DEPARTMENT OF ENVIRONMENTAL PROTECTION
LAND USE MANAGEMENT
NEW JERSEY GEOLOGICAL SURVEY

Prepared in cooperation with the
U. S. GEOLOGICAL SURVEY
NATIONAL GEOLOGIC MAPPING PROGRAM

BEDROCK GEOLOGY OF THE BRIDGEPORT AND MARCUS HOOK QUADRANGLES
GLOUCESTER AND SALEM COUNTIES, NEW JERSEY
GEOLOGIC MAP SERIES GMS 06-1

INTRODUCTION

Bedrock of the Bridgeport and Marcus Hook quadrangles includes unconsolidated Coastal Plain formations that overlie metamorphic and igneous basement rocks. The Coastal Plain formations include sand, clay, and glauconite clay laid down in coastal, nearshore marine, and continental shelf settings between 110 and 75 million years ago. The underlying metamorphic and igneous rocks are much older and were originally laid down as sediments, or intruded as magma, between 700 and 420 million years ago, and 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', BB', and CC' 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 bedrock formations in most of the map area. The surficial deposits are mapped by Stanford (2006).

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 40 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 30 feet thick. Contains traces of lignite. Late Cretaceous (late Campanian) in age based on pollen (Wolfe, 1976) and ammonites (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 50 feet thick. Sand contains some lignite and mica and minor amounts of glauconite; mica, lignite, and pyrite are common in the clays. Late Cretaceous (early Campanian) in age, based on pollen (Wolfe, 1976). Grades downward into the Woodbury Formation.

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 70 feet thick. Clay is micaceous with some pyrite and lignite 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 fine-sandy silty clay to clayey silt. Olive, dark gray, black where unweathered, olive-brown to yellowish-brown where weathered. As much as 30 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 ammonites (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, rarely reddish-yellow where weathered, gray to black where unweathered. Gray colors are dominant. As much as 180 feet thick. Sand includes some lignite, pyrite, and minor feldspar and mica. Silt and clay beds include abundant mica and lignite. Late Cretaceous (Turonian-Coniacian) in age based on pollen (Christopher, 1979, 1982; Miller and others, 2004). Unconformably overlies the Potomac Formation. Contact with the Potomac Formation placed at change from predominantly gray clay and silt in Magothy Formation to red clay in the Potomac as reported in well or boring logs, or at increased gamma-ray intensity, decreased electrical resistance, and increased spontaneous potential on geophysical logs, recording the thicker clays in the Potomac. The upper 10-15 feet of the Magothy Formation as mapped here may include the Cheesequake Formation, which has been identified biostratigraphically in coreholes in this region (Miller and others, 2004; Sugarman and others, 2004) but, as a largely non-glauconitic silt, cannot be lithically distinguished from the Magothy based on outcrop and well data in the map area.

Kp3
Kp2 POTOMAC FORMATION--Quartz sand, fine- to very coarse-grained, and clay and silt, thin- to thick-bedded; minor pebble-to-cobble gravel. Sand is white, yellow, light gray where weathered, gray where unweathered. Clay and silt are white, yellow, brown, reddish-yellow, red where weathered, gray to black where unweathered. Unweathered clay and silt less common than in the Magothy Formation. Clay and silt beds more abundant than sand beds. As much as 350 feet thick. Sand includes some lignite, and minor feldspar and mica. Clay and silt beds include abundant mica and some lignite. The outcropping Potomac Formation in the map area (unit Kp3) is equivalent to the Potomac Formation, unit 3 (Doyle and Robbins, 1977), based on pollen (Owens and others, 1998), and is of Late Cretaceous (early Cenomanian) age. Unit 2 (Kp2) may be present in the subsurface downdip from the outcrop belt (section AA'), based on the presence of a regionally traceable thick sand at the base of unit 3, as recorded on geophysical logs. Unit 2 is of Early Cretaceous (Albian) age (Doyle and Robbins, 1977; Owens and others, 1998). Pollen from dark-gray clay at depths of 144 and 160 feet in borings MW1-C and PGS-TH-2, respectively, confirm a Potomac age for the sediments but cannot be definitively assigned to zones (L. A. Sirkin, written communication, 1991). Unconformably overlies early Paleozoic and Late Proterozoic bedrock.

