WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY GROUND-WATER STUDIES IN DELAWARE

GROUND-WATER ISSUES

Ground water is an important natural resource in Delaware that supplies 67 percent of the population (about 400,000 people) with drinking water. In 1985, 79 million gallons of ground water were withdrawn daily in the State. Of that quantity, 37 percent was used for public supply, 26 percent was for agriculture, 20 percent was used by industry, 16 percent was for domestic and commercial use, and 1 percent was for thermoelectric-power generation. The major issues related to ground water in Delaware are:

- Contamination by agricultural chemicals and hazardous wastes,
- Effects of land use, and
- Declining water levels and intrusion of brackish water.

U.S. GEOLOGICAL SURVEY PROGRAMS

The U.S. Geological Survey (USGS), established in 1879, is the principal source of scientific and technical expertise in the earth sciences within the Federal government. USGS activities include research and services in the fields of geology, hydrology, and cartography. The mission of the Water Resources Division of the USGS is to develop and disseminate scientific information on the Nation's water resources. The activities of the Water Resources Division in Delaware are conducted by scientists and technicians in the Dover office.

Hydrologic stations are maintained at selected locations throughout Delaware to record data on stream discharge and stage, ground-water levels, and water quality. This information is stored in the USGS National Water Data Storage and Retrieval System data base, and the information commonly is used by planners and managers when making decisions that affect Delaware's water resources.

The USGS, in cooperation with the Delaware Geological Survey, maintains a Statewide network of 46 observation wells to monitor ground-water levels. Data from the observation-well program includes water-level fluctuations in relation to rainfall, drought, withdrawals, and other factors which are essential for the prudent development and management of Delaware's ground-water resources.

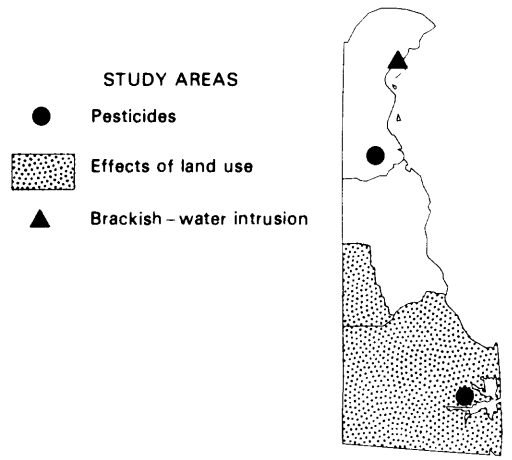
The USGS has conducted more than 20 hydrologic investigations in Delaware. In fiscal year 1988, the USGS entered into cost-sharing agreements with five Federal, State, and local agencies involving eight hydrologic investigations in Delaware. Six of these investigations address ground-water availability and quality. Three examples of studies that address specific ground-water issues in Delaware are discussed in the following sections.

Pesticides in Agricultural Areas

The effects of agricultural practices on water resources in Delaware are important owing to contamination of ground water by pesticides. Mechanisms for the removal of pesticides from ground water are limited. Most domestic and many municipal water supplies in southern New Castle, Kent, and Sussex Counties are derived from shallow ground-water sources. Pesticide contamination of ground-water sources has the potential to affect a large segment of the population. The USGS, in cooperation with the Delaware Geological Survey (DGS), is investigating two agricultural areas known to have received applications of pesticides. The purposes of this investigation are to gather information on the distribution of pesticides in ground water and to identify the specific environmental factors that influence ground-water contamination by pesticides. Existing information is being studied, and new information is being obtained from newly-constructed test wells and from soil- and water-quality sampling. The study areas have soil and aquifer characteristics typical of larger areas of the Delmarva Peninsula, and therefore water-management officials expect to use the results of this investigation to assess the probable distribution of pesticides in shallow ground water and to implement remedial measures where appropriate.

