First State Geology

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

RESEARCH · DELAWARE GEOLOGICAL SURVEY · SERVICE · EXPLORATION

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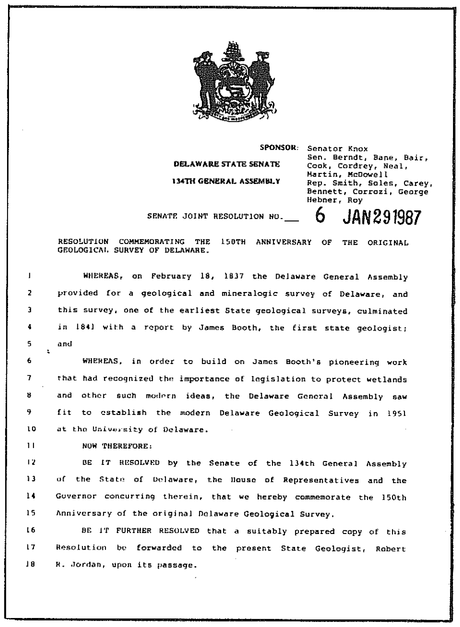
Joint Resolution Commemorates Original Delaware Geological Survey

On January 29, 1987, the 194th General Assembly passed Joint Resolution No. 6, commemorating the 150th anniversary of the original Delaware Geological Survey. Senator Andrew Knox initiated the resolution, which recognizes the legislation passed on February 18, 1837, that created the first "geologic and mineralogic survey of the State."

The 1830s was an important time for the initiation of State geological surveys. Most of those original geological surveys were short-lived and truly "surveys," but they were reestablished later and the name "survey" still applied in the sense of a continual, updating inventory of geological resources and processes. For example, geological surveys of Pennsylvania, Maryland, New Jersey, Ohio, and Virginia were all begun in the mid-1830s.

Delaware's survey was made by James C. Booth starting in 1837 and ending in 1841 with the publication of a report. The General Assembly passed legislation reestablishing the Survey in 1951. The University of Delaware was made the parent institution, and Johan J. Groot was named State Geologist. His successor is the current State Geologist, Robert R. Jordan. Dr. Groot is still associated with the DGS, where he is studying fossil pollen as an aid to understanding Delaware's stratigraphy and ancient climates.



SPONSOR: Senator Knox
Sen. Berndt, Bane, Bair, Cook, Cordrey, Neal, Martin, McDowell
Rep. Smith, Soles, Carey, Bennett, Corrozi, George Hebner, Roy

DELAWARE STATE SENATE
134TH GENERAL ASSEMBLY

SENATE JOINT RESOLUTION NO. 6 JAN 29 1987

RESOLUTION COMMEMORATING THE 150TH ANNIVERSARY OF THE ORIGINAL GEOLOGICAL SURVEY OF DELAWARE.

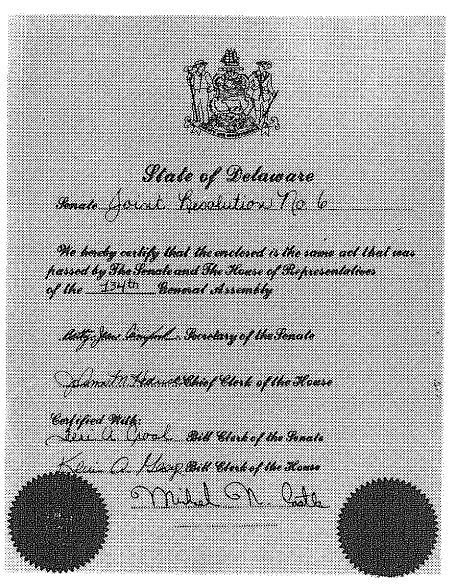
WHEREAS, on February 18, 1837 the Delaware General Assembly provided for a geological and mineralogic survey of Delaware, and this survey, one of the earliest State geological surveys, culminated in 1841 with a report by James Booth, the first state geologist; and

WHEREAS, in order to build on James Booth's pioneering work that had recognized the importance of legislation to protect wetlands and other such modern ideas, the Delaware General Assembly saw fit to establish the modern Delaware Geological Survey in 1951 at the University of Delaware.

NOW THEREFORE:

BE IT RESOLVED by the Senate of the 134th General Assembly of the State of Delaware, the House of Representatives and the Governor concurring therein, that we hereby commemorate the 150th Anniversary of the original Delaware Geological Survey.

