Roberts (1928); in the west, unit corresponds to part of the Catharpin Creek Member of the Bull Run Formation (JTRbc) of Lee (1979) and the Buckland and Waterfall Formations of Lindholm (1979).
QUARTZ CONGLOMERATE S3 (Quartz and schist conglomerate with minor quartzite and basalt clasts, and sandstone, siltstone, or shale)	Very thin to very thick soil or weathered rock, commonly 0 to 30 m, average 15 m. Conglomerate disaggregated and saprolitized; surface lag boulder gravel common.	Thick-bedded to massive (1 m to >5 m); may contain lenses of sandstone, siltstone, or shale. Vertical to sub-vertical joints commonly 10 cm to 3 m apart.	2325–2520	4–6	Low to high	Low	Easy to moderate, may require blasting.	Moderate to large, depending on inclination of dipping beds and degree of induration.	Conglomerate and shale may ravel on exposure to air. Unit is locally leached to 3–5 m, producing friable gravel and coarse-grained sand.	Conglomerate shows considerable variation in principal clast lithology: dominantly subrounded quartz and schist pebbles in the eastern part of the basin; dominantly greenstone, basalt, limestone, phyllite, and subrounded quartzite in the western part of the basin. Matrix varies from clay to sand. In the eastern part of the basin, unit corresponds to the Reston Member of the Manassas Formation (TRmre) of Lee (1979), the Reston Formation of Lindholm (1979), and the Border Conglomerate of Roberts (1928); in the west, to the Goose Creek Conglomerate Member of the Bull Run Formation and the Waterfall Formation of Lindholm (1979), and part of the Catharpin Creek Member of the Bull Run Formation (JTRbc) of Lee (1979).
LIMESTONE CONGLOMERATE S4 (Limestone and dolomite conglomerate with minor sandstone and siltstone)	Very thin to moderately deep soil or weathered rock, commonly 0 to 10 m, average 3 m.	Thick-bedded to massive (1 m to >5 m), commonly intertonguing with, or containing thin lenses of thin (1 cm to 50 cm) beds of calcareous sandstone, siltstone, and shale. Vertical to sub-vertical joints commonly 1 m to 3 m apart. Calcite veins abundant.	2325–2520	4–6	Low to high	Low	Moderate to difficult, may require blasting.	Moderate to very large depending on amount of interbedded siltstone and sandstone, inclination of dipping beds, and degree of solution along joints and fractures.	Conglomerate and shale may ravel on exposure to air. Subsurface solution may provide good ground-water sources but may result in local subsidence. Typically forms knobs and ridges where exposed at the surface. Small to large sink holes and solution along joints are common.	Clasts dominantly subrounded to angular limestone and dolomite. Matrix variable, may be siltstone, sandstone, or calcite, with calcite the cementing agent. Unit corresponds to the Leesburg Limestone Conglomerate Member (JTRbl) of the Bull Run Formation and the Tuscarora Creek Member (TRmtc) of the Manassas Formation of Lee (1977, 1979) and the Leesburg Limestone Conglomerate Member of the Bull Run Formation of Lindholm (1979).
BASALT B (Extrusive lava flows)	Thin soil and saprolite, 0 to 6 m, average 3 m, with spheroidally weathered cobbles in soil.	Flow units intercalated with stratified sedimentary rocks. Flows commonly 1 to 10 m or more thick. Cooling and columnar-curved jointing variable, 3–10 cm apart. Mineralization common along joints.	2625–2835	1–4	Medium to very high	High	Easy (when weathered and intensely jointed), to difficult, requiring blasting (when fresh and massive).	Slight to moderate depending on degree of jointing.	Rock locally in high state of stress (shown by spalling rock in quarries). Fresh rock is very durable and is excellent for use as crushed stone. Locally may have large volume of water at base of flows and small areas of swelling ground.	Color gray, green, or black. Plagioclase feldspar and pyroxene form a tightly interlocking mosaic; crystal size <1 mm. Locally vesicular, or amygdaloidal with calcite and zeolites. Unit corresponds to Mount Zion Church Basalt (JTRbcm), Hickory Grove Basalt (JTRbch), and Sander Basalt (JTRbcs) of the Catharpin Creek Member of the Bull Run Formation of Lee (1979).