Effects of Land Use in Southern Delaware

Elevated concentrations of iron and nitrate in the shallow ground water of southern Delaware limit the usefulness of the water supply. Owing to increasing demand for water in this area,



it is important to understand the distribution and movement of chemical constituents that could restrict ground-water use. Although previous studies correlated land use with ground-water contamination, the relation has not been studied in detail. From 1981 through 1987, the USGS, in cooperation with the DGS, studied the origin, migration, and fate of selected chemical constituents in shallow ground water. The purposes of these investigations were to determine the chemical composition of the ground water and to define the processes that control the chemical quality of the water. The study indicated that most of the shallow ground water in southern Delaware has been affected by human activities, and that nitrate can be related directly to land use. These findings will be of considerable importance when resource managers need to develop additional public water supplies.

Brackish-Water Intrusion in the New Castle Area

Ground-water pumping in the New Castle area has resulted in a substantial lowering of ground-water levels. This lowering has caused the intrusion of brackish water from the Delaware River into aquifers that provide water supplies to the area north of the Chesapeake and Delaware Canal. Continued or increased ground-water withdrawals may increase the intrusion of brackish river water and eventually render the ground water unfit for consumption. The USGS, in cooperation with the Delaware Department of Natural Resources and Environmental Control, investigated the severity and extent of chloride contamination and evaluated the response of the ground-water system to alternative development plans. A ground-water flow model was used to simulate aquifer response to five different development plans, to quantify the amount of river-water intrusion for each plan, and to evaluate the feasibility of using freshwater-injection barriers to protect the aquifers from brackish-water contamination. This investigation identified a direct correlation between the rate of river-water intrusion and the quantity and quality of water withdrawn from the aquifers. Water-resources managers expect to use the results of the study to optimize current ground-water development and to plan for prudent future development.

GROUND-WATER MANAGEMENT

The use of ground water in Delaware is regulated by the Department of Natural Resources and Environmental Control. The department's Water-Supply Branch licenses well drillers, issues well-construction permits, requires well-completion reports, issues water-use allocations, and has primary responsibility for Federal ground-water protection and management programs. The Delaware Department of Health and Social Services, Division of Public Health (DPH), regulates the quality and adequacy of public water-supply systems that provide service to three or more dwellings, to public buildings, and to establishments that use water to prepare food or beverages. In addition, the DPH can regulate land use within 1 mile of a public water-supply source to protect the quality of that source. The Delaware Geological Survey and the Water Resources Agency for New Castle County are the principal nonregulatory agencies involved in Delaware water issues. During fiscal year 1988, the following Federal, State, and local agencies entered into interagency or cooperative cost-sharing agreements with the USGS to conduct ground-water investigations in Delaware:

Delaware Department of Natural Resources and Environmental Control
Delaware Geological Survey
U.S. Environmental Protection Agency
Water Resources Agency for New Castle County

SELECTED REFERENCES

Denver, J.M., 1986, Hydrogeology and geochemistry of the unconfined aquifer, west-central and southwestern Delaware: Delaware Geological Survey Report of Investigations No. 41, 100 p.

Martin, M.M., 1984, Simulated ground-water flow in the Potomac aquifers, New Castle County, Delaware: U.S. Geological Survey Water-Resources Investigations Report 84-4007, 85 p.

McGreevy, L.J., Hyatt, G.J., and Cockey, E.J., 1986, Water-resources activities of the U.S. Geological Survey Mid-Atlantic District 1984–1986: U.S. Geological Survey Open-File Report 86-490, 129 p.

Phillips, S.W., 1987, Hydrogeology, degradation of ground-water quality, and simulation of infiltration from the Delaware River into the Potomac aquifers, northern Delaware: U.S. Geological Survey Water-Resources Investigations Report 87-4185, 86 p.

U.S. Geological Survey, 1984, National water summary 1983—Hydrologic events and issues: U.S. Geological Survey Water-Supply Paper 2250, 243 p.

_____1985, National water summary 1984—Hydrologic events, selected water-quality trends, and ground-water resources: U.S. Geological Survey Water-Supply Paper 2275, 467 p.

Information on technical reports and data related to ground water in Delaware can be obtained from:

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