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Summary of Ground-Water-Levels in New Jersey, Water Year 2007

Ground water is one of the Nation's most important natural resources. It provides about 40 percent of our Nation's public water supply. Currently, nearly one-half of New Jersey's drinking water is supplied by more than 300,000 wells that serve more than 4.3 million people. As demand for water increases, managing the development and use of the ground-water resource so that the supply can be maintained for an indefinite time without causing unacceptable environmental, economic, or social consequences is critical.

The U.S. Geological Survey (USGS) has operated a network of observation wells in New Jersey since 1923 for the purpose of monitoring ground-water-level changes throughout the State. Long-term, systematic measurement of water levels in observation wells provides the data needed to evaluate changes in the ground-water resource over time. Records of ground-water levels are used to evaluate recharge, ground-water discharge, seasonal fluctuations, long-term climate change, and water-supply development. Water-level data are also used to develop ground-water models and to forecast trends.

This report describes water levels in the USGS New Jersey Water Science Center Observation Well Network during water year 2007 (October 1, 2006, through September 30, 2007). It documents trends in water levels in confined aquifers in southern New Jersey, fractured-rock aquifers in northern New Jersey, and unconfined (water-table) aquifers throughout the State. Water levels in four bedrock wells, three unconfined wells, and three confined wells are shown in hydrographs. Web site addresses for accessing the data are provided.

Water-Level Monitoring in 2007

During water year 2007, ground-water levels were measured in 199 network wells: 145 wells were equipped for continuous water-level monitoring, and 54 wells were measured manually from two to six times per year. Twenty-two of the continuously monitored wells are equipped with satellite data-collection platforms that provide near-real-time data. The locations of ground-water-level observation wells in New Jersey measured during the 2007 water year are shown in figure 1; the locations of wells with hydrographs presented in this report are shown in the inset in figure 1. The published data for water year 2007, including site information, tables of water levels, and water-level hydrographs, are available at *http://wdr.water.usgs.gov/wy2007/search.jsp*.

Water Levels in Unconfined and Fractured-Rock Aquifers

Average annual precipitation in New Jersey ranges from about 40 inches along the southeastern coast to 51 inches in the north-central part of the State. Statewide, the annual mean precipitation is 45 inches per water year based on precipitation during 1895–2007 (Office of the N.J. State Climatologist, Rutgers University, New Jersey, unpub. data, accessed February 21, 2007, at *http://climate.rutgers.edu*). Water levels in wells completed in unconfined and fractured-rock aquifers are directly related to the annual precipitation, which was more than 3 inches above average during the 2007 water year.

The effects of climate on daily mean water levels in six drought-network observation wells during water year 2007 can be seen in the hydrographs shown in figure 2. Daily mean water-level data for three wells open to bedrock aquifers (Taylor (37-202), Readington School 11 (19-270), and Cranston Farms 15 (21-364)) and three wells open to the unconfined aquifer (Morrell 1 (23-104), Lebanon State Forest 23-D (05-689), and Vocational School 2 (11-42)) for 2007 are compared to monthly extremes, the median, and percentile classes. The number of years for which measurements are available for each month is included in parentheses beneath the month label.

The highest ground-water levels of the year in many wells in New Jersey occurred in April. According to the New Jersey State Climatologist, an average of 9.11 inches of rain fell during April 2007, making it the wettest April in 113 years of statewide recordkeeping. Moderate to heavy rain fell for approximately 36 hours, and, on April 16, the combination of heavy rain falling on already wet ground together with exceedingly low barometric pressure caused the water levels in several wells (both confined and unconfined) to rise to their highest level on record. Water levels in many wells were the highest of the 2007 water year on this date. The water year ended with the third driest September on record (precipitation 3 inches below normal), causing water levels in many wells to fall to their lowest levels of the water year.

Water levels in most wells that tap unconfined aquifers in the New Jersey Coastal Plain show the effects of recent climate patterns. Water levels in a typical unconfined well in the New Jersey Coastal Plain (fig. 3) illustrate the influence of precipitation on ground-water levels. Low water levels in water years 1998 1999, 2001, and 2002 were the result of dry years, and the high water levels in water years 2003 through 2007 were the result of wet years.