GREENSTONE CONGLOMERATE S5 (Greenstone cobble conglomerate with minor quartz pebbles and sandstone)	Very thin to moderately deep soil or weathered rock, commonly 0 to 6 m, average 0.5 m.	Thick-bedded to massive (0.6 m to 7 m). Vertical to sub-vertical joints commonly 1 to 3 m apart in intersecting sets.	2325–2625	1–5	Medium to high	Low to high	Difficult, requires blasting.	Slight to moderate, depending on inclination of dipping beds and cement of matrix. Clasts may disaggregate.	Conglomerate may ravel on exposure to air. Large boulders may separate from matrix.	Clasts dominantly sub-rounded to angular greenstone in a siltstone or sandstone matrix, commonly well-indurated and firmly cemented by silica. Unit corresponds to the southern part of the Mountain Run Member of the Bull Run Formation (JTRbm) and the Rapidan Member of the Manassas Formation (TRmra) of Lee (1980) and the Cedar Mountain Conglomerate Member of the Bull Run Formation of Lindholm (1979).
THERMALLY METAMORPHOSED ROCKS T (Siltstone, shale, and sandstone hornfels, with minor metaconglomerate and marble)	Thin soil and residuum, 0 to 10 m, average 1 m.	Thin- to thick-bedded, (depending on rock type), well indurated and tough. Vertical to sub-vertical joints commonly 10 cm to 1 m apart. Mineralization common along fractures.	2325–2625	1–5	Medium to very high	High	Difficult, requires blasting.	Moderate, but varies depending on inclination of relict bedding and existing joints.	Slightly baked shales may flake; vugs and fractures are commonly mineralized.	Microcrystalline hornfels, except for coarse sandstone, conglomerate, and marble. Color commonly gray, green, buff, or black, may be mottled with epidote clusters. Metallic minerals (specular hematite and copper sulfides and sulfates) common. Unit corresponds to thermally metamorphosed rocks (JTRtm) of Lee (1979).
DIABASE J (Intrusive igneous bodies)	Irregular very thin to moderately thick saprolite, 0 to 10 m, average 6 m, with spheroidally weathered cobbles in soil.	Massive to platy, depending on joint density; mainly vertical to sub-vertical intersecting joints, few horizontal joints. Narrow dikes and stocks are subvertical, but thin to moderately thick (1 to 100 m) sills mainly dip with the sedimentary rocks. Joint spacing variable. Mineralization is common along joints and fractures.	2625–2835	1–3	Medium to very high	High	Difficult, requires blasting.	Slight to moderate in large bodies, excessive in thin sills and dikes.	Rock locally in high state of stress as occasionally evidenced by spalling rock in quarries and in bore holes.	Jointing is highly variable geographically. Spacing is commonly 5 to 50 cm in the area north of Culpeper, Va., 1 m to >3 m south of Culpeper. Plagioclase feldspar and augite form a tightly interlocking mosaic; crystal size commonly 1 mm to 5 mm, but may be as large as 1 cm. Unit corresponds to Diabase (JTRd) of Lee (1979).
PRE-TRIASSIC ROCKS P (Schist, phyllite, limestone, greenstone, and quartzite)	Thin to thick soil and saprolite, 0–50 m; average 15 m.	Massive to foliated, small folds preserved. Jointing variable, commonly 1 cm to 1 m, average 10 cm. Pervasive north-northeast through-going fractures, foliation and cleavage. Dips moderately eastward to vertical and steeply westward.	2460–2835	1–5	Medium to very high	Very low to very high	Moderate to difficult, may require blasting.	Slight to very large depending on lithology, shear zones, joints orientation of foliation and cleavage, and degree of weathering.	Massive zones may be highly stressed, with spalling possible. Shear zones highly altered; swelling and squeezing are common along shear zones. Machine boring slowed by quartz pods and other hard inclusions.	Unit corresponds to a large number of variously named metamorphic rock types (Drake and Froelich, 1977). Bedrock is hard and fresh where exposed in stream cuts or cliffs; elsewhere deeply weathered and mantled by saprolite and soil; in places, bedrock concealed by colluvium and slumped material, especially along Bull Run Mountain.

