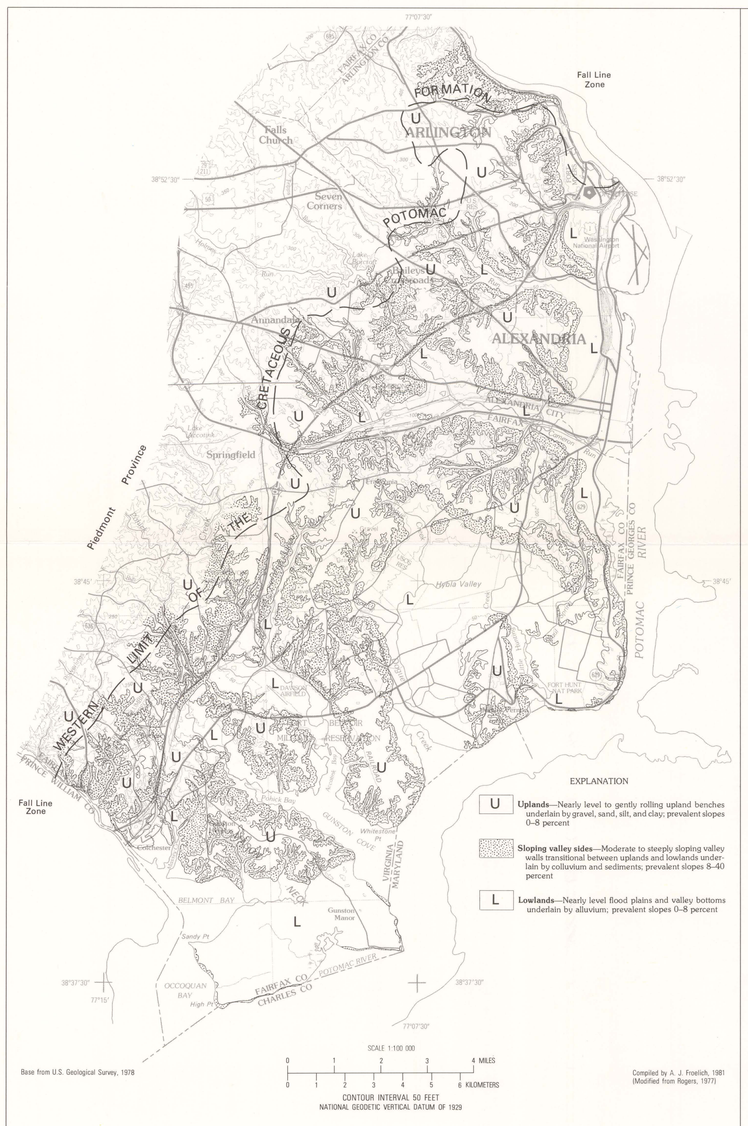
DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

