



# WATER FACT SHEET

U.S. GEOLOGICAL SURVEY, DEPARTMENT OF THE INTERIOR

## U.S. GEOLOGICAL SURVEY GROUND-WATER STUDIES IN NEW JERSEY

New Jersey has a sufficient supply of ground water suitable for most uses. About 50 percent of the population obtains their drinking water from ground water. In 1985, about 760 million gallons per day of ground water were pumped from the principal aquifers in the State. The principal aquifers in New Jersey are of two types, non-coastal plain aquifers and coastal plain aquifers.

The non-coastal plain aquifers consist of glacial valley-fill deposits and fractured shales, limestones, sandstones, and crystalline rocks. The glacial valley-fill aquifers are the most productive of these aquifers, yielding as much as 2,000 gallons per minute to wells. Ground water in the shales, limestones, sandstones, and crystalline rocks generally occurs in fractures within 500 feet of the land surface. Wells in these aquifers typically yield a few hundred gallons per minute. However, increasing ground-water withdrawals have caused significant declines in water levels.

The coastal plain aquifers consist of layered sequences of sand, silt, and clay and commonly yield 500 to 1,000 gallons per minute to wells. Approximately 75 percent of the freshwater used on the coastal plain is ground water. Since the early 1900's, increased ground-water withdrawals from the coastal plain aquifers have caused regional declines to more than 60 feet below sea level. The greatest water-level declines have occurred near Point Pleasant, New Jersey—at least 240 feet from 1900 through 1983.

### GROUND-WATER ISSUES

Ground-water withdrawals are causing significant water-level declines in New Jersey. Therefore, the New Jersey Department of Environmental Protection (DEP) has designated parts of Monmouth, Middlesex, Camden, Burlington, and Gloucester Counties as critical water-supply areas. The U.S. Geological Survey (USGS) has developed a ground-water flow model of the coastal plain aquifers that is being used extensively by the DEP to determine the needed reduction in ground-water withdrawals in these critical areas.

Ground-water quality has been degraded owing to the effects of urbanization, industrialization, agriculture, land disposal of waste, and atmospheric deposition. Organic compounds are a serious and pervasive contamination threat to ground water in New Jersey. Since 1970, nearly 1,200 wells have been closed owing to organic-compound contamination. A USGS study found detectable organic compounds in about 20 percent of the 315 coastal plain wells sampled. About 200 wells have been closed owing to chloride, arsenic, nitrate, mercury, lead, chromium, biological, and (or) radiological contamination.

### U.S. GEOLOGICAL SURVEY PROGRAMS

The mission of the USGS is to develop and disseminate scientific knowledge about the Nation's water resources. Since its inception in 1879, the USGS has been an integral part of the national and international earth-science community. Today, it is the principal repository of scientific and technical expertise in the earth sciences within the Federal government. USGS activities span a wide range of earth-science research and services in the fields of geology, hydrology, and cartography.

The USGS has conducted ground-water investigations in all parts of New Jersey and, since 1905, has published more than 150 reports. During fiscal year 1987, 23 interpretive ground-water investigations were conducted in cooperation with 13 Federal, State, and local agencies.

Although ground water is abundant, New Jersey has four serious problems: ground-water availability, seawater intrusion, radioactive substances in ground water, and organic compounds and trace metals in ground water. The USGS maintains and operates long-term monitoring networks for ground-water levels, seawater intrusion, and water quality in New Jersey. This information, which is stored in computerized data bases, is used extensively by the USGS and other agencies to assess hydrologic problems, and by the DEP to manage ground-water resources.

### CASE STUDIES

- Organic contamination at Picatinny Arsenal—The USGS is studying ground-water contamination caused by the disposal of wastewater from metal-plating operations at the Picatinny



#### STUDY AREAS

- Organic contamination at Picatinny Arsenal
- Natural radioactivity in ground water
- Water supply in Atlantic City area

**Arsenal.** The study is defining the chemical, physical, and biological processes controlling the movement and fate of these contaminants. The largest organic component of the contaminant plume in the ground-water system is trichloroethylene (TCE). Concentrations of TCE in the plume range from 25,000 times greater than the State drinking-water criteria near the source, to near detection limits about 1,500 feet away from the source. Ground water in the plume also contains cadmium, chromium, lead, selenium, cyanide, and copper. Models of ground-water flow and contaminant transport will be used to predict the fate of these contaminants and to understand the movement and fate of organic contamination in similar hydrogeologic settings.