[1]The stratigraphic nomenclature used in this report was used by the authors of the various data sources and does not necessarily conform with usage of the U.S. Geological Survey.

[2]Physical data are available only for some rock units; where data are lacking, the physical properties are inferred from comparisons with those of rock elsewhere that possesses similar composition, structure and geologic history.

[3]Where possible, based on comparison with tunneling behavior of similar rocks encountered in Washington, D. C. area Metro System (Meuser and others, 1969). Tunnel construction in rocks of the Culpeper basin has been limited to the installation of water and sewer systems, 5–30 m below the surface. Tunnel diameters of 1–2 m and lengths of 150–300 m are common. Tunnels have been excavated (all or in part) in rock units S1, S2, S3, S4, T, and J. Although overbreak has not presented any unusual problems, several specific and sometimes prominent problems can be anticipated:
(1) Failure to obtain consistent results in blasting of weathered or partially weathered siltstone (units S1 and S2).
(2) Difficulty of blasting and removal of massive, fresh S1.
(3) Difficulty of drilling in silt/clay filled fractures and cavities of S4.
(4) Unpredictability of grouting procedures due to the existence of unexposed seams, joints, and fractures in weathered to partially weathered rock.

[4]Drillability:
1—most difficult, likely to require diamond drilling for maximum efficiency.
7—least difficult

[5]Strength Class — Range of Compressive Strength (Kgf/cm²)

Strength Class	Range of Compressive Strength (Kgf/cm²)
Very high	>2,240
High	1,120–2,240
Medium	560–1,120
Low	280– 560
Very low	< 280

[6]Inferred for intact rock. Modulus is reduced by physical defects and chemical alteration in the rock; it differs with respect to bedding, foliation, or direction of principal residual stress (Deere and Miller, 1966).

Modulus Class	Range of Static Modulus of Elasticity (Kgf/cm²)
Very high	$8.4X10^5$
High	$5.6X10^5$—$8.4X10^5$
Medium	$2.8X10^5$—$5.6X10^5$
Low	$0.7X10^5$—$2.8X10^5$
Very low	$<0.7X10^5$

[7]Excavatibility—Relative ease of digging and removal by surface power equipment such as tractors, rippers, scrapers, back hoes, etc. (Pugliese, 1972; Obert, 1973; Varnes, 1974).

[8]Overbreak—In tunneling, denotes quantity of rock actually excavated beyond perimeter previously fixed as the finished excavated tunnel outline (Terzaghi, 1977; Sanborn, 1950; Krynine and Judd, 1957; Louderback, 1950).
Overbreak depends on many factors, most prominent among which are:
(1) Joint spacing—Overbreak is greater where joints are closely spaced.
(2) Nature of joint surfaces—Overbreak is greater where fracture surface are smooth, coated with clay, continuous, and uncemented.
(3) Orientation of tunnel relative to dip of bedding—Overbreak is greater where the angle between the tunnel and the bedding of sedimentary rocks is steep.
(4) Shattering effect of blasting on rocks—Overbreak is greater where rock is shattered beyond the tunnel payline.
(5) Distance between the working face and roof supports—Overbreak is greater where nearest roof supports are far from exposed tunnel face.
(6) Length of time between tunneling and installation of roof supports—Overbreak is greater when supports are not installed immediately, allowing time for the exposed rock to ravel, spall, or fall.

[9]Remarks—Color descriptions are best applied to fresh, unweathered rock. Weathered surfaces may appear quite different in color.

THE CULPEPER BASIN FOLIO

The Culpeper basin is a structural trough filled with sedimentary and igneous rocks of Mesozoic age that borders the eastern front of the Blue Ridge in northern Virginia. The basin extends from the Rapidan River near Madison Mills, Va., northeastward across the Potomac River and terminates just west of Frederick, Md.

