ANNANDALE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
U.S. GEOLOGICAL SURVEY
OPEN FILE REPORT 75-262

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Topography by photogrammetric methods from aerial photographs taken 1955. Field checked 1956. Revised 1965

Polyconic projection. 1927 North American datum
10,000-foot grid based on Virginia coordinate system, north zone
1000-meter Universal Transverse Mercator grid ticks, zone 18, shown in blue

Red tint indicates areas in which only landmark buildings are shown

Fine red dashed lines indicate selected fence and field lines where generally visible on aerial photographs. This information is unchecked

Revisions shown in purple compiled from aerial photographs taken 1971. This information not field checked

Purple tint indicates extension of urban areas

SCALE 1:24000

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

ROAD CLASSIFICATION

UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

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EXPLANATION

Predominant crystalline bedrock types, in order of increasing hardness and decreasing ease of excavation and rippability.

1	f	SCHIST - mica, chlorite, quartz, pelitic; with quartzite, metagraywacke, gneiss and quartz veins
2	f-m	MAFIC - greenstone and greenschist, amphibolite; metavolcanic and metaigneous (tonalite, etc.)
3	f-m	ULTRAMAFIC - serpentinite; with chlorite-actinolite-talc schist near contacts
4a	m-l-f	GNEISS - quartz, feldspar, mica, hornblende; includes 4a-metagraywacke, granofels, minor schist
5	l-m	GRANITE - quartz, feldspar, mica; includes granodiorite, pegmatite, aplite, adamellite, etc.
6	m	QUARTZ BODIES - veins and dikes; massive and shattered

f,l,m — f- foliated rocks; l - layered rocks; m - massive rocks

80 — Direction (strike) and inclination (dip) of dominant foliation or layering

Strike of vertical foliation

65 — Strike and dip of joints (planar cracks or partings)

Strike of vertical joints

Trend of fault, fracture, or lineament, approximately located; dotted where concealed or inferred

Contact between rock units, approximately located

Contact, gradational or inferred, approximately located, dotted where concealed

Bedrock Map of the Annandale Quadrangle, Virginia

The generalized rock-type map separates the crystalline bedrock which underlies Annandale quadrangle into six major rock types; each type groups rock units with grossly similar physical characteristics. The crystalline rocks are arranged in order on the Explanation from Unit 1, the softest, most foliated and readily splittable to Unit 6, the hardest, most massive, and least splittable.

The quadrangle is underlain at varying depths by areas of igneous rocks (crystalline rocks formed by solidification from a molten or partially molten state) and metamorphic rocks (crystalline rocks formed in the solid state in response to great heat, deep burial and such extreme pressure that the original texture was profoundly altered). Three (3) major areas of massive igneous rocks, chiefly granite, separate extensive areas underlain by metamorphic rocks. The belts of metamorphic rock generally strike east-northeasterly, and dip steeply to the northwest or southeast. Most of the metamorphic rocks are foliated or layered, with platy minerals, such as mica and chlorite, so oriented that the rock splits most readily in the direction of foliation or layering. Mica schist is foliated, mafic and ultramafic rocks are commonly foliated, and gneiss ranges from locally foliated to layered. Joints (fractures or partings which abruptly interrupt the physical continuity of a rock mass) are very abundant in the granite and are the chief planes of breakage of the massive rock. Although joints in the metamorphic rocks occur with diverse orientations, the most obvious are commonly oriented perpendicular to the foliation. Standard symbols for joints and foliation appear on the map and in the Explanation. Fresh, hard igneous and metamorphic bedrock outcrops are chiefly restricted to stream valleys, although some hard rock units (Units 3 and 6) characteristically crop out on uplands; however, most of the rolling interstream uplands (on Units 1, 4 and 5) are mantled by a blanket of decayed rock (saprolite) locally as much as 50 metres (160 feet) thick, with soil at the surface.

The type of bedrock buried beneath Coastal Plain strata is inferred in part from sparse scattered drill hole data and mainly on the basis of unpublished aeromagnetic maps (Zietz and Kirby, 1974, unpublished maps).

Sources of geologic data used to compile this map appear in the List of References. A tabular summary (Table 1) lists geologic names, selected characteristics and engineering properties of the major rock types. More detailed engineering aspects are treated specifically in the relevant references.

References

Engineering geology of the Northeast Corridor, Washington, D. C., to Boston, Massachusetts 1967, U. S. Geol. Survey Miscellaneous Geologic Investigation Map 1-514-A.

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TABLE 1 - SELECTED PROPERTIES OF ROCK UNITS IN ANNANDALE QUADRANGLE, VIRGINIA

Modified from Sheet 6, Table summarizing geologic, hydrologic and engineering conditions in Engineering geology of the Northeast Corridor, Washington, D. C. to Boston, Massachusetts: Bedrock Geology, 1967, U. S. Geol. Survey Misc. Geol. Inv. Map I-514-A.