OCZu LATE PROTEROZOIC AND EARLY PALEOZOIC METAMORPHIC AND IGNEOUS ROCKS, UNDIFFERENTIATED--Gray schist and gneiss, some gray to pink diorite and pegmatite and dark gray amphibolite. Upper 5-50 feet is commonly weathered to a brown, gray, or greenish-gray micaceous sandy clayey saprolite. Of Late Proterozoic and early Paleozoic age. Includes the Wissahickon Formation and related rocks of the Potomac-Philadelphia-Hartland terrane of Late Proterozoic, Cambrian, and Ordovician age (Volkert and others, 1996; Schenck and others, 2000). Is entirely covered by surficial deposits or Coastal Plain formations in the map area but the unit is penetrated by boreholes. It was also observed in a subsurface excavation near Thompson Point northwest of Gibbstown, which exposed intercalated hornblende gneiss, mica schist, pegmatite, and thin felsic gneiss bands, with an overall foliation trending due north to N15°W with vertical to 65° southeast dip (F. J. Markewicz and H. F. Kasabach, written communication, 1967). In the area west of Oldmans Creek, unit OCZu may include rocks correlative to the Wilmington complex, of Ordovician and Silurian age, in the Delaware and Pennsylvania Piedmont (Schenck and others, 2000). Borings "Sun 2" and "Sun 3" penetrated rock described as diorite, a lithology indicative of the Wilmington complex, whereas logs for most other wells and borings penetrating unit OCZu typically report gneiss and schist, which are characteristic of the Wissahickon Formation.

MAP SYMBOLS

Contact--Approximately located. Triangle indicates contact observed in outcrop.

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

● B47 -147 OCZu — Well or boring, location accurate to within 200 feet--Number followed by map-unit symbol is depth, in feet below land surface, of base of unit (or top of bedrock for unit OCZu) as inferred from driller's log or geophysical log. Identifiers of the form "15-xxx" are U. S. Geological Survey Ground Water Site Inventory numbers. Identifiers of the form "30-xxxx" are N. J. Department of Environmental Protection well permit numbers. Identifiers of the form "Bxxx" are borings drilled for the Commodore Barry bridge (provided courtesy of the Delaware River Port Authority). Identifiers of the form "Sun x", "2xx+xx", "PGS-TH-x" and "MW-x" are borings or monitoring wells with logs on file at the N. J. Geological Survey. Identifiers of the form "MW-xxD", "05-xxx-x", "03-xxx-x", "98-xxx-x", and "LPA-xxx" are from Jengo (2006).

15-47 ->147 Kmg — Well or boring, location accurate to within 1000 feet--Identifiers and symbols as above.

Surficial deposits--On sections, shown where more than 10 feet thick.

30-739 E, 15-378 G — Geophysical log--On sections. "G" indicates gamma-ray log, shown as a single red line, intensity increasing to right. "E" indicates electric log, shown as paired blue lines, with spontaneous potential shown on left-hand curve (voltage increasing to right) and resistance shown on right-hand curve (resistance increasing to right).

