DEPARTMENT OF ENVIRONMENTAL PROTECTION
LAND USE MANAGEMENT
NEW JERSEY GEOLOGICAL SURVEY

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U. S. GEOLOGICAL SURVEY
NATIONAL GEOLOGIC MAPPING PROGRAM

BEDROCK GEOLOGY OF THE CAMDEN AND PHILADELPHIA QUADRANGLES
CAMDEN, GLOUCESTER, AND BURLINGTON COUNTIES, NEW JERSEY
OPEN-FILE MAP OFM 61

INTRODUCTION

Bedrock of the Camden and Philadelphia quadrangles includes unconsolidated Coastal Plain formations that overlie metamorphic basement rocks. The Coastal Plain formations include sand, clay, and glauconite clay laid down in coastal, nearshore marine, and continental shelf settings between 95 and 75 million years ago. The underlying metamorphic rocks are much older and were originally laid down as sediments between 700 and 550 million years ago, and later compressed and deformed several times. The lithology and age of the formations are provided in the *Description of Map Units*. Age relations are also summarized in the *Correlation of Map Units*. Sections AA' and BB' show the subsurface geometry of the formations along the line of section. Further detail on the regional stratigraphy of the Coastal Plain formations is provided by Owens and others (1998). Surficial deposits of Pliocene and Quaternary age overlie the Coastal Plain formations in most of the map area. The surficial deposits are mapped by Stanford (2004).

DESCRIPTION OF MAP UNITS

Kml MOUNT LAUREL FORMATION--Quartz sand, slightly glauconitic, medium-grained. Yellowish-brown to reddish-yellow where weathered, gray where unweathered. As much as 20 feet thick in map area. Contains traces of feldspar, mica, and phosphate pellets. Late Cretaceous (late Campanian) in age based on nannoplankton (Sugarman and others, 1995). Grades downward into the Wenonah Formation.

Kw WENONAH FORMATION--Quartz sand, micaceous, slightly glauconitic, fine to very fine-grained. Yellow to very pale brown where weathered, gray to pale-olive where unweathered. As much as 50 feet thick. Contains traces of carbonaceous material. Late Cretaceous (late Campanian) in age based on pollen (Wolfe, 1976) and ammonite fossils (Kennedy and Cobban, 1994). Grades downward into the Marshalltown Formation.

Kmt MARSHALLTOWN FORMATION--Quartz glauconite clayey sand, fine- to medium-grained. Olive to dark gray where unweathered, brown to olive-brown where weathered. As much as 20 feet thick. Contains traces of feldspar, mica, finely disseminated pyrite, and phosphatic fragments. Late Cretaceous (middle Campanian) in age, based on nannoplankton (Sugarman and others, 1995). Unconformably overlies the Englishtown Formation.

Ket ENGLISHTOWN FORMATION--Quartz sand, fine to coarse-grained, with thin beds of clay and silt. Sand is white, yellow, and light-gray where weathered, gray where unweathered. Silt and clay are light-gray to brown where weathered, dark-gray to black where unweathered. As much as 70 feet thick. Sand contains some lignite and mica and minor amounts of glauconite; mica, carbonaceous matter and pyrite are common in the clays. Late Cretaceous (early Campanian) in age, based on pollen (Wolfe, 1976). Grades downward into the WoodburyFormation.

Kwb WOODBURY FORMATION--Clay with minor thin beds of very fine quartz sand. Dark gray and black where unweathered, yellowish-brown to brown where weathered. As much as 80 feet thick. Clay is micaceous with some pyrite and carbonaceous material and traces of glauconite. Late Cretaceous (early Campanian) in age based on pollen (Wolfe, 1976). Grades downward into the Merchantville Formation.