- **Natural radioactivity in ground water**—A USGS investigation in north-central New Jersey has determined that elevated levels of natural radionuclides in ground water are associated with uranium-rich rocks; these rocks also are associated with elevated radon levels. About 20 percent of the ground-water samples from 260 wells have elevated radioactivity; 5 percent of these samples have gross alpha-particle activities in excess of the standard set by the U.S. Environmental Protection Agency (elevated gross alpha-particle activities in ground water occur mainly in association with certain geologic structures and deposits).
- **Water supply in the Atlantic City area**—The Atlantic City 800-foot sand aquifer is the principal source of water supply for communities in Atlantic, Ocean, and Cape May Counties. The demand for water in Atlantic and Cape May Counties is expected to increase by 22 percent between the years 1975 and 2020. In 1980, withdrawals from this aquifer averaged 21 million gallons per day. In 1983, ground-water levels were more than 80 feet below sea level. Little was known about the possible effects of increasing withdrawals on ground-water availability and seawater intrusion in the Atlantic City area; however, these lowered water levels indicated that the inland migration of seawater might become an important ground-water concern. In 1985, the USGS installed two wells, one located 1.9 and the other 5.5 miles offshore in the 800-foot sand. In 1986, chloride concentrations of 15 milligrams per liter (mg/L) were measured in water from one well and 77 mg/L in water from the other well. These values, which are well below the national drinking-water standard, indicated the presence of a large body of freshwater offshore and eliminated the concern of imminent seawater intrusion into pumping centers. The USGS has prepared a computer model of ground-water flow to evaluate the consequences of proposed ground-water withdrawals.

## GROUND-WATER MANAGEMENT

The thorough evaluation of the State's ground-water resources is critical to effective ground-water management. Since the late 1800's, the New Jersey Geological Survey and the USGS have investigated ground-water conditions in New Jersey. In 1988, the two agencies provide technical support for ground-water regulation through cooperative data-collection and hydrologic-investigation programs.

Before 1960, most of the water supplies within New Jersey were managed by the cities and townships; however, in the 1960's, a serious drought focused attention on the State's water-supply problems. In 1970, the primary authority for managing and regulating water resources was centralized with the creation of the New Jersey Department of Environmental Protection. During 1987, the following Federal, State, and local agencies entered into cost-sharing agreements with the USGS to conduct ground-water investigations or collect ground-water data:

City of Cape May  
City of Wildwood  
Gloucester County  
Greenwich Township  
New Jersey Department of  
Agriculture

New Jersey Department of  
Environmental Protection,  
Division of Water Resources  
New Jersey Department of  
Environmental Protection,  
Office of Science and Research

Somerset County Board of  
Chosen Freeholders  
Township of Lower  
U.S. Department of Energy  
U.S. Department of the Army  
U.S. Department of the Navy  
U.S. Environmental Protection  
Agency  
U.S. Department of Interior,  
Fish and Wildlife Service

## SELECTED REFERENCES

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- Fusillo, T.V., Ehler, T.A., and Martin, Mary, 1987, Movement and fate of chlorinated solvents in ground water—Research activities at Picatinny Arsenal, New Jersey: U.S. Geological Survey Open-File Report 87-395, 16 p.
- Schaefer, F.L., and Walker, R.L., 1981, Saltwater intrusion into the Old Bridge aquifer in the Keyport-Union Beach area of Monmouth County, New Jersey: U.S. Geological Survey Water-Supply Paper 2184, 21 p.
- U.S. Geological Survey, 1984, National water summary 1983: U.S. Geological Survey Water-Supply Paper 2250, 243 p.
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- Vowinkel, E.F., and Foster, W.K., 1981, Hydrogeologic conditions in the coastal plain of New Jersey: U.S. Geological Survey Open-File Report 81-405, 39 p.
- Zapoczka, O.S., and Szabo, Zoltan, 1987, Source and distribution of natural radioactivity in ground water in the Newark Basin, New Jersey, in Graves, Barbara, ed., Radon, radium and other radioactivity in ground water—Hydrogeologic impact and application to indoor airborne contamination: Chelsea, Mich., Lewis Publishers, p. 47-68.

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

District Chief  
U.S. Geological Survey  
Water Resources Division  
810 Bear Tavern Road, Suite 206  
West Trenton, New Jersey 08628

New Jersey Water Resources Institute  
Center for Coastal and Environmental Studies  
Doolittle Hall  
Rutgers University  
New Brunswick, New Jersey 08903

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