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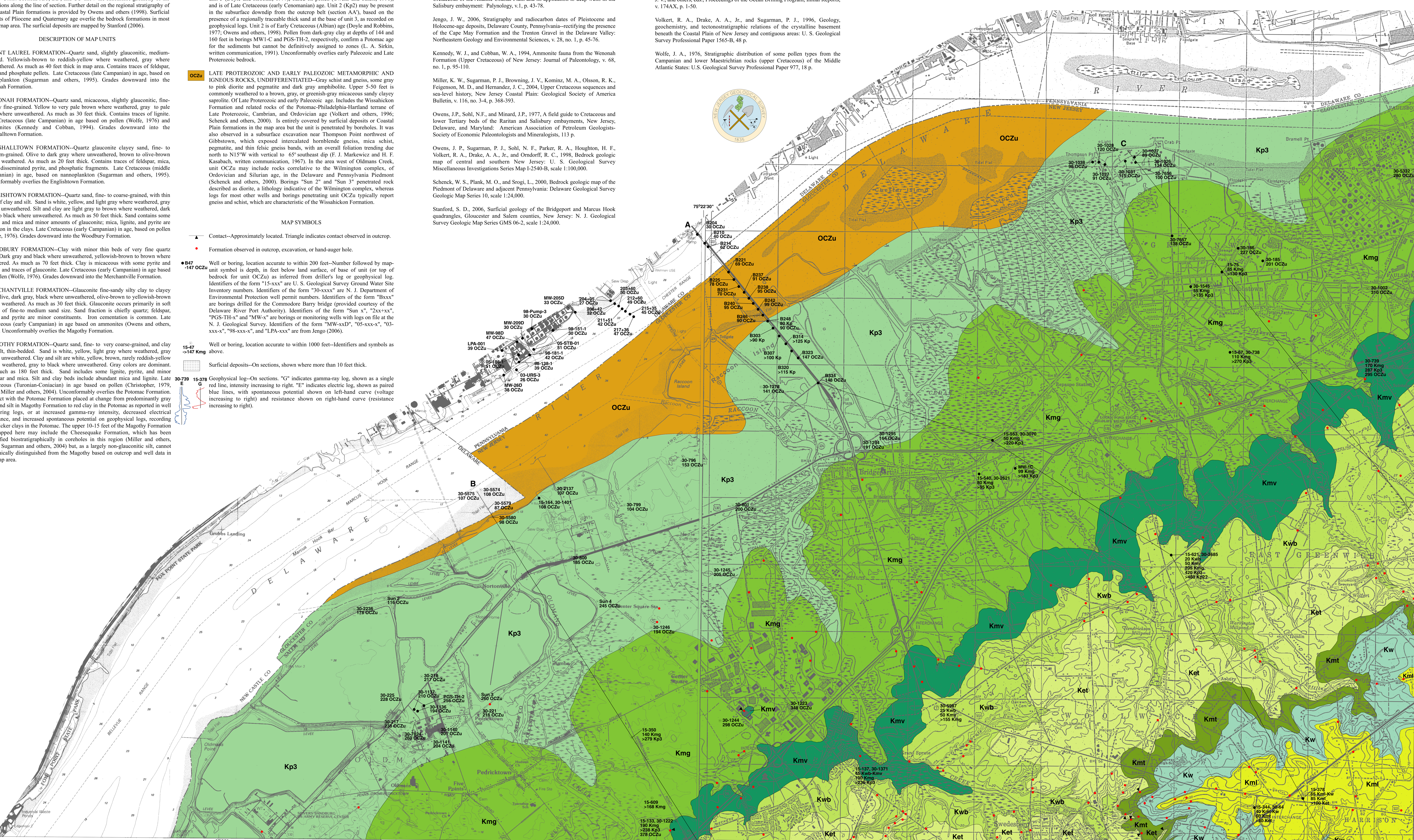
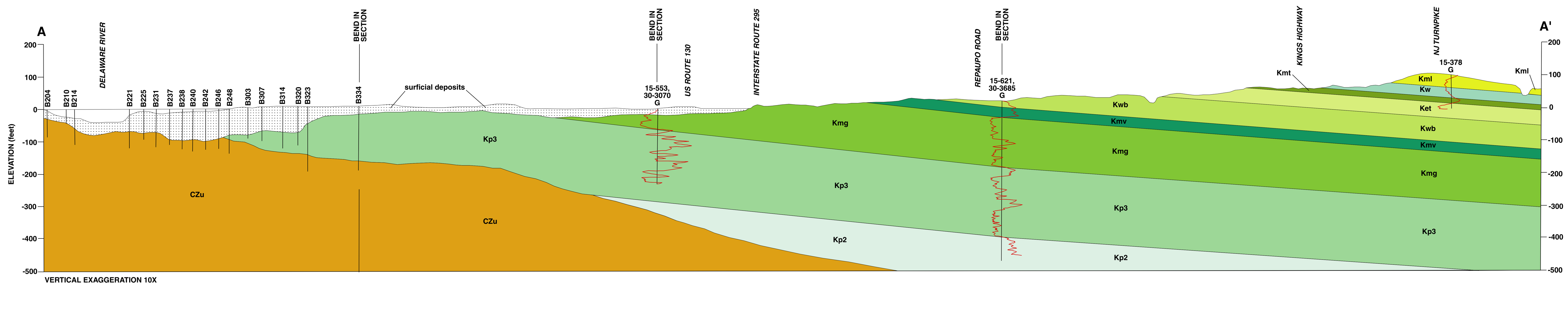
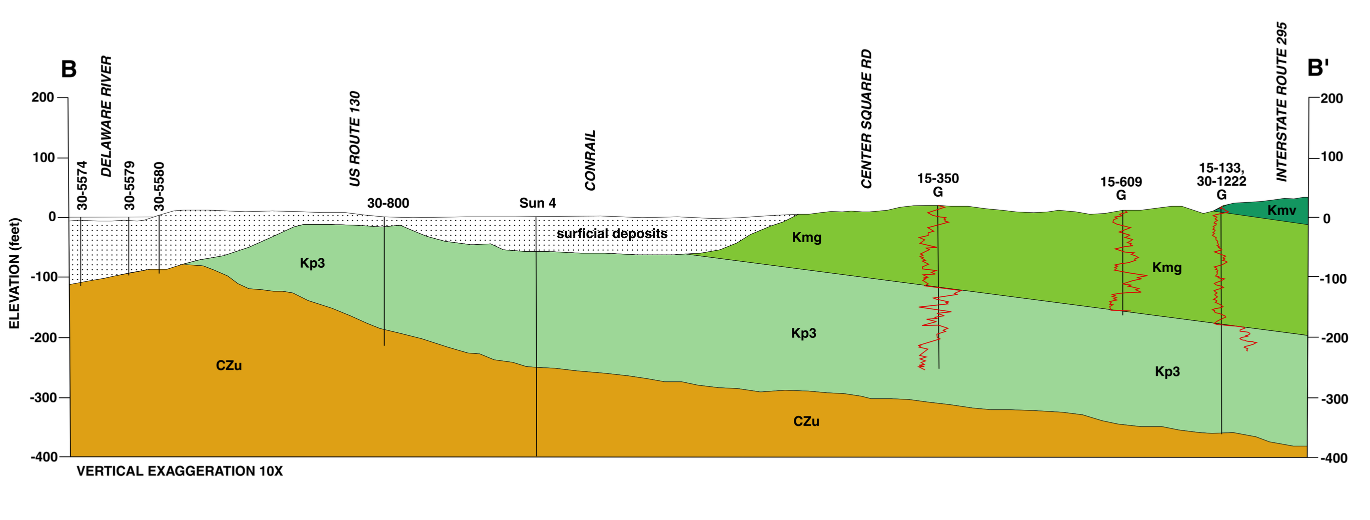