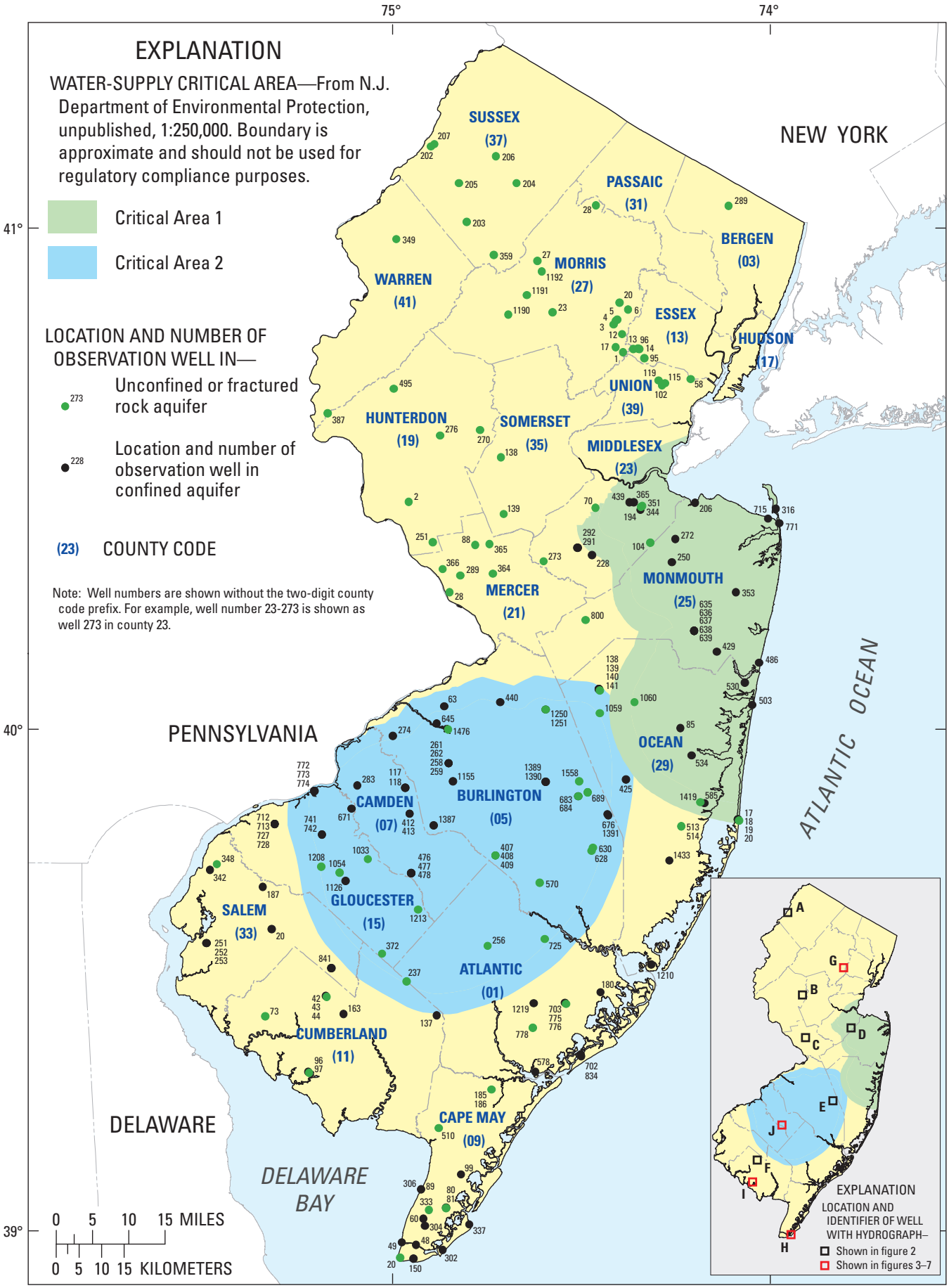

Figure 1. Location of ground-water-level observation wells in New Jersey.