BE IT FURTHER RESOLVED that a suitably prepared copy of this Resolution be forwarded to the present State Geologist, Robert R. Jordan, upon its passage.



State of Delaware

Senate Joint Resolution No 6

We hereby certify that the enclosed is the same act that was passed by The Senate and The House of Representatives of the 134th General Assembly

Secretary of the Senate

Chief Clerk of the House

Certified With:

Bill Clerk of the Senate

Bill Clerk of the House

James Booth Papers Acquired by Morris Library

In 1986 the University of Delaware's Morris Library acquired many of the personal papers of James C. Booth (1810-1888), Delaware's first State Geologist (1837-1841). Thomas Pickett, DGS Associate Director, is examining the material to see what can be learned of the early investigations of the State's geology as well as about Booth and his and others' contributions to 19th century science.

Over 3,000 unsorted items include letters, manuscripts, field notebooks, ephemera, bills, receipts, and many letters to and from Booth. Many of the letters to his mother reveal details of field work and comments interesting and useful for modern geologists, for example, "...the greensand in the Odessa area makes it the best farming land in the State." Other letters to notable 19th century scientists, such as Joseph Henry of the Smithsonian, Benjamin Silliman, Jons Jakob Berzelius, and Charles Goodyear, reveal behind-the-scenes intricacies of 19th century science.

The study of the history of geology sometimes yields details of "lost" outcrops or ideas long forgotten that are useful to modern geologists. For example, Booth's geologic field notebook for the summer of 1837 includes details of geology along Duck Creek around Smyrna and in other nearby areas that have proved useful in present-day geologic mapping there.

James Booth was a native of the town of New Castle. He was primarily a chemist and probably the first American to study analytical chemistry in Germany. He came back to the Philadelphia area and established an analytical laboratory and school. In 1836 he joined the first Pennsylvania

Geological Survey which, during that summer field season, unlocked the key to understanding the Appalachian mountain system by determining the sequence of strata exposed in the Valley and Ridge Province. In 1837 the State of Delaware hired him to do the Delaware survey. After publication of "A Memoir of the Geological Survey of the State of Delaware" in 1841, Booth spent most of the rest of his life as Refiner and Melter of the U. S. Mint in Philadelphia and continued to run his own analytical lab (still existing in Ambler, Pennsylvania).

The DGS plans to publish more from the Booth papers as they are classified and examined at length.

First State Geology is published by the Delaware Geological Survey, a State agency established by an Act of the Delaware General Assembly in 1951 and organized as a unit of the University of Delaware.

Robert R. Jordan,
State Geologist and Director
Richard N. Benson,
Editor, First State Geology

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Seismic Stratigraphy off Delaware's Atlantic Coast

The DGS has published stratigraphic interpretations of marine seismic reflection profiles run in 1976 and 1983 off Delaware's Atlantic coast. Authored by Richard N. Benson, A. Scott Andres, John H. Roberts, and Kenneth D. Woodruff, the report is entitled "Seismic Stratigraphy Along Three Multichannel Seismic Reflection Profiles off Delaware's Coast" and is published as Miscellaneous Map Series No. 4.

All three profiles and their interpretations are on one large sheet and the text is on the reverse. The profiles are records of seismic energy reflected off underground rock layers as deep as 30,000-35,000 feet.

Two of the three profiles are three-second two-way travel time records of a high-resolution electric sparker survey, one profile parallel to the Atlantic coast for 35 miles from Delaware Bay to offshore Ocean City, Md., and the other extending for over 10 miles offshore from Ocean City. The third profile is a six-second record of an air-gun seismic energy source. It extends 30 miles southeasterly from near the entrance to Delaware Bay.

Interpretations of the records show presumed early Mesozoic rift basins beneath an unconformity represented in many places by a prominent reflector. Subparallel reflectors above the unconformity represent sedimentary rocks of the U. S. Atlantic continental margin that were deposited after the continents of Africa and North America began to drift away from each other. Those reflectors represent rocks ranging in age from Late Jurassic to Quaternary as determined by correlation with both onshore and offshore drill-hole data.

The publication presents much new information and provides an important link between the onshore geology of the Atlantic Coastal Plain of Delaware and the offshore geology of the Baltimore Canyon trough.

Hydrology News

Discharge of Fresh Ground Water to Rehoboth and Indian River Bays

The results of a recent ground-water modeling study are contained in a new publication entitled "Estimate of Direct Discharge of Fresh Ground Water to Rehoboth and Indian River Bays." The report, by A. Scott Andres, includes discussions of study methodology, aquifer characteristics, and model results.