This report is one of a series of earth science information maps being prepared as part of a study of the geologic and hydrologic resources of the Culpeper basin. Geology on these maps is modified from Lee (1977, 1978, 1979, 1980), Eggleton (1975), and Lindholm (1979). The scale of these maps, 1:125,000 (1 inch=approximately 2 miles), permits only a regional overview or guide to evaluating geologic and hydrologic conditions that may influence certain types of land use. The maps are not intended for enlargement, nor are they, or any graphical or tabulated data included, intended to replace site investigations. Local details at a given site may differ from the general conditions portrayed on these maps, and detailed studies are invariably required for site planning.

By combining the basic resource maps in a variety of ways, depending on the relevant limiting factors for any given land use, the user can derive a secondary series of maps that focus on specific problems. Potential uses of these maps and possible derivative products are discussed in the texts accompanying each map.

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INTRODUCTION

This generalized bedrock map of the Culpeper basin and vicinity, Virginia and Maryland, shows nine major rock types; each type groups rock units having grossly similar physical characteristics. Five sedimentary and four crystalline rock types are described in order from softest, best bedded, most foliated, and most readily splittable to hardest, most massive, and least splittable.

The Culpeper basin contains a variety of sedimentary rocks (formed by accumulation of sediment in water) consisting of layers or beds of sandstone, shale, siltstone, and conglomerate. They are grouped into five principal rock types (units **S1** through **S5**). Bedding symbols in these map units indicate the trend (strike) and inclination (dip) of the rock layers. The layers dip generally 5° to 60° west with the strata steepening progressively toward a major normal fault system that forms the linear western margin of the basin. Fresh rock outcrops are most abundant along stream valleys. The upland areas are mantled by a thin residuum of partly decayed rock usually less than 6 m thick, with soil at the surface, while most of the stream valleys are covered by alluvium.

In the western part of the basin, the sediments are interbedded with flows of basalt (unit **B**), a crystalline igneous rock, which was once molten and which rose from great depth along fractures. This molten rock was extruded as lava flows that crystallized fairly rapidly at the surface.

All the sedimentary rocks are cut locally by diabase (unit **J**), a crystalline igneous rock which, like the basalt, was once molten and which also rose from great depth along fractures. In contrast to the basalt, this rock crystallized deep below the surface. Diabase occurs as dikes (narrow, elongate, subvertical bodies), sills (flat, tabular bodies more or less parallel to the bedding of the sedimentary rocks), or stocks (large discordant bodies with steep subvertical sides). The sedimentary rock immediately adjacent to these diabase intrusions is commonly thermally altered to a tough, finely crystalline metamorphic rock (unit **T**).

The basin is bordered and underlain by a great variety of metamorphic "basement" rock (crystalline rocks formed in the solid state in response to great heat and extreme pressure that profoundly altered the original texture during deep burial), grouped together as unit **P**. Different rock types within this unit crop out in linear belts. The belts of rock generally strike north-northeast and dip steeply to the northwest or southeast. Most of the rocks are foliated, with platy materials such as mica and chlorite so oriented that the rock splits most readily in the direction of foliation or layering. Locally, as at Herndon and in "The Ridge," southeast of Culpeper, Va., inliers of basement rock protrude through the sedimentary rocks of the basin.

All the rock types are cut by intersecting systems of joints (planar fractures or partings that abruptly interrupt the physical continuity of a rock mass). The igneous rocks (units **J** and **B**) display columnar cooling joints, and the sedimentary rocks (**S1** through **S5**) commonly have joints produced by shrinkage or other diagenetic changes; tectonic joints formed by pervasive deformational stresses are present in all the units.

A number of broad flexures that plunge gently to the west are present in the western portion of the Culpeper basin (Lindholm, 1979, Froelich, unpublished data). Gentle south-plunging, northeast-trending folds are mapped east of Nokesville (Lee, 1979) and minor tight folds are near the western border fault near Point of Rocks and south of Leesburg (Froelich, unpublished data; Volckmann, unpublished data).

