

## INTRODUCTION

The Water Resources Division of the U.S. Geological Survey (USGS), in cooperation with Federal, State, and local agencies, collects a large amount of data pertaining to the water resources of New Jersey each water year. These data, accumulated over many water years, constitute a valuable data base for developing an improved understanding of the water resources of the State. To make these data readily available to interested parties outside the USGS, the data are published annually in this report series, titled "Water Resources Data-New Jersey."

This report series includes records of stage, discharge, and water quality in streams; stage, contents, and water quality in lakes and reservoirs; and water levels and water quality in ground-water wells. This volume contains water-quality records, containing various chemical analyses from 123 continuing-record surface-water stations and 35 ground-water sites. Locations of these stations are shown in figures 21-25. Additional water-quality data were collected at 5 special-study sites that are not part of the systematic data collection program. The special-study sites include 2 surface-water sites, 1 spring site, and 240 ground-water sites. Locations of these sites are shown in figures 49-53. The data in this report represent that part of the National Water Information System (NWIS) data collected by the USGS and cooperating Federal, State, and local agencies in New Jersey.

This series of annual reports for New Jersey began with the 1961 water year with a report that contained only data relating to the quantities of surface water. For the 1964 water year, a similar report was introduced that contained only data relating to water quality. Beginning in 1975, surface water, water-quality, and ground-water data were combined in one volume. Beginning with the 1977 water year, these data were published in two volumes based on drainage basins. Beginning with the 1990 water year, the format was changed to include all surface-water discharge and surface-water quality records in Volume 1 and all ground-water level and ground-water quality records in Volume 2. Beginning with the 1998 water year, the format has changed to include surface-water discharge records in Volume 1, ground-water level records in Volume 2, and surface- and ground-water-quality records in Volume 3.

Prior to introduction of this series and for several water years concurrent with it, water-resources data for New Jersey were published in U.S. Geological Survey Water-Supply Papers. Data on stream discharge and stage and on lake or reservoir contents and stage, through September 1960, were published annually under the title "Surface-Water Supply of the United States, Part 1B." For water years 1961 through 1970, the data were published in two 5-year reports. Data on chemical quality, temperature, and suspended sediment for water years 1941 through 1970 were published annually under the title "Quality of Surface Waters of the United States," and water levels for water years 1935 through 1974 were published under the title "Ground-Water Levels in the United States." The above-mentioned Water-Supply Papers can be consulted in the libraries of the principal cities of the United States and can be purchased from U.S. Geological Survey, Branch of Information Services, Box 25286, Denver, CO 80225-0286, (303) 202-4610.

Publications similar to this report are produced annually by the USGS for all States. These reports have an identification number consisting of the two-letter State abbreviation, the last two digits of the water year, and the volume number. For example, this volume is identified as "U.S. Geological Survey Water-Data Report NJ-05-3." For archiving and general distribution purposes, the reports for water years 1971 through 1974 also are identified as water-data reports. Water-data reports are available for purchase in paper copy or in microfiche from the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

Additional information, including current prices, for ordering specific reports can be obtained from the Director, USGS New Jersey Water Science Center, at the address given on the back of the title page of this report or by telephone ((609) 771-3900).