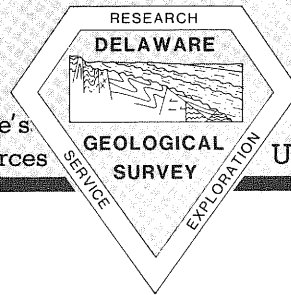


# First State Geology

Current information about Delaware's geology, hydrology and mineral resources



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## State Boundary Monument Restoration

One hundred and forty-nine monuments mark Delaware's common boundaries with Maryland, Pennsylvania, and New Jersey. In response to a growing awareness of the poor condition of many of the markers, the Delaware General Assembly provided funding for restoration work to the State Boundary Commission through its Chairman, Robert R. Jordan, at the Delaware Geological Survey.

Restoration began at the southwest corner of the State at the Mason-Dixon stone called Middle Point (Figure 1). This stone marks the middle of the

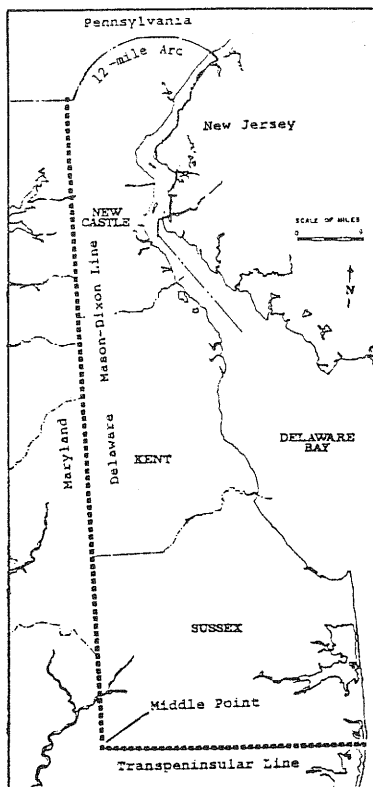


Figure 1. Map of Delaware's boundaries. Solid squares mark locations of monuments on Mason-Dixon and Transpeninsular lines.



Figure 2. Base of vandalized Middle Point stone.

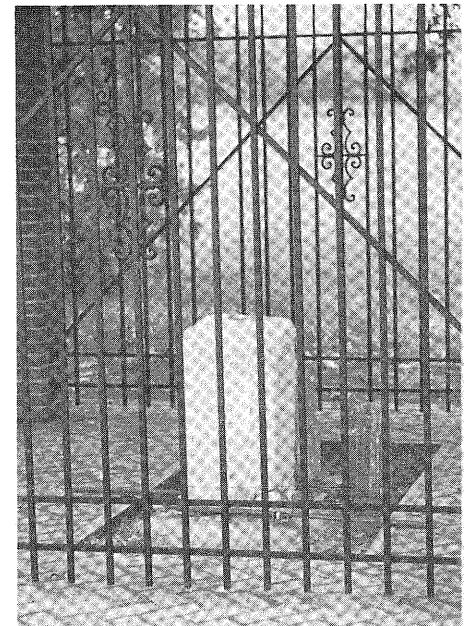


Figure 3. Reset Middle Point stone and protective grill.

Delmarva Peninsula and the point where Mason and Dixon started north to the 12-mile arc. A protective pavilion was erected in 1961 by the Daughters of the American Revolution. In May 1983, vandals tore the monument from its base, apparently by using a chain attached to the bumper of a car. The damaged base is shown in Figure 2. On October 24, 1985, the states of Delaware and Maryland, with help from the National Geodetic Survey, reset Middle Point in its original position. Cosmetic masonry work was done and a protective grill, extending from floor to ceiling, was installed to prevent further vandalism (Figure 3).

After Middle Point was restored, the Commission had one mark reset and resurveyed, one monument moved to safe-keeping within the Middle Point Pavilion, and protective steel I-beams placed around three other monuments along the east-west Transpeninsular Line. Work along this boundary line has now been completed and a formal agreement confirming the reestablishment of the line has been drawn for

consideration in both states.

Restoration is nearly finished on the more than 220-year-old Mason-Dixon Line monuments marking Delaware's western boundary with Maryland. Four monuments were reset and resurveyed, eight monuments protected with steel I-beams, and eight are awaiting cosmetic repairs.