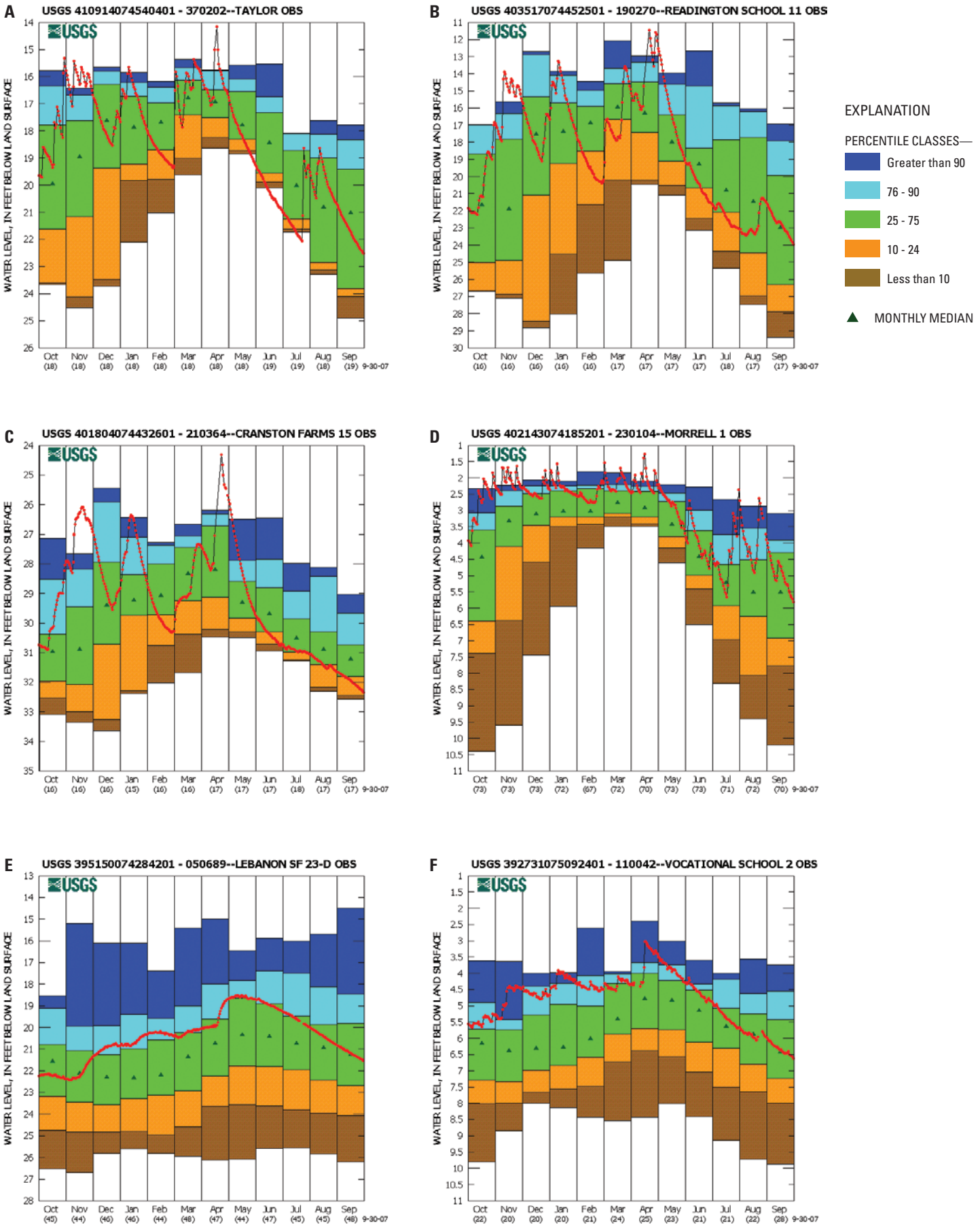

Figure 2. Ground-water levels in three bedrock wells in northern New Jersey (A-C) and three unconfined-aquifer wells (D-F) in the New Jersey Coastal Plain, water year 2007. (Well locations are shown in figure 1 inset.)