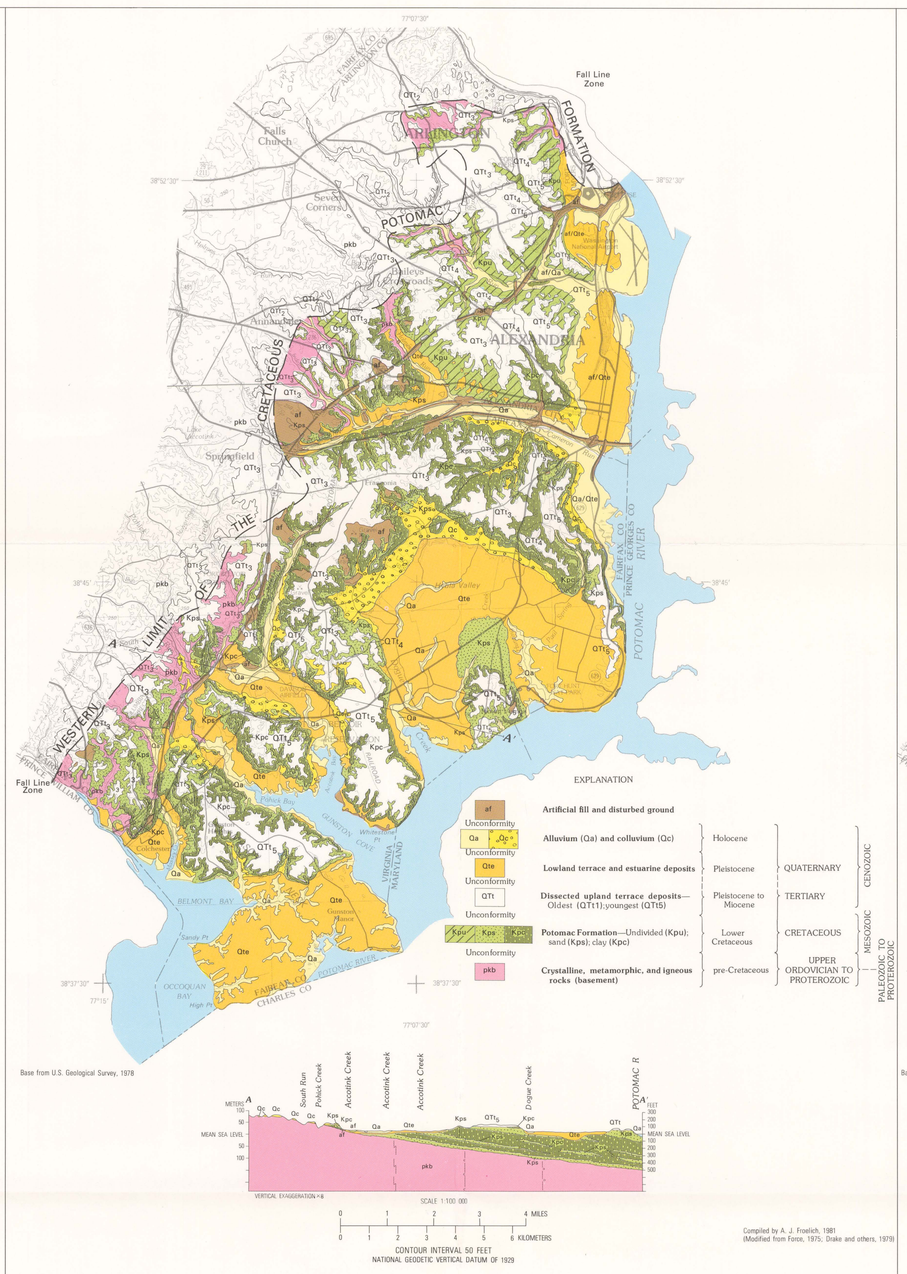
MISCELLANEOUS INVESTIGATIONS SERIES
MAP I–1423 (SHEET 1 OF 5)



Base from U.S. Geological Survey, 1978

Compiled by A. J. Froelich, 1981 (Modified from Rogers, 1977)