Also, the Boundary Commission has executed a joint agreement with the Commonwealth of Pennsylvania to protect, replace, and repair the monuments marking the Delaware-Pennsylvania boundary. The Commission is also working with New Jersey toward a joint agreement to repair the six Delaware-New Jersey boundary reference monuments along the portion of the States' common boundary within the 12-mile arc. A contract has been proposed for survey and remonumentation work along these boundaries. William S. Schenck, DGS Research Associate II, manages the restoration project for the State Boundary Commission through the DGS.

# Geologic Map of South Central Kent County

A geologic map entitled "Geology of South Central Kent County, Delaware" by Richard N. Benson and Thomas E. Pickett has recently been released. It is the seventh in the Geologic Map Series published by the DGS. At a scale of 1:24,000, it covers all or parts of four topographic quadrangles aligned east-west across Delaware, just south of Dover. The up-dip-projected, subcropping geologic contact between the Calvert and Choptank formations is mapped as offset by a fault postulated from analysis of subsurface drill hole data and Landsat imagery. A cross-section using these data illustrates a horst-graben structural style offsetting key subsurface geologic contacts. An inset map showing altitude of the pre-Coastal Plain surface (basement) includes postulated faults that offset that surface. A detailed overlay shows thickness contours (isopachs) of the surficial Columbia Formation sands and gravels. The thickest portion of the Columbia is an east-west band across the center of the map that coincides with a paleovalley tributary to the ancient Delaware River to the east. Another overlay illustrates thickness contours of Holocene tidal marsh sediments. A discussion accompanies the map.

Maps in the Geologic Map Series are published as scientific reports but are not just for the geologist alone. The aim also is to provide for the widest possible practical use that includes information on mineral resources (mostly sand and gravel) and availability of potential water-yielding geologic units (aquifers). Over half of Delaware has been mapped. The remainder of the State will be mapped at a rate of about one map per year. The next map in the series will include the Milford area.

## DGSCIC Data Base

Tracy S. Stapleford

The Delaware Geological Survey's Cartographic Information Center (DGSCIC) is a focal point for questions concerning all types of cartographic products. The Center's computer data bases provide information about the location and availability of maps, charts, aerial photography, boundary marks, and vertical geodetic control throughout the State of Delaware. It was compiled from an inventory of State, county, and local agencies. Computer searches are conducted using key words such as date, scale,

city, county, topographic quadrangle, and/or a map/photo identifier to help define specific types of maps or photos. The DGSCIC can provide a computer printout of the data available with the name, address, and phone number of the contact person in the agency holding the cartographic product of interest.

Through the Center's affiliation with the U. S. Geological Survey's (USGS) National Cartographic Information Center (NCIC) in Reston, Virginia, information is available for all cartographic materials covering the United States produced by federal agencies. The major objective of the DGSCIC is to provide access to the many public resources which are available.

Requests for additional information can be directed to: DGSCIC, University of Delaware, Newark, Delaware 19716. The DGSCIC can help locate and order the cartographic products in the following list. Those the DGSCIC can provide are noted with an asterisk(\*).

### Aerial Photography

Access to federal, State, and private sources through NCIC's Aerial Photography Summary Record System (APSRs).

Flight lines for National Ocean Service (NOS), National Aeronautics and Space Administration (NASA), and National High Altitude Photography (NHAP) with order forms.

\* Computer searches and listings from the main aircraft accessions file at EROS Data Center for anywhere in the continental U. S.

Agricultural Stabilization and Conservation Service photography.

Side Looking Airborne Radar (SLAR).

\* Computer listing of photography over any area of Delaware from the statewide data base.

\* Coastal orthophotoquads in Delaware.

\* Reproducible film positives of quad-centered NHAP photography over most of the State between 1977-1982.

### Space Imagery

\* Computer searches and listings from the main LANDSAT accessions file at EOSAT for images anywhere in the world from LANDSAT 1, 2, 3, 4, and 5.

Large Format Camera Images of shuttle mission 41-G, October 1984.

Manned space craft missions photography.