Water levels in seven observation wells (27-1, 27-4, 27-5, 27-6, 27-12, 27-17, and 27-20) that tap glacial deposits in Morris County in northern New Jersey rose to their highest level in the last 10 years in water year 2007. Most notable was the Briarwood School well (27-12), in which the water level rose more than 23 feet from October 2003 to September 2007 (fig. 4). This rise was the result of a reduction in ground-water withdrawals and the increased use of surface water in this area in recent years.

Water Levels in Confined Aquifers

Water levels in the confined aquifers in the Coastal Plain of New Jersey have fluctuated seasonally for more than 50 years as a result of increased ground-water withdrawals during the summer, when water levels decline, and decreased withdrawals during the winter, when water levels rise. However, ground-water levels also have shown the effects of changes in withdrawal patterns over the past 10 years. In general, water-level changes in these aquifers are the result of changes in withdrawals rather than climatic variations.

Water levels in wells in the confined Cohansey aquifer in the northern part of Cape May County have been relatively constant. In wells in the southern part of the County (09-48, 09-49, and 09-150), water levels have risen about 5 feet since 1998 as a result of reduced withdrawals from the Cohansey aquifer after Cape May City began desalination of water from the Atlantic City 800-foot sand for public supply.

Water levels in the Atlantic City 800-foot sand have declined because of increased withdrawals for the Cape May City desalination plant. Water levels in the Coast Guard 800 observation well (09-302) (fig. 5) have declined more than 10 feet since 1998, and water levels in two wells north of the desalination plant (09-306 and 09-337) have declined 2 and 6 feet, respectively, since 1998. In Atlantic County, water levels have been relatively stable over the past 5 years.

Water levels in the Piney Point aquifer throughout much of the southern part of the State continue to decline. Water levels in Piney Point aquifer wells in Atlantic County and southern Ocean County (01-834, 01-1219, and 29-1210) continued a long-term decline. In Cumberland County, water levels in three wells (11-44, 11-96, and 11-163) declined 59, 24, and 32 feet, respectively, from June 2004 to September 2007 as a result of increased withdrawals near Bridgeton (fig. 6). Water levels in the Piney Point aquifer in parts of Ocean and Burlington Counties have been relatively stable (05-407, 05- 676 and 29-425). Water levels in the Vincentown aquifer (wells 05-1250, 25-636 and 29-139) have remained stable over the past 10 years except during periods of drought, when they fell 1 to 3 feet.

Water levels in observation wells 05-1155 and 05-1387 in the Wenonah-Mount Laurel aquifer in Burlington County have been relatively stable during 2005-07. However, water levels in two wells in Camden and Salem Counties (07-478 and 33-020) fell to their lowest level during 2007 (fig. 7). Ground-water levels in several observation wells in Monmouth and Ocean Counties (25-637 and 25-486) continued to rise.

Ground-water levels in the Englishtown aquifer system in Monmouth and Ocean Counties (wells 25-429, 29-530, 29-503, and 29-534) have continued to rise in recent years. The water level in the Toms River 2 Obs well (29-534) in central Ocean

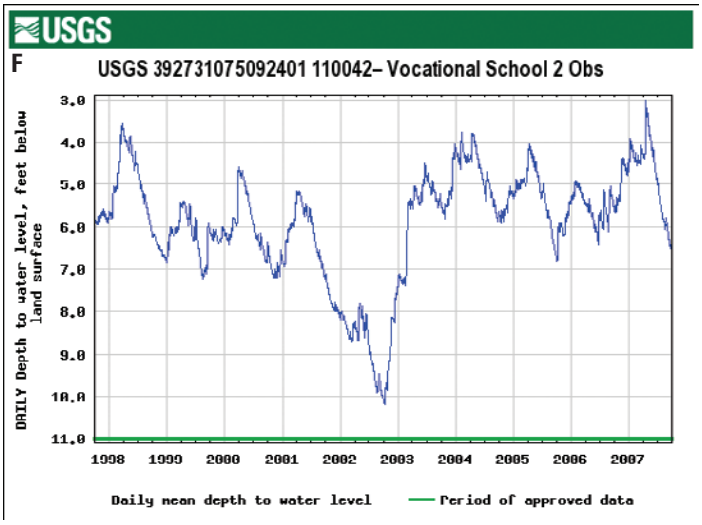

Figure 3. Long-term water levels in well 11-42 in the Kirkwood-Cohansey aquifer system, New Jersey, water years 1998–2007. (Well location is shown in figure 1 inset.)

