

Surface materials map unit (pl. 1)	Description of parent bedrock	Weathered profile	Unified Soil Classification <sup>1</sup> of residuum	Total unit weight (kgf/m <sup>3</sup> )	Drainage and natural-moisture characteristics		Suitability as compacted material	Excavation properties	Susceptibility to erosion	Shear strength and compressibility characteristics	Allowable bearing pressure (kgf/cm <sup>2</sup> )	Slope stability	Road-performance characteristics
					Surface drainage	Internal drainage and natural moisture							
Conglomerate cgl	Gray to reddish-brown conglomerate, sandstone, siltstone, and shale, thin to thick bedded (1.3 cm-5 m). Bedding generally obscure and joints widely spaced. In places, conglomerate has some boulders of quartz, quartzite, and schist as large as 25-cm diameter, rounded to angular. Boulders and coarse gravel locally may make up 30 percent of total volume, and be completely encased in matrix. Matrix typically friable silty sand, cemented by silica, iron oxides, and minor clay. May have some calcite cement.	Residuum typically massive, has few or no joints and parting planes, and is normally gravelly, sandy, and silty. In places, hard quartz and quartzite boulders and cobbles encased in weaker, friable matrix of medium to stiff consistency to depths of at least 7 m. Schist boulders commonly weaker than matrix. Contact between zones weathered to different degrees, irregular in places. Depth of weathered material above unweathered rock varies from 0 to 10 m, averaging about 3 m. Residuum commonly disaggregated, loose, and friable at ground surface, gradually becoming more rocklike at depth; indurated ledges at surface in places.	SP, SM, GM, GP, ML	1,900 and higher, generally increasing with depth to unweathered rock.	Commonly well drained, locally poorly drained.	Permeability generally low; natural-moisture content commonly near plastic limit in residuum.	Residuum generally easily compacted and makes strong, low-compressible fill; however, some facies have boulders or highly micaceous silty residuum, making compaction more difficult. Compaction of highly micaceous soil very sensitive to moisture content.	Residuum easy to excavate using light power equipment; weathered rock may be difficult.	Residuum on silty and micaceous facies are highly erodible, especially where remolded. Weathered and unweathered rock may ravel.	Medium to stronger consistency. Effective friction angle generally greater than 25°. Micaceous silt may be highly compressible and behave much as saprolite on crystalline rocks. Erratic boulders along eastern margin of area may make conventional sampling impossible.	1 or more for shallow footings above unweathered rock.	Temporary vertical slopes generally stable to depths of at least 2.7-3 m, though may be unstable at shallower depths because of adversely oriented joints or parting planes. Permanent long slopes in residuum and weathered rock commonly stable at less than about 35°; in unweathered rock, generally stable at much steeper angles.	Micaceous silt may give poor support and is susceptible to frost heaving and weakening, but surface and internal drainage generally sufficient to prevent serious problems. Residuum generally can be stabilized with cement.
Sandstone ss	Interbedded gray, pink, and reddish-brown arkosic sandstone, conglomerate, siltstone, and shale, thin to thick bedded (0.6 cm-5 m); generally well-defined beds. Siltstone and shale beds are 2.5 cm-0.3 m thick; in places intensely fractured and jointed. Most joints steep to vertical; partings parallel to bedding at contrasting rock types. Arkose fine to coarse grained, locally conglomeratic; commonly 1-5 percent mica, interlocking quartz and feldspar grains cemented by iron oxides and silica, and locally by calcite.	Residuum, typically dominantly sandy and silty, contains some clay-rich beds. Residuum may have only a few more fractures and parting planes than parent rock, or may be much more fractured. Weathered rock has larger, stronger pieces of hard rock yet retains original joints, fractures, and bedding of parent bedrock. Joints, fractures and parting planes commonly clay or oxide coated, at some places are infilled with clay, but typically thin open voids are present between pieces of rock. Residuum depth 0-5 m; depth to unweathered rock 0-7 m. Average depth of weathering about 1.5 m, and generally not highly variable at a specific site. Slightly weathered strata may overlie highly weathered strata.	SP, SM, SC (ML, CL)	2,000 and higher, generally increasing with depth to unweathered rock.	Well to poorly drained, depending primarily on topography.	Weathered rock commonly more permeable than residuum and unweathered rock. Weathered rock commonly saturated after rainy periods, producing perched water table near ground surface. Permeability of weathered rock normally low to medium. Unweathered rock highly fractured in places, producing high permeability.	