\* Ordering information and order forms for LANDSAT and other available space imagery.

### Geodetic Control

\* Computer-searchable data base of all federal vertical control in Delaware with listings available.

Current NGS horizontal control information on file.

\* Computer-searchable data base of information on the condition of Delaware's boundary marks (including Mason-Dixon monuments).

### Maps and Charts

\* Over the counter sales of USGS topographic maps of Delaware with the capability of ordering all other USGS maps.

\* All DGS maps and atlases.

Thematic maps and atlases for the United States from federal and State agencies.

\* Computer listing from the statewide data base of maps for any area in Delaware.

\* Flood Prone Area maps.

\* Flood Insurance Rate Maps for Delaware communities and counties. (Repository of current maps kept at DGSCIC).

Access to NCIC Map and Chart Information System.

Historic and out-of-print USGS maps.

NOAA marine and aeronautical charts.

Map separates and composites of USGS topographic maps.

### NCIC State Affiliates

\* There are 43 State Affiliates linking the Nation to the NCIC. Address information is available from DGSCIC.

## SMAC Meeting

On April 23 the DGS hosted the annual meeting of the State Mapping Advisory Committee, chaired by Thomas E. Pickett. The purpose of the Committee is to coordinate State mapping activities and needs and present unified recommendations to the U. S. Geological Survey for its topographic mapping efforts in Delaware. The new chief of the USGS Eastern Mapping Center, Eric Anderson, spoke on State-federal relationships. The meeting was open to all in the State who might have an interest in maps or are involved in mapping. William S. Schenck discussed the status of mapping in Delaware and described the functions of the DGS Cartographic Information Center.

## Dissolved-Sodium Anomaly in Piney Point Ground Waters

A recently published study by Nenad Spoljaric discusses the causes of elevated sodium concentrations in ground water in central Delaware. In the greater Dover area sodium concentrations in well waters from the glauconitic Piney Point Formation commonly exceed 100 parts per million. Investigation of chemical characteristics of the water and statistical analyses of the results show that these high concentrations are due to a natural ion-exchange process. Calcium dissolved in ground water replaces sodium in the mineral glauconite, thus releasing sodium to the ground water.

The mass of sodium in the glauconite fraction of the Piney Point formation in the area studied was calculated to be about 14,500 tons. Most of this sodium is available for exchange by calcium. However, as a result of extensive pumpage of water from the Piney Point Formation, a large cone of depression has developed that causes sodium-enriched water from the formation outside of the study area to be drawn into the Dover area. Thus the actual mass of sodium available for the exchange process greatly exceeds 14,500 tons.

The problem of relatively high sodium content in the eastern United States is much more common than usually assumed. Waters low in dissolved solids and in which calcium has been depleted and sodium increased through natural cation exchange processes are indeed common in sediments of the Atlantic Coastal Plain.

At present there is no method to stop or reverse this natural process. Sodium in the concentrations measured is considered generally safe for human consumption. However, people who are on low-sodium or sodium-free diets may be advised either to use appropriate filters to remove sodium from drinking water or to look for alternate sources of water suitable for their diets.

The Report of Investigations No. 40, entitled "Sodium Concentrations in Water from the Piney Point Formation, Dover Area, Delaware" is available on request from the Survey's office at the University of Delaware.