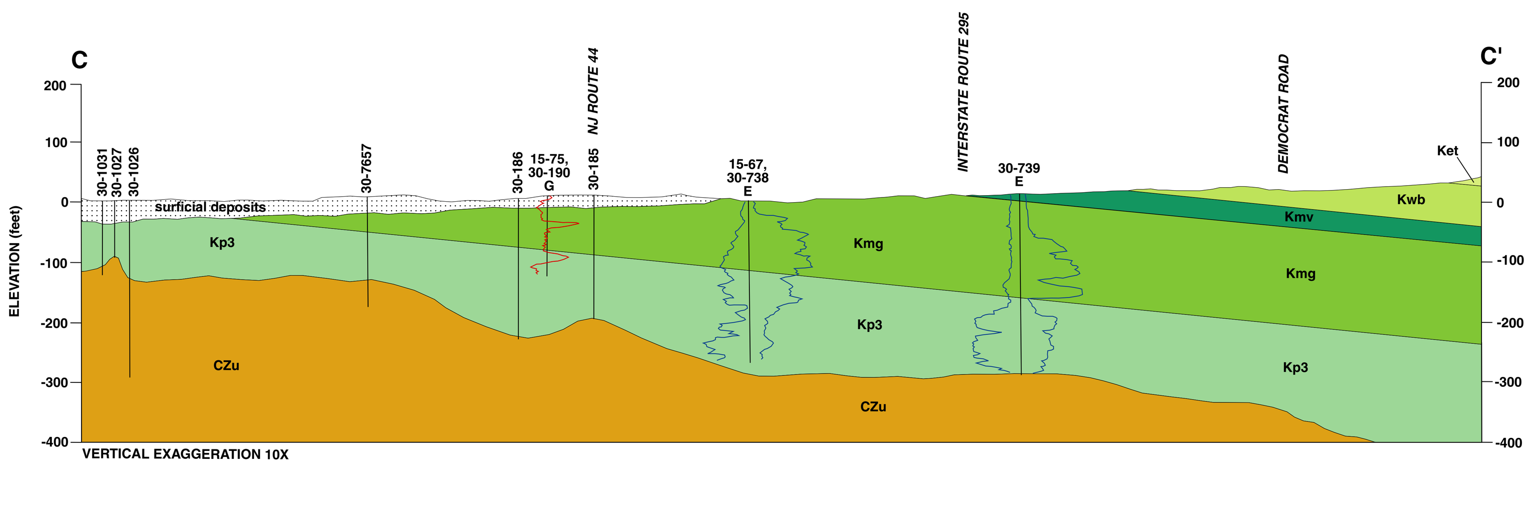
Base from U. S. Geological Survey Bridgeport and Marcus Hook quadrangles, 1995

PENNS GROVE — WOODSTOWN

Geology mapped 2001-2002
Cartography by S. Stanford and M. Girard







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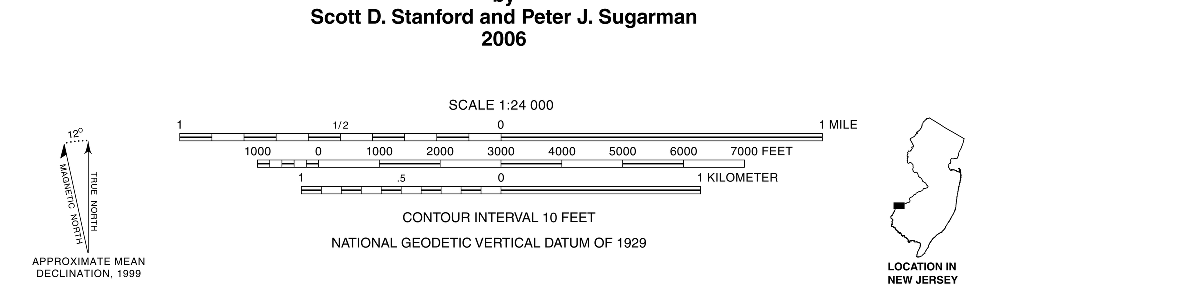
2006



CORRELATION OF MAP UNITS