Residuum easily compacted, and makes strong, low-compressible fill where very sandy facies predominate.	Same as "Conglomerate."	Weathered and unweathered fine-grained facies easily eroded. May break down rapidly into small chips; in places may erode along joints and parting planes, making tubes as large as 10 cm in diameter.	Medium to stronger consistency. Effective friction angle generally greater than 25°, except lower for very fine grained facies. Residuum generally not highly compressible; however, large settlements can develop where partings have weak fillings.	1 or more for shallow footings above unweathered rock; commonly much higher. Presence of erosion tubes may undermine structures.	Temporary vertical slopes generally stable to depths of at least 2.7-3 m, though possibly unstable at shallower depths because of adversely oriented joints or parting planes. Such weak zones can be softened to medium to stiff consistency. Permanent long slopes in residuum and weathered rock commonly stable at less than 35°; in unweathered rock stable at 35° or less, except in massive sandstone having no siltstone or shale layers. Such layers can weaken and erode, undermining sandstone. Permanent long slopes in massive unweathered sandstone commonly stable at 60° or greater.	Perched water near ground surface and silty soils make subgrade susceptible to frost weakening and pumping. Very silty soils can be stabilized by cement in some places.
Siltstone sts	Consists mostly of reddish-brown laminated mudstone and lesser amounts of slightly fissile shale interbedded with siltstone and fine-grained sandstone. Well-defined beds 0.6 cm-1 m thick. Commonly intensely jointed; joints from a fraction of a centimeter to 8 cm apart. One parting set commonly parallel to bedding; joints steeply dipping. High-angle joints commonly at several orientations at a specific site. Calcite common as cement, vug and vein fillings, and locally as layers.	Residuum may grade from massive plastic clay to weak, small, rectangular clayey chips, 0.1-0.15 cm thick, which have irregular, subangular, blocky shapes. Residuum may also have flaggy fragments, little altered from parent bedrock. Fragments commonly clay or oxide coated; at some places clay fills voids between fragments. Partings along bedding may be continuous for many meters. Soil along partings softened to soft to stiff consistency; weakened soil in partings as thick as 0.5 cm. Residuum may be as thick as 1.7 m and have consistency of medium to stronger. Beneath residuum, rock fragments are larger, stronger, and irregularly fractured, but have same joints, fractures, and bedding as underlying fresh rock. Thin, open voids commonly separate rock fragments. Weathered profile rarely exceeds 7 m in depth, commonly is 1-2.3 m. Depth of weathering generally not highly variable at a specific site. Slightly weathered strata may overlie highly weathered strata.	ML, MH, CL, CH, SM, SC (SP)	1,150 and higher, generally increasing with depth to unweathered rock.	Commonly poorly drained.	Permeability low; water ponds near surface.	Residuum commonly has acceptable compaction qualities, and is moderately strong and low-compressible as fill, except where highly plastic clay is present. Weathered and unweathered material may slake and weaken after compaction. Materials which slake may settle greatly where used as backfill for utility excavations, unless properly compacted.	Same as "Conglomerate."	High clay content usually prevents severe erosion. Weathered and unweathered rock may rapidly soften and weaken where exposed and be highly erodible.	Clay soft to stiff, silt generally stronger than clay. Effective friction angle probably greater than 20°, even for clay. Highly plastic clay soils can be highly compressible; can have partings with highly compressible material.	1 or more for shallow footings above unweathered rock; swelling soils may require footings deeper than 1.3-1.7 m.	Temporary vertical slopes generally stable to depths of at least 2 m, though possibly unstable at shallower depths because of adversely oriented joints or parting planes. Such weak zones can be softened to medium to stiff consistency. Permanent long slopes in residuum and weathered rock commonly stable at 35° or less, depending on jointing; steeper slopes may fail as siltstone and shale weather.	Same as "Sandstone," except generally not as susceptible to adverse frost weakening and pumping. CBR (California Bearing Ratio) values of clays can be very low.

<sup>1</sup>The following letters indicate certain soil characteristics. First letter: G, gravel; S, sand; M, silt; C, clay; O, organic; Pt, peat. Second letter: W, well graded; P, poorly graded; M, silty; C, clayey; L, low plasticity; H, high plasticity. The materials are described in terms of major and minor occurrences; minor occurrences are in parentheses.

## PHYSICAL PROPERTIES AND ENGINEERING CHARACTERISTICS OF WEATHERED MATERIALS ON SEDIMENTARY BEDROCK, FAIRFAX COUNTY, VIRGINIA