## The Deep Cut of the Chesapeake and Delaware Canal

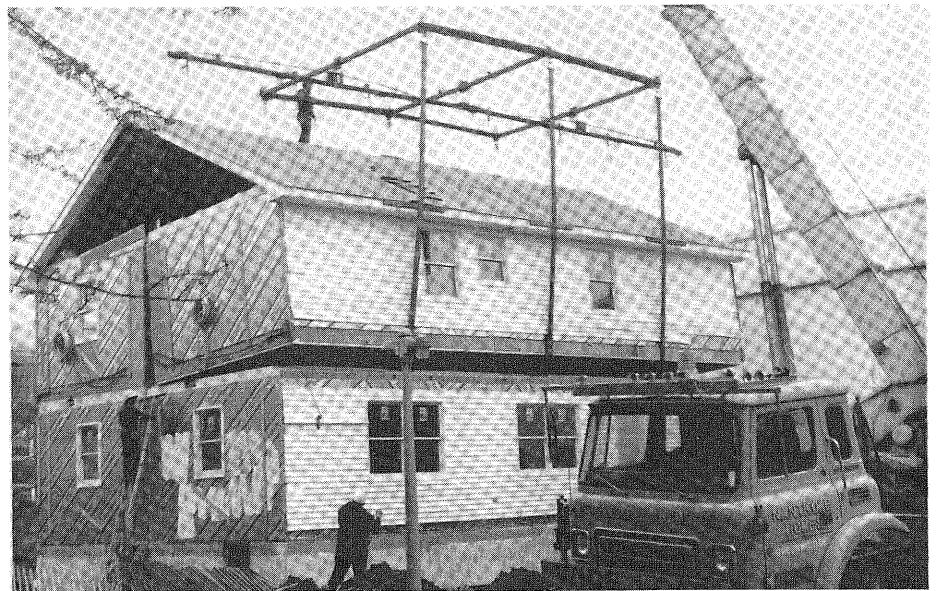


The above photograph depicts the remnants of a previously more continuous outcrop of marine Cretaceous rocks along the Chesapeake and Delaware Canal. The Deep Cut was so named because it was the section of the canal that required the most digging during construction in the 1820s. It is in the drainage divide of the Delmarva Peninsula with elevations up to 70 feet above sea level in the area between the Summit Bridge (Route 896) and the Conrail Bridge just east.

Over the past 30 years the DGS has worked closely with the U. S. Army Corps of Engineers, which has

jurisdiction over the Canal Reservation, the Delaware Congressional Delegation, the Department of Natural Resources and Environmental Control, the Delaware Nature Education Society and others to endeavor to preserve this important bluff. It is the best exposure of Coastal Plain strata in the State and one of the best in the northern Atlantic Coastal Plain. Maintaining the present exposure by not bulldozing the bluff and covering it with stone rip-rap ensures an opportunity for future generations to study the sedimentary and fossil record of the Late Cretaceous marine seas that covered this portion of Delaware.

## Building Replaces Trailers



Members of the DGS who for some years have "made do" with quarters in office trailers will be soon moving to a new facility. The General Assembly provided that a small office building, to be completed in June, be constructed to replace the trailers. The above photograph shows the final assembly of

the building's modular units that were shipped to the site located just to the east of (behind) DGS headquarters in Penny Hall. The building will house six staff members and allow improved public access to the Cartographic Information Center.

# DGS Meeting on Sussex County Water Resources Projects

The DGS presented a progress report on several eastern Sussex County water resources-related projects at a public meeting held March 26 in Rehoboth Beach. The presentations given by Robert R. Jordan, Kenneth D. Woodruff, John H. Talley, and A. Scott Andres focused on the availability of fresh water and on publicizing the ongoing projects in the coastal Sussex County area.

There is an abundance of fresh water, but the water is not always available where it is needed. A water supply and sewage disposal plan of regional scope is needed to ensure an adequate, good-quality supply of water. The DGS work will contribute toward such a plan. Results of the Survey's work will be published as a series of maps and reports over the next year. Persons interested in obtaining additional information should contact John Talley or Scott Andres at 451-2833.

## Penny Hall Portrait

In April, the DGS received a gift of a 1958 oil painting of Penny Hall, which we share with the Department of Geology. The painting is approximately 3 by 4 feet and depicts the building after a snow storm. It first hung in the office of the late William Batt, Director of the Biochemical Foundation which occupied the building before the University acquired it in the 1960s. Mrs. Batt donated the painting which now hangs in the foyer of Penny Hall.

## Publications

### Recent DGS Publications

#### Reports of Investigations

- No. 40 Sodium Concentrations in Water from the Piney Point Formation, Dover Area, Delaware: N. Spoljaric, 1986, 14p.

#### Geologic Map Series

- No. 7 Geology of South-Central Kent County Area, Delaware: R. N. Benson and T. E. Pickett, 1986, scale 1:24,000.