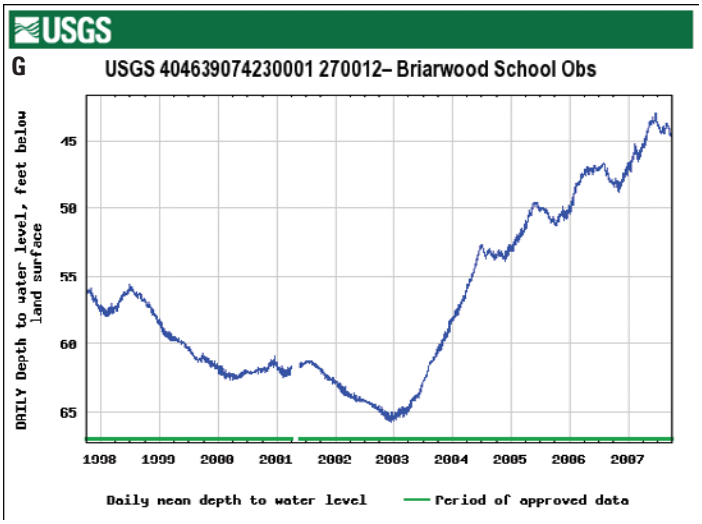

Figure 4. Long-term water levels in glacial aquifer well 27-12, New Jersey, water years 1998–2007. (Well location is shown in figure 1 inset.)

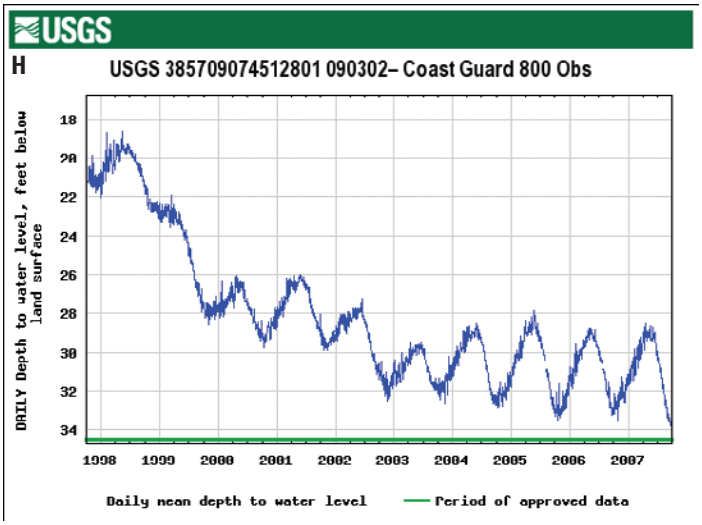

Figure 5. Long-term water levels in well 09-302 in the Atlantic City 800-foot sand, New Jersey, water years 1998–2007. (Well location is shown in figure 1 inset.)

County has risen by more than 40 feet since 1992. Water levels in the Englishtown aquifer system in parts of Burlington County are also showing declines similar to those in the Wenonah-Mount Laurel aquifer.

Water levels in the Potomac-Raritan-Magothy aquifer system have declined slightly during the past 10 years at several wells in southern Monmouth and northern Ocean Counties (25-635, 25-639, and 29-85). In much of Burlington, Camden, and Gloucester Counties, water levels in several observation wells (05-258, 05-261, 05-262, 05-274, 05-645, 05-683, 07-283, 07-117, 07-412, 07-413, 07-476, 07-477, 11-137, 15-671, 15-712, 15-713, 15-741, 15-742, 15-728, and 15-772) have risen gradually over the past 10 years because of mandated decreases in withdrawals in Critical Area 2 (fig. 1).