Published as DGS Report of Investigations No. 43, it is another product of the Survey's intensive study of the water resources and geology of eastern Sussex County and the Inland Bays region. The research was partly funded by the Department of Natural Resources and Environmental Control and will be useful to that agency's management of the area's water resources.

A water-budget model and a flow-net model were used to estimate the rate of ground-water discharge to Rehoboth and Indian River bays. The results indicate that the rate of fresh ground-water discharge is in the range of 21 to 43 million gallons per day. These numbers should be used only as gross indicators of actual conditions because of data gaps and the simplifying assumptions used in the models. However, the estimated discharge rates are significant and should be useful in studies of the water budget of the bays and of effects of development along their shores.

Northern Atlantic Coastal Area

Geohydrologic information pertaining to the Columbia aquifer is shown on Sheet 2 of Hydrologic Map Series No. 5, "Geohydrology of the Northern Coastal Area, Delaware." The map, by A. Scott Andres, includes the Lewes, Cape Henlopen, Fairmount, and Rehoboth Beach 7.5-minute quadrangles. The map area is part of the rapidly developing Inland Bays region.

The near-surface Columbia aquifer is the primary source of fresh water for most municipal, domestic, industrial, and agricultural supplies in this area. Its near-surface position also makes the aquifer particularly vulnerable to contamination by surficial sources. Development of the area will place an increased demand on the aquifer for both water supply and wastewater disposal. This map, along with companion DGS publications Sheet 1 of Hydrologic Map Series No. 5, Special Publication No. 14, and Hydrologic Map Series No. 7 provide information that should be useful in the management of the area's water resources.

The map shows several cross-sections, elevation of the base of the aquifer, and ground-water flow patterns as interpreted from drilling records and water-level data. Brief discussions of aquifer characteristics and aquifer hydrology are also presented.

Hydrologic Data, Coastal Sussex County

Hydrologic data for Coastal Sussex County are contained in DGS Special Publication No. 14, entitled "Basic Hydrologic Data for Coastal Sussex County, Delaware" by John H. Talley and A. Scott Andres. The report area extends from Primehook Beach on the north to Selbyville on the south, and east to the Atlantic Ocean. It includes the Inland Bays region.

The publication contains specific information on 425 selected wells, historic and current water levels and associated hydrographs for 36 wells, detailed water quality data for 88 wells, and hydraulic characteristics for 94 wells. Also included are data on stream discharges, tide levels, and long-term precipitation. The report can be used in conjunction with DGS Hydrologic Map Series Nos. 5 ("Geohydrology of the Northern Coastal Area") and 7 ("Geohydrology of the Southern Coastal Area").

Southern Atlantic Coastal Area

Basic geohydrologic data for the southern Atlantic coastal area are presented on Sheet 1 of Hydrologic Map Series No. 7, entitled "Geohydrology of the Southern Coastal Area, Delaware," by John H. Talley. The mapped area extends from Long Neck on the north to the Delaware-Maryland boundary on the south, and from a line running north-south through Dagsboro east to the Atlantic Ocean. Designed to provide information on the occurrence, availability, quantity, and quality of ground water as well as data pertaining to precipitation, surface-water streamflow, and tide levels, the map is of use to planners, managers, consultants, municipal officials, residents, and others who are concerned with the development and management of ground- and surface-water resources in the area.

Locations of high-yielding wells, selected geologic test borings, observation wells, tide gages, stream gages, water-level hydrographs, and a geologic cross-section showing the lateral and vertical distribution of individual aquifers in the map area are depicted.

Ground Water in Delaware

DGS Information Series No. 3, entitled "Ground Water in Delaware," by Kenneth D. Woodruff was written primarily for homeowners and others interested in general background information on ground water. The brochure describes how ground water originates, the various subsurface zones containing water, and how the amount available is controlled by rainfall and local geology.

Domestic Water Systems

DGS Information Series No. 4, entitled "Domestic Water Systems," by John H. Talley contains information on the primary requirements of an individual water system, operation of the system, and system components including well pumps and storage tanks. Also included is information on selecting a contractor and criteria used to estimate construction costs. The brochure is designed to be used in conjunction with Information Series Nos. 2 ("Domestic Water Well Construction") and 3 ("Ground Water in Delaware").