#### Hydrologic Map Series

- No. 5 Geohydrology of the Northern Coastal Area, Delaware: A. S. Andres, 1986, scale 1:24,000.  
No. 6 Geohydrology of the Chesapeake and Delaware Canal Area, Delaware: K. D. Woodruff, 1986, scale 1:24,000

#### Open File Reports

- No. 30 Evaluation of Remote Sensing and Surface Geophysical Methods for Locating Underground Storage Tanks: A. S. Andres, 1986, 8 p.

#### Delaware Geological Survey Atlas

- Taylor's Bridge Quadrangle (TAB): N. Spoljaric, editor, 1986, 9 p.

#### Miscellaneous Map Series

- No. 1 Availability of Earth Science Maps of Delaware: W. S. Schenck, 1986 (revised).

#### Information Series

- No. 1 Delaware Geological Survey Cartographic Information Center: W. S. Schenck, 1986.  
No. 2 Domestic Water Well Construction: J. H. Talley, 1986.

#### Forthcoming DGS Publications

- Seismic Stratigraphy along Three Multichannel Seismic Reflection Profiles off Delaware's coast: R. N. Benson, A. S. Andres, J. Roberts, and K. D. Woodruff.

List of Publications: 1986, J. H. Talley and D. C. Windish.

## Staff Notes

Three DGS staff members were among those professional employees recognized for length-of-service milestones by the University of Delaware on May 22. **Nenad Spoljaric**, Senior Scientist, and **Kenneth D. Woodruff**, Associate Director, received awards for twenty years of service. **William S. Schenck**, Research Associate II, was presented with a five-year service award.

**Richard N. Benson**, Senior Scientist, represented Delaware at the April 24 Plenary Regional Technical Working Group Meeting of the Minerals Management Service, Atlantic OCS Region, Tysons Corner, Virginia.

**Robert R. Jordan**, State Geologist and Director, presented the rationale for research on the mid-Atlantic continental margin to the "EDGE" Workshop convened by the Houston Area Research Council, The Woodlands, Texas, March 5-6. The workshop was a planning meeting for the formation of an organization to facilitate seismic exploration of the deep crust of the U. S. continental margins. Jordan also represented the State of Delaware at the meeting of the Outer Continental Shelf Policy Committee at Charleston, South Carolina, March 12-13. The Committee advises the Secretary of the Interior about oil and gas leasing and environmental protection of the continental shelves of the U.S. Jordan's

other activities include the Liaison Committee of the Association of American State Geologists, which met with federal officials in Washington, D.C., April 14-16 to discuss coordination of federal and State geologic programs. Jordan's recent appointments include election as an Alternate to the House of Delegates of the American Association of Petroleum Geologists, and being named to the Steering Committee of Delaware's Environmental Legacy, a new environmental initiative announced by Governor Castle.

**Thomas E. Pickett**, Associate Director, presented an invited seminar, "Coastal Stratigraphy from Devon to Kent, England," on January 30 at the Department of Geology, College of William and Mary, Williamsburg, Virginia. He led a field trip to selected geologic sites in New Castle County for the Delaware Nature Education Society, March 15. Pickett and **Nenad Spoljaric**, Senior Scientist, served as judges of student oral presentations for the Delaware Junior Science Symposium held March 19 in Clayton Hall.

**John H. Talley**, Hydrogeologist, gave a talk on "Ground Water Resources in the Delaware Piedmont" at the Annual Meeting of the Centerville Civic Association, April 8. Talley also was named to the Water Resources Technical Coordinating Committee for the Water Resources Agency for New Castle County. As a member of the Delaware Water Well Contractors Licensing Board, he was involved in the writing of revised regulations governing the construction of water wells. Talley and Richard N. Benson are co-principal investigators for third-year funding of \$25,250 from the U. S. Department of Interior's Minerals Management Service under the cooperative agreement between that agency and the Association of American State Geologists. Two stratigraphic test wells will be drilled in coastal Delaware as part of a continuing study of the geologic framework and hydrocarbon potential offshore Delaware Bay.

**Kenneth D. Woodruff**, Associate Director, gave talks on "Earthquakes in Delaware," at the Geology Department weekly seminar, University of Delaware, February 20, and at Brandywine State Park, April 9.