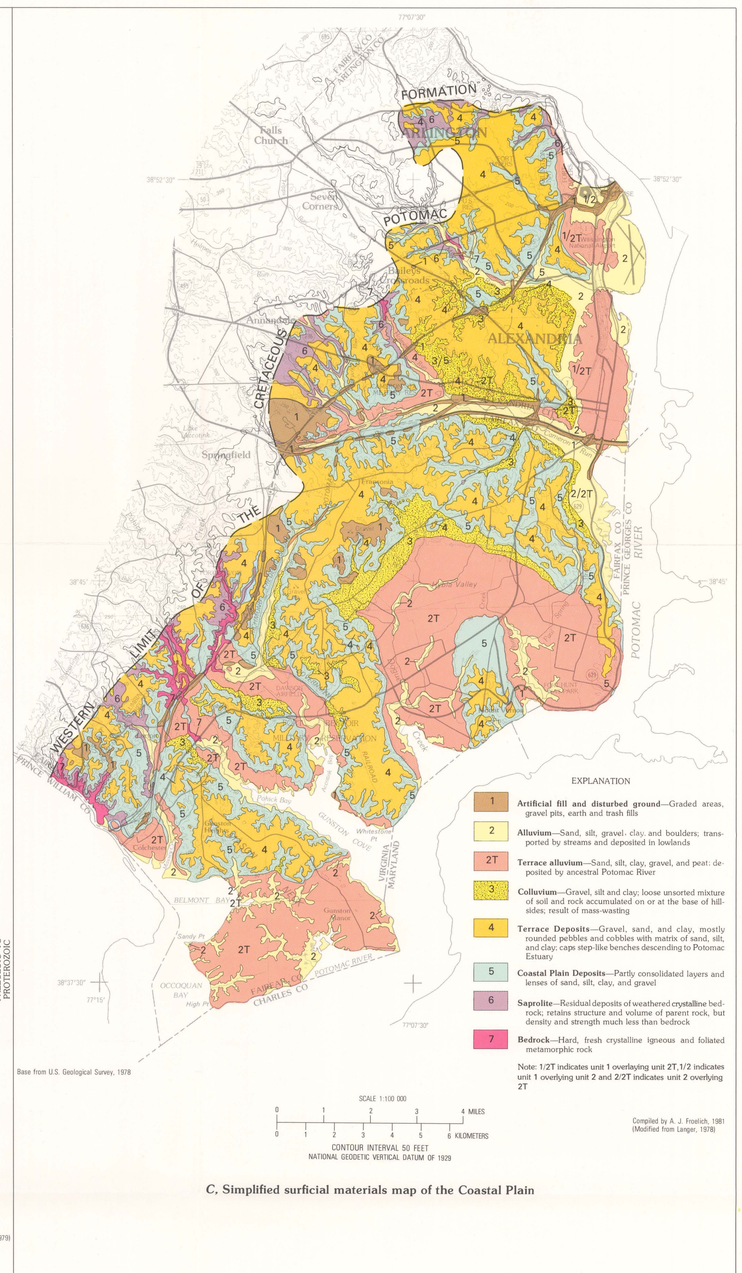
A, Landforms in the Coastal Plain



Base from U.S. Geological Survey, 1978

Compiled by A. J. Froelich, 1981 (Modified from Force, 1975; Drake and others, 1979)

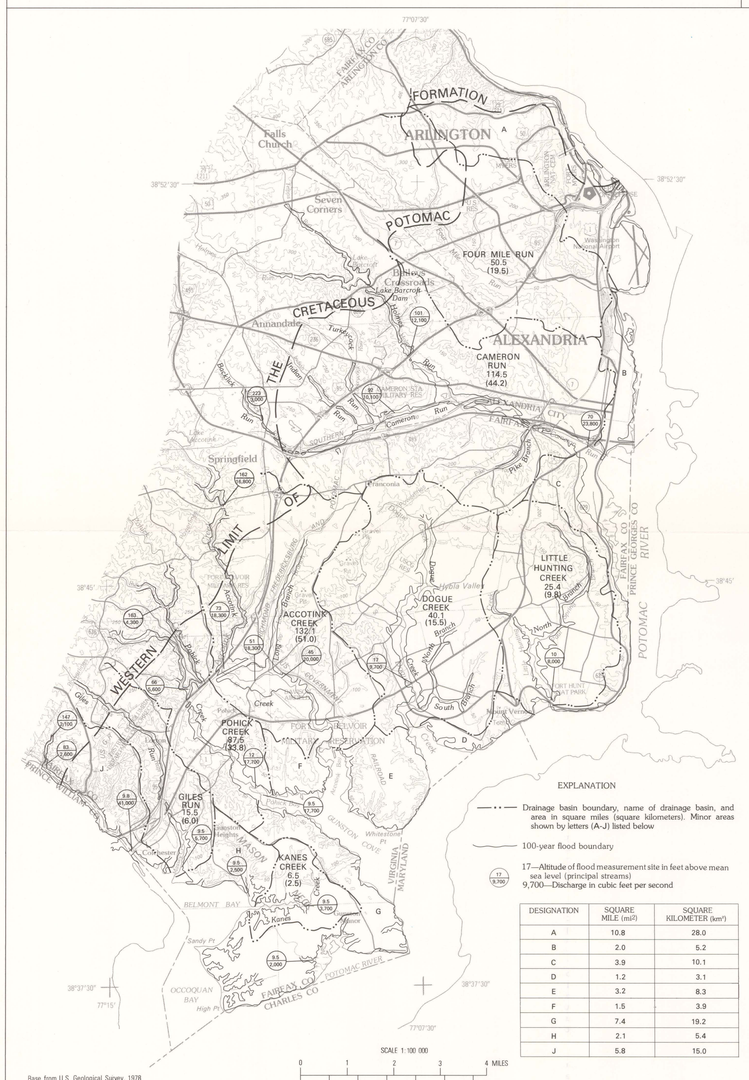
B, Simplified geologic map and section of the Coastal Plain



Base from U.S. Geological Survey, 1978

Compiled by A. J. Froelich, 1981 (Modified from Langer, 1978)

C, Simplified surficial materials map of the Coastal Plain



DESIGNATION	SQUARE MILE (mi²)	SQUARE KILOMETER (km²)
A	10.8	28.0
B	2.0	5.2
C	3.9	10.1
D	1.2	3.1
E	3.2	8.3
F	1.5	3.9
G	7.4	19.2
H	2.1	5.4
J	5.8	15.0

Base from U.S. Geological Survey, 1978

Compiled by A. J. Froelich, 1981 (Modified from Mohler and Novak, 1977; 1978)

D, Drainage basins and extent of 100-year flood in the Coastal Plain

Base from U.S. Geological Survey, 1978

Compiled by A. J. Froelich, 1981 (Lineaments modified from Iwahashi and Heironimus, 1978; Joint measurements from Langer and Obermeier, 1978)

E, Comparison of lineaments observed on LANDSAT imagery with joint measurements in eastern Fairfax County, Virginia

Base from U.S. Geological Survey, 1978

Compiled by A. J. Froelich, 1981 (Modified from Obermeier, 1979)

F, Slope stability in the Coastal Plain

The eastern part of Fairfax County, Alexandria City, and Arlington County, Virginia, lie within the Atlantic Coastal Plain. In this region, the Coastal Plain is characterized by a series of nearly level, gravel-capped terraces that descend step-like from the rolling hills of the Piedmont province on the northwest to the Potomac Estuary on the east. The surface of the Coastal Plain is cut by streams that expose sediment layers having different ages. These exposures facilitate reconstruction of a long history of episodic erosion and deposition under diverse and changing geologic conditions.

Map ***A***, depicting landforms, shows that gently sloping uplands (**U**) are intricately dissected by tributary streams that drain eastward to the Potomac Estuary. The tributaries occupy nearly flat lowland valleys (**L**), which commonly are joined to the uplands by moderately to steeply sloping valley sides. The dominant geomorphic process in the uplands is weathering—the physical disintegration and chemical decomposition of coherent sediments in place, producing a mantle of loose material. The main process operative on the sloping valley sides is mass wasting—the dislodgement and downslope transport of soil and weathered rock material due to gravity, by means of slump, creep and landsliding. In the lowlands, the chief processes are erosion, transportation, and deposition of weathered material by streams.

Map ***B***, showing simplified geology, indicates that the upland terraces are remnants of much more extensive Cenozoic fluvial gravel deposits. The terrace gravels unconformably (said of layers that do not succeed the underlying beds in immediate order of age and do not fit together as parts of a continuous whole) overlie interbedded channel-fill sands and overbank flood-plain silts and clays of the Cretaceous Potomac Formation. The gravels overlap the crystalline Piedmont rocks above the Fall Line zone. The Fall Line is an imaginary north-northeast-trending line formed by joining the low falls or rapids of major streams that form a barrier to navigation. These falls or rapids form at the contact between the younger soft strata of the Coastal Plain and the harder crystalline rocks of the Piedmont. As shown on the accompanying cross section, the Cretaceous strata form an eastward dipping prism of sediment that thickens from a feather edge at the Fall Line to more than 600 feet (200 m) at the Potomac Estuary. The Cretaceous sands and clays crop out almost exclusively on the sloping valley sides but underlie all the surficial units in lowlands and uplands. The slightly dissected lowlands that flank the Potomac Estuary at Hybla Valley, Mason Neck, and in eastern Alexandria are underlain by Pleistocene sand, silt, clay, and gravel layers of fluvial and estuarine origin deposited by an ancestral phase of the Potomac River (Froelich and others, 1978). The present top of these deposits lies between 40 to 90 feet (13 to 30 m) above sea level and the base is as much as 90 feet (30 m) below sea level. Hybla Valley is an abandoned meander of an ancestral Potomac River now occupied by underfit tributaries, Dogue and Little Hunting Creeks.

Map ***C*** shows the geologic formations grouped into surficial units based on different modes of occurrence and physical properties. Sparse outcrops of crystalline rocks that include slate, schist, gneiss, and granite are grouped on the map as "bedrock," because all are hard, fresh, very strong rock. The bedrock is mapped separately from the overlying saprolite, the soft, weathered, clay-rich residuum of these rocks. All of the terrace-gravel cappings are grouped together regardless of age as they are similar in texture, origin, and engineering properties. The Cretaceous sands and clays are also grouped, despite their different physical properties, because they are intricately interbedded.

Map ***D*** shows the principal streams and their drainage basins as well as the limits of the 100-year flood. At any site within the 100-year flood plain, there is at least a 1 in 100, or 1 percent, chance of being flooded each year. Most of the principal streams head in the Piedmont and cross the Fall Line in narrow bedrock gorges which open into broad alluvial flood plains across the Coastal Plain. Altitude of flood measurement sites (in feet above mean sea level) and peak discharge (in cubic feet per second) are measured at selected gaging stations.

Map ***E*** depicts the relationship of structural alignments observed on LANDSAT imagery of the Coastal Plain to joint sets measured mainly in Cretaceous clay exposures. The two sets of data, measured independently, provide corroboration to a plausible structural framework of fractures that is relevant to engineering problems related to slope stability. Steeply dipping normal and reverse faults that cut the Coastal Plain sediments at some of the joint localities are also shown. The faults are poorly exposed, but are probably part of the regional northeast-trending Stafford fault system (Mixon and Newell, 1977).

Map ***F***, showing relative slope stability in the Coastal Plain, was derived largely by combining critical factors extracted from maps ***A***, ***B***, ***C***, and ***E*** supplemented by extensive field observations. For example, by superimposing the areas showing sloping valley sides from map ***A*** on the distribution of Cretaceous clay (which swells excessively when wet and shrinks when dry) from map ***B***, most areas of relatively unstable slopes can be delineated. Where broken by regional fractures and through-going joint systems (map ***E***), slopes underlain by clays are commonly prone to failure.

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Units of Measurement

U.S. Customary (English) units of measurement are used principally in the text and are converted to equivalent International System (SI or metric) units. Some original data on maps have not been given with English and metric unit equivalents. Conversion factors for units of measurement used in this folio are given below. To convert to metric, multiply by the conversion factor; to convert to English, divide by the conversion factor.

English	Conversion factor	Metric
Feet	0.3048	Meters (m)
Miles	1.609	Kilometers (km)
Square feet	0.0929	Square meters (m^2)
Square miles	2.590	Square kilometers (km^2)
Cubic feet	0.02832	Cubic meters (m^3)
Gallons	3.785	Liters (l)

Sheet 1 of 5: Maps showing surficial geologic and hydrologic aspects of the Coastal Plain in Fairfax County and vicinity, Virginia

INTERIOR—GEOLOGICAL SURVEY, RESTON, VA—1985—GB/217

FOLIO OF GEOLOGIC AND HYDROLOGIC MAPS FOR LAND-USE PLANNING IN THE COASTAL PLAIN OF FAIRFAX COUNTY AND VICINITY, VIRGINIA

By
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1985

For sale by Branch of Distribution, U.S. Geological Survey, 1200 South Eads Street, Arlington, VA 22202