POSSIBLE USES OF THE MAP

The map can be used in conjunction with the mineral resources map (Froelich and Leavy, 1982) to delineate the general distribution of bedrock types which have been quarried. In addition, this map can be used in conjunction with the surface materials map (Froelich, 1982) to delineate areas of similar rock residuum. Such areas should show comparable rates of infiltration, percolation, absorption, and shrink-swell potential in areas of similar topography. When used in conjunction with data on the availability of ground water (Murphy, 1979) and on the chemical quality of ground water (Posner and Zenone, 1982), which are some considerations critical in water-quality studies, the selection of favorable sanitary landfill sites, and the assessment of sites for surface or subsurface disposal of treated sewage water may be possible.

This map may provide a better understanding of regional structure and may prove useful to engineers in the planning and location of major construction of environmentally or geologically sensitive structures such as power plants, dams, or hospitals. It will provide source information for the evaluation of an area for zones of potentially weak, fractured and unstable rock at shallow depth, which might influence foundation strength for large structures, or interconnected fracture systems at greater depth that will influence ground-water yields to water wells.

Sources of geologic data used to compile this map appear below in the list of references cited. Geology shown on this map has been modified from these references on the basis of field work done by the authors in 1979 to 1981. Table 1 lists selected characteristics and general engineering properties of the major rock types. Table 1 also lists geologic names and those geologic map symbols that correspond to the usage on the 1:24,000-scale geologic maps of Lee (1978, 1979, 1980). By locating the specific area or geologic unit of interest on the 1:24,000 geologic map, the map symbol can be matched to the bedrock unit on this regional map and the general engineering properties may be interpreted. For example, geologic unit TRbb on the Nokesville quadrangle equates to unit **S1** on this map and has the corresponding engineering properties of **S1**. More detailed engineering aspects are in some cases treated specifically in the relevant references.

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DESCRIPTION OF ROCK TYPES

Predominant consolidated rock types, in order of decreasing ease of excavation and rippability and increasing hardness. Main rock name and map symbol in upper-case letters. Lower-case letters denote rock structure: **b**, bedded rocks; **f**, foliated rocks; **m**, massive rocks;

S1 — b — SILTSTONE—Red to purplish-brown, ferruginous, micaceous, calcareous, feldspathic siltstone, locally fossiliferous; interbedded with dark red (in places green to gray), fissile, silty shale and minor beds of light-gray to reddish-brown arkosic sandstone. Rocks of this unit are jointed and readily eroded, forming gently rolling lowlands. Mantled by thin residuum and clayey loam soil except where fresh rock is exposed in road or stream cuts

S2 — b — SANDSTONE—In the eastern part of the basin, red to brown to gray, arkosic, micaceous sandstone, commonly with calcite cement, interbedded with purplish-brown sandy siltstone; also includes minor amounts of silty, sandy shale and quartz pebble conglomerate. In the west, sandstone is typically gray, calcareous, and interbedded with gray to black fossiliferous shales and siltstones, and with conglomerate composed of basalt, greenstone, and schist pebbles. Unit is jointed but mostly resistant to erosion, forming gently rolling uplands and locally steep bluffs. Residuum and soil are thin and sandy

S3 — b–m — QUARTZ CONGLOMERATE—Red to purplish-brown and dark-greenish-gray, pebble, cobble, and boulder conglomerate having a poorly sorted, silty sand matrix, interbedded with red-brown arkosic sandstone and purplish-brown sandy siltstone. Clasts are mainly subrounded to angular quartz, quartzite, and schist in the eastern part of the basin; subrounded greenstone, basalt, limestone, phyllite, and quartzite clasts in the west. Conglomerate is commonly deeply weathered and loose in the east, indurated except where deeply weathered in the west. Residuum is thick and saprolitic and soil is thin and gravelly, commonly with coarse lag gravel at the surface