New Castle County Project

The DGS has initiated a project with the Water Resources Agency for New Castle County to produce maps of four categories of Resource Protection Areas (Cockeysville RPA, Wellhead RPA, Surface Water RPA, and Recharge RPA) in the county.

Delaware Mineral Production

The Delaware Geological Survey and the U. S. Bureau of Mines (USBM), Department of the Interior, have a joint agreement to gather mineral production statistics. The results are published annually in the USBM Minerals Yearbook.

Sand and gravel are the principal minerals produced in Delaware's three counties. Annual production during the last few years has averaged over 1,000,000 tons at a value of more than $3,000,000. The product in the northern part of the State is generally more gravelly than to the south where it is finer-grained. The best deposits in New Castle County are generally near routes 13 and 896. In Kent and Sussex counties, the deposits are more uniformly spread out as they grade from fluvial in the north to marine in origin in southern Delaware.

The sand and gravel production in Delaware is probably under reported. Also, at least as much as is reported produced in the State is probably imported from nearby Maryland and Pennsylvania for construction use.

Other minerals and mineral commodities produced in Delaware are glauconitic greensand (for use in soil conditioning), refined petroleum products, magnesium compounds and aluminum hydroxide from sea water, petroleum coke, sulfuric acid, sulfur from the refining process, and slag (from steel processing).

Excluding refined petroleum products, the total annual mineral and mineral byproduct production in Delaware exceeds $30,000,000. In addition, chrome ore, gypsum, ilmenite, magnesium oxide, and manganese ore are shipped into the State for processing into higher value products.

Cartographic Corner

By W. S. Schenck
Coordinator, DGSCIC

- The Saint Georges USGS 7.5-minute quadrangle has been photo-revised as of 1985 and is now available.
- National Geodetic Survey (NGS) has sent out the new North American Datum of 1983 (NAD83) horizontal positions for all of the horizontal control points in Delaware. Anyone needing individual positions for horizontal control points in Delaware may contact the DGSCIC. Persons interested in purchasing the two-volume set of Delaware's listings may contact the National Geodetic Information Center at 301-443-8631.
- On May 12, 1987, the DGS hosted a meeting of the State Mapping Advisory Committee (SMAC) and its Digital Subcommittee. David R. Doyle, National Geodetic Survey, Horizontal Branch, discussed the new horizontal datum NAD83 and its implications for Delaware. A second talk by Lawrence Batten, U. S. Geological Survey, Office of Geographic and Cartographic Research, provided a general overview of Geographic Information Systems (GIS).
- The American Society of Photogrammetry and Remote Sensing (ASPRS), the American Congress on Surveying and Mapping (ACSM), and the University of California, Berkeley are sponsoring GIS'87, October 26-30, 1987, at the Nikko International Hotel, San Francisco, California. The meeting will focus on methods and management techniques that place geographic information systems *into the hands of the decision maker.* (ASPRS News Bulletin, April 22, 1987.)
- The Geographic Information Management Systems (GIMS) Committee of ASPRS/ACSM has released the first of a new series of publications. The volume, entitled *GIS for Resource Management: A Compendium,* introduces the techniques and functional capabilities of geographic information systems for managing natural resources. It includes articles on the use of GIS for land suitability studies, urban studies, water resource management, soil resource management, vegetation resource management, and global studies. The book also contains a bibliography of selected significant works published from January 1980 through December 1985. It may be purchased from ASPRS, 210 Little Falls Street, Falls Church, VA 22046. (ASPRS News Bulletin, April 22, 1987.)
- The Association of American Geographers (AAG) is convening the International Geographic Information Systems Symposium (IGIS'87), November 15-18, 1987, at the Hyatt Regency-Crystal City, Arlington, VA. They are calling for papers with abstracts due by June 1, 1987, but will accept poster session work until July 1, 1987. (AAG IGIS'87 call for papers announcement.)
- The North American Cartographic Information Society (NACIS) will be having its seventh annual meeting and

conference, NACIS VII, October 28-31, 1987. The conference is entitled *New Dimensions in Cartography* and will convene at the Radisson Inn and Conference Center, Atlanta, GA. NACIS VII will include a variety of paper and poster sessions, exhibits, cartographic field trips, and panel discussions with recognized authorities from government, private, and academic organizations. NACIS is currently calling for papers that relate to the theme of this year's meeting, with title and abstract information due no later than July 1, 1987. (Cartographic Information, Newsletter of NACIS, March 1987, No. 24:2.)