Map Unit & Dominant Rock Type	Principal Rock Types and Equivalent Geologic Formation	Structure and Planar Elements (splittability)	Residuum (overburden)	Maximum Dry Density (lbs/ft)	Rippability 1/	Unconfined Compressive Strength 2/	Young's Modulus of Elasticity 2/	Overbreak 4/	Surface Excavatability 5/	Remarks
SCHIST 1	Pelitic schist, mica schist, metagraywacke, quartz-feldspar-mica schistose gneiss, quartzite. Wissahickon, pelitic schist facies.	Metamorphic foliation is dominant planar elements; dips steeply, multiple directions common. Fissile, splits along 1mm to 1cm planes. Many small scale folds; faults & joints commonly parallel foliation, jointing irregular; transverse sets facilitate breakage into polygonal blocks.	0-50ft Avg 20ft Thick micaceous saprolite and soil.	163.5-176	3-6	Low to Medium	Low to Medium	Slight to moderate	Moderate to easy; usually requires blasting	Machine boring slowed by quartz pods and other hard inclusions. Overbreak and rock load depend on orientation of excavation to foliation. Squeezing ground in wet shear zones probable. Scaling slight to moderate. Weathering moderate to pronounced. Susceptible to shearing at dips of 15 degrees or more toward open cut faces. Commonly forms gently rolling hills and steep linear valleys.
MAFIC 2	Meta-igneous, meta-volcanic & volcani-clastic greenstones; epidote-chlorite schist, amphibolite, chlorite-actinolite-talc schist, metagabbro, tonalite, meta-diorite, etc.	Foliated schistose to banded and massive; locally many fractures. Locally fissile; splits along 1mm. to 5cm. planes. Also blocky. Joints abundant, closely spaced, dip steeply.	0-25ft Avg 7ft thin to moderately thick clayey saprolite and soil.	164-172	1-5	Hornblende gneiss: medium to high	Low to high	Slight to moderate	Moderately difficult; requires blasting	Machine boring slowed by quartz pods and other hard inclusions. Overbreak and rock loads dependent on frequency and orientation of foliation, rock defects & alteration. Impeded drainage. Moderately weathered. Commonly forms nearly level uplands or lowlands.
Ultra-mafic 3	Serpentinite (peridotite, pyroxenite, dunite), gabbro, talc schist, etc.	Massive to locally foliated; commonly sheared and broken by intersecting zones of weak, friable slippery material. Joints common.	0-2ft Avg 1ft Thin to no saprolite or soil.	151-178	2-5	Very low (sheared) to very high (massive)	Very low (sheared) to very high (massive)	Excessive	Difficult; requires blasting	Exceedingly difficult to work. Swelling and squeezing ground along wet shear zones; high stage of stress likely in massive serpentinite bodies. May act as barrier to ground water and septic effluent migration. Good road metal. Shears nearly along contacts, and fractures on cut faces when wet. Unweathered or slightly weathered. Commonly forms rolling uplands.
GNEISS 4	Schistose gneiss, granite gneiss, granofels, pegmatite, granodiorite, (meta-graywacke, schist, etc.). Sykesville Fm.* Wissahickon, diamictites (Boulder gneiss).	Massive, layered, thick-bedded to foliated where interbedded with schist or along shear planes. Splits along 1cm to 1m planes. Joints prominent, dip steeply, parallel and perpendicular to layering.	0-30ft Avg 15ft Moderately thick micaceous, sandy, silty saprolite and soil.	166.6-170.1	3-5	Schistose gneiss: low to medium. Massive gneiss: Medium to high.	Medium to high.	Moderate to excessive.	Moderate; requires blasting	Overbreak and rock loads depend on orientation of excavation to foliation and joint system. Fair to good rip-rap. Extent of weathering moderate. Will sustain steep cut faces except in thinly layered schistose portions which may shear. Massive jointed units commonly break into blocks rather than slabs or plates. Locally quarried for dimension stone, building stone, flagstone and rip-rap. Commonly forms gently rolling uplands and steep walled valleys.
GRANITE 5	Adamellite, gneissic granite, aplite, etc. pegmatite "Occoquan granite".				3-5	Medium to high.		Moderate		
QUARTZ 6	Veins, dikes, pods.	Massive and shattered to 5cm. fragments.	0-1ft no saprolite, essentially no soil.	165	1-3	Low to high.	Low to high.	Not applicable	Difficult; requires blasting	Exceedingly difficult to work where not shattered by fractures. Unweathered. As much as 75' wide. Commonly forms bold upland ridges.

1/ Rippability
1—Most difficult
7—Least difficult

3/ Strength Class — Range of Compressive Strength (psi)
Very high — > 32,000
High — 16,000-32,000
Medium — 8,000-16,000
Low — 4,000-8,000
Very Low — < 4,000

3/ Modulus Class — Range of Static Modulus of Elasticity (psi)
Very high — > 12 x 10^6
High — 8 x 10^6 - 12 x 10^6
Medium — 4 x 10^6 - 8 x 10^6
Low — 1 x 10^6 - 4 x 10^6
Very Low — < 10^6

4/ Overbreak - in tunneling denotes quantity of rock (actually excavated beyond perimeter previously fixed by the engineer as the finished excavated tunnel outline.

5/ Excavatability - relative ease of digging a removal by surface power equipment such as bulldozers, rippers, scrapers, back hoes, etc.