S4 — b–m — LIMESTONE CONGLOMERATE—Dominantly gray, pebble and cobble conglomerate with a reddish-brown to gray sandy, silty, or limy matrix and calcite cement. Interbedded with thin lenses or beds of reddish-brown calcareous sandstone or siltstone. Clasts are mostly subrounded to angular dolomite or limestone with minor schist, phyllite, or siltstone. Unit is extremely susceptible to solution, particularly on exposed faces and along joints or fractures. Residuum is red-brown, non-calcareous, silty and sandy clay. Thickness of residuum is extremely variable. It is thin or absent on low, linear strike ridges of massive conglomerate, but may be very thick in parallel swales where conglomerate is intensely jointed and dissolved or where interbedded with siltstone, The bedrock surface beneath the swales is irregular, with pits, ridges and pinnacles of rock which produce relief of 6 m or more on the bedrock surface

B — m — BASALT—Lava flows intercalated with stratified sedimentary rocks. Gray-green to black, dense, hard, interlocking mosaic of equigranular, subhedral feldspar and pyroxene. Unit fine-grained, in part porphyritic with feldspar phenocrysts, in part diabasic in texture. Commonly weathered to yellowish- or reddish-brown to gray, clay-rich residuum as thick as 10 m, containing spheroidally weathered core stones. Thin flow units intensely jointed. Thicker units less intensely jointed but have well-developed columnar joints. Tops of flows are commonly vesicular or amygdaloidal; amygdules commonly contain calcite and zeolites. Forms narrow ridges and irregular upland topography

S5 — b–m — GREENSTONE CONGLOMERATE—Very hard, dark greenish-gray to reddish-brown, cobble and boulder conglomerate having a clayey, sandy to silty matrix firmly cemented by silica. Clasts mainly subrounded to angular greenstone with minor subrounded quartzite and vein quartz. Commonly forms steep bedrock bluffs, but rolling upland surfaces may be mantled by moderately thick saprolitic residuum with scattered core stones. Soil is thin reddish-brown silt and clayey loam

T — b — THERMALLY METAMORPHOSED ROCKS—Thermally metamorphosed sedimentary rocks surrounding diabase intrusive bodies. Red-brown siltstone and shale hornfels are bleached to various shades of mauve, buff, or green-gray, commonly spotted. These rocks have been baked to great toughness, and mineralization is common along joints or fractures, in blebs within the rocks, or within clasts in metamorphosed conglomerate. Typical metamorphic minerals in the unit include epidote, cordierite, metallic minerals, pyroxene, or garnet. Bedding is moderately well preserved. Residuum is generally thin; soils are thin and gravelly. Commonly forms uplands locally higher than adjacent diabase

J — m — DIABASE— Intrusive dikes, stocks, and sill-like bodies of dense, hard, dark-gray to black, holocrystalline igneous rock having a medium-grained texture and an equigranular fabric of interlocking subhedral feldspar and pyroxene. Irregular pods and pegmatitic veins of granophyre are common in larger diabase bodies. Overlain by reddish- to yellowish-brown and gray clay-rich residuum as much as 10 m thick, commonly containing spheroidally weathered core stones of fairly fresh rock. Unit commonly forms irregular upland topography, but locally underlies lowlands and valleys

P — m–f — PRE-TRIASSIC ROCKS—Undivided schist, phyllite, quartzite, greenstone, limestone, or metasiltstone. Commonly foliated and cleaved and pervasively jointed; thick saprolite cover, except hard and fresh where exposed in cliffs or stream cuts. Soils commonly thick silt loams except on uplands underlain by quartzite (sandy soils) or greenstone (clayey soils)