For further information on these items, please contact the Delaware Geological Survey Cartographic Information Center (DGSCIC) at 302-451-8262.

Publications

Recent DGS Publications

Reports of Investigations

No. 43. Estimate of Direct Discharge of Fresh Ground Water to Rehoboth and Indian River Bays: A. Scott Andres, in press.

Hydrologic Map Series

No. 5. Geohydrology of Northern Coastal Area, Delaware, Sheet 2. Geohydrology of the Columbia Aquifer: A. Scott Andres, in press.

No. 7. Geohydrology of Southern Coastal Area, Delaware, Sheet 1. Basic Geohydrologic Data: J. H. Talley, 1987.

Miscellaneous Map Series

No. 1. Availability of Earth Science Maps of Delaware: W. S. Schenck, 1987 (revised).

Information Series

No. 3. Ground Water in Delaware: K. D. Woodruff, 1986.

No. 4. Domestic Water Systems: J. H. Talley, 1987.

Special Publications

No. 14. Basic Hydrologic Data for Coastal Sussex County, Delaware: J. H. Talley and A. S. Andres, 1987, 101 pp.

Atlas Series

Middletown Quadrangle (MID) Atlas: N. Spoljaric, editor.

Cecilton Quadrangle (CEC) Atlas: N. Spoljaric, ed., in press.

Other Publications by DGS Staff

T. E. Pickett, 1987, Upper Cretaceous and Quaternary stratigraphy of the Chesapeake and Delaware Canal, in D. C. Roy, ed., Northeastern Section of the Geological Society of America Centennial Field Guide Volume 5, Geological Society of America, Boulder, CO, pp. 23-24.

Forthcoming DGS Publications

List of Publications 1987: J. H. Talley and D. C. Windish.

Special Publication No. 15: Delaware Geological Survey Laboratory Procedures Manual: compiled and edited by Michael G. Kramer.

Staff Notes

The DGS welcomes new staff member **Charles Thomas Smith,** Senior Research Technician, who joined us on April 27. Tom is a graduate of Pennsylvania State University. His primary responsibilities are laboratory operations and geophysical instrumentation. Tom replaces **Michael G. Kramer,** who left in February for a position with the DuPont Company.

With the completion of her DGS project work, **Tracy Stapleford** has accepted a position with Dunn Geoscience Corporation in Harrisburg, PA.

John H. Roberts completed his third and final semester as a DGS graduate research assistant under funding provided by the U. S. Department of Interior's Minerals Management Service. He is continuing his studies for the M.S. degree in geology at the University.

Through an arrangement with the University of Delaware, former State Geologist **Johan J. Groot** has returned to his specialized research area of palynology. He is working on the extensive collection of fossil pollen and spores that he developed during his years at the DGS from 1951 to 1969. His studies will be valuable to the DGS's research on stratigraphy and climatic history.

Congratulations to **Thomas E. Pickett,** Associate Director, who completed twenty years of service with the DGS. He received his length-of-service award from the University on May 27.

Richard N. Benson, Senior Scientist, attended the U. S. Geological Survey workshop on the geology of the early Mesozoic basins of eastern North America, May 11-14, Reston, VA.

Robert R. Jordan, State Geologist and Director, organized and chaired the symposium "Outlook for Employment in Hydrology and Hazardous Waste Management" at the Southwest Section Meeting of the American Association of Petroleum Geologists (AAPG) at Dallas, TX, March 23. He also presented a paper, "Opportunities in Hydrogeology," based on the findings of a committee on that subject that he chairs for AAPG. He has recently received the Certificate of Merit from AAPG. Also, Jordan was appointed to the Governmental Affairs Committee of the American Institute of Professional Geologists for the 1987-1989 term.

Thomas E. Pickett, Associate Director, serves on the Committee on Sea Level Rise of the Governor's Delaware Environmental Legacy Program. He spoke on Miocene geology at the meeting of the Kent County Archeological Society in Dover May 20. Pickett and Richard N. Benson represented DGS at the Pennsylvania Geological Survey's planning meeting on geologic mapping in southeastern Pennsylvania, at the Nolde Environmental Center near Reading, PA, on May 6.

W. S. Schenck, Research Associate II, was elected in January to serve as a member of the Executive Board of the North American Cartographic Information Society.

John H. Talley, Senior Scientist, gave a talk entitled "Our Water Supply" at the New Castle County Water Conservation Conference on Residential, Industrial, and Commercial Water Conservation, April 23.