Availability of Data

The water-level data in the USGS annual Water-Data Report for water year 2007 (U.S. Geological Survey Water-Data Report WDR-US-2007) for New Jersey can be accessed online at *http://wdr.water.usgs.gov/wy2007/search.jsp*. Multiple-year graphs of mean daily water levels and tables of water levels measured in water year 2007 are available at this site. A map interface showing the well locations also is available.

A list of the sites in the USGS New Jersey Water Science Center Ground-Water-Level Observation Network and links to historical water-level data at the USGS National Water Information System Web interface (NWISWeb) site are available at *http://nj.usgs.gov/gw/Network/GW_Networks.html*. A new addition to the USGS Web display of ground-water-level data is the New Jersey Active Ground Water-Level Network page, which shows data and statistics (if sufficient data are available to calculate statistics) for wells in which water levels were measured in the past year and can be found at *http://groundwaterwatch.usgs.gov/StateMaps/NJ.html*. Real-time data from the Real-Time Ground-Water Level Network, which includes 22 wells in New Jersey that are equipped with real-time capability , can be accessed at *http://groundwaterwatch.usgs.gov/rtn/StateMaps/NJ.html*.

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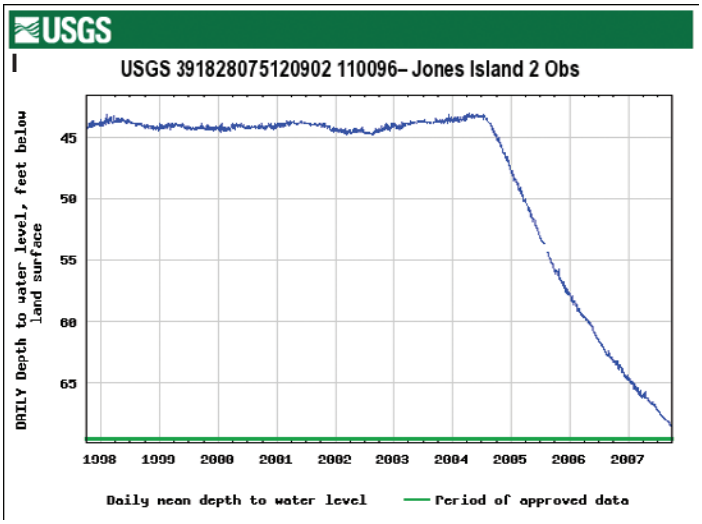

Figure 6. Long-term water levels in well 11-96 in the Piney Point aquifer, New Jersey, water years 1998–2007. (Well location is shown in figure 1 inset.)

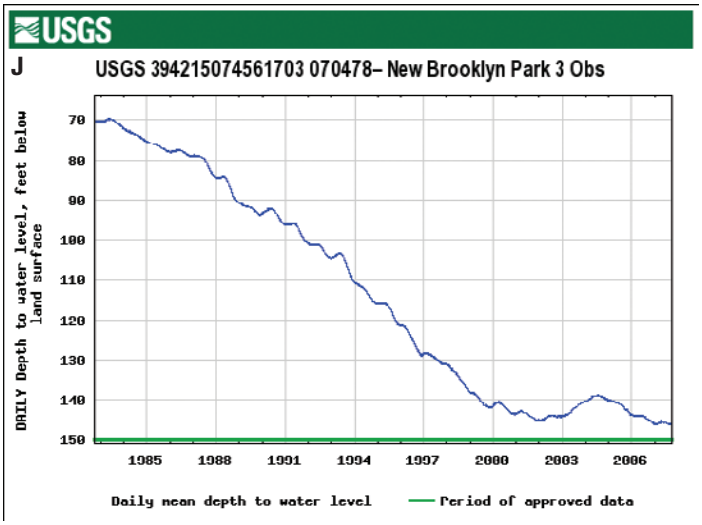

Figure 7. Long-term water levels in well 07-478 in the Wenonah-Mount Laurel aquifer, New Jersey, water years 1998–2007. (Well location is shown in figure 1 inset.)

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