MAP SYMBOLS

Culpeper basin border outline

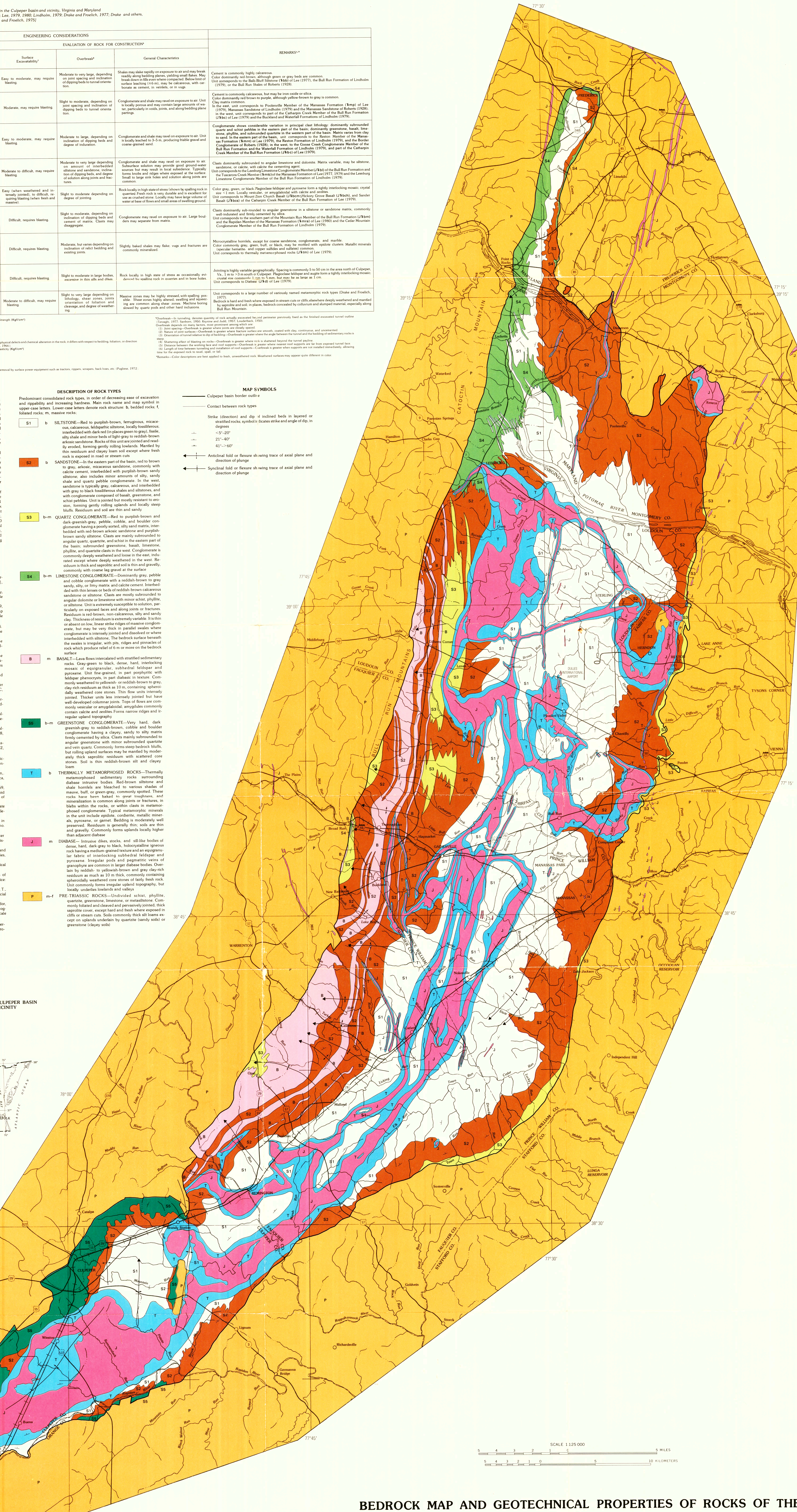
Contact between rock types

Strike (direction) and dip of inclined beds in layered or stratified rocks; symbol indicates strike and angle of dip, in degrees
<5°–20°
21°–40°
41°–>60°

Anticlinal fold or flexure showing trace of axial plane and direction of plunge

Synclinal fold or flexure showing trace of axial plane and direction of plunge

LOCATION OF CULPEPER BASIN AND VICINITY



SCALE 1:125 000
5 4 3 2 1 0 5 MILES
5 4 3 2 1 0 5 10 KILOMETERS

BEDROCK MAP AND GEOTECHNICAL PROPERTIES OF ROCKS OF THE CULPEPER BASIN AND VICINITY, VIRGINIA AND MARYLAND

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