Kmv MERCHANTVILLE FORMATION--Glauconite clay. Olive, dark gray, black where unweathered, olive-brown to yellowish-brown where weathered. As much as 50 feet thick. Glauconite occurs primarily in soft grains of fine-to-medium sand size. Sand fraction is chiefly quartz; feldspar, mica, and pyrite are minor constituents. Iron cementation is common. Late Cretaceous (early Campanian) in age based on ammonite fossils (Owens and others, 1977). Unconformably overlies the Magothy Formation.

Kmg MAGOTHY FORMATION--Quartz sand, fine to very coarse-grained, and clay and silt, thin-bedded. Sand is white, yellow, light-gray where weathered, gray where unweathered. Clay and silt are white, yellow, brown, reddish-yellow where weathered, gray to black where unweathered. As much as 120 feet thick. Sand includes some lignite, pyrite, and minor feldspar and mica. Silt and clay beds include abundant mica and carbonaceous material. Late Cretaceous (Santonian) in age based on pollen (Wolfe and Pakiser, 1971; Christopher, 1977). Unconformably overlies the Potomac Formation.

Kp3 POTOMAC FORMATION--Quartz sand, fine to very coarse-grained, and clay and silt, thin- to thick-bedded; minor granule to cobble gravel. Sand is white, yellow, light-gray where weathered, gray where unweathered. Clay and silt are white, yellow, brown, reddish-yellow where weathered, less commonly gray to black where unweathered. Unweathered clay and silt less common than in Magothy Fomation. As much as 280 feet thick. Sand includes some lignite, and minor feldspar and mica. Silt and clay beds include abundant mica and carbonaceous material. The Potomac Formation in the map area is equivalent to the Potomac Formation, unit 3 (Doyle and Robbins, 1977), based on pollen (Wolfe and Pakiser, 1971; Owens and others, 1998), and is of Late Cretaceous (early Cenomanian) age. Unconformably overlies Cambrian and Late Proterozoic bedrock.

CZu PRE-CRETACEOUS METAMORPHIC ROCKS--Chiefly schist. Upper 10-150 feet is commonly weathered to a micaceous clayey saprolite. Of Late Proterozoic and Cambrian age. Includes the Wissahickon Formation and related rocks of the Potomac-Philadelphia-Hartland terrane (Volkert and others, 1996). In subsurface only.

MAP SYMBOLS

Contact--Approximately located. Solid triangle indicates contact observed in outcrop.

Formation observed in outcrop, excavation, or hand-auger hole.

Formation formerly observed in outcrop or excavation (Woolman, 1897; Bascom and others, 1909; field notes on file at N. J. Geological Survey) but no longer exposed.

7-538 Well with gamma log--Used to construct section. Numbers of the form 7-xxx are U. S. Geological Survey Ground Water Site Inventory identification numbers. Numbers of the form 31-xxxx are well permit numbers issued by the N. J. Department of Environmental Protection, Bureau of Water Allocation.

31-62 -138 CZu Well or boring penetrating pre-Cretaceous basement--Upper number is identifier, lower number followed by "CZu" is elevation of base of Cretaceous in feet below sea level. Where the Magothy-Potomac contact is penetrated, the elevation (in feet below sea level) of the contact is indicated between the unit symbols. Identifiers of the form 31-xxxx are well permit numbers issued by the N. J. Department of Environmental Protection, Bureau of Water Allocation. Identifiers prefixed by W, E or B are bridge borings provided by the Delaware River Port Authority. Identifiers prefixed by WM are bridge borings from Woolman (1897). Identifiers prefixed by GH are from Jengo (1999).

zone III Pollen zone--Circle indicates approximate location of sample (Wolfe and Pakiser, 1971).

Well with gamma log--On sections. Intensity of gamma radiation increases to right.

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SCALE 1:24 000

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

APPROXIMATE MEAN DECLINATION, 1967 (TRUE NORTH, MAGNETIC NORTH, 10°)

LOCATION IN NEW JERSEY

Base from U. S. Geological Survey Camden and Philadelphia quadrangles, 1967, photorevised 1973
Geology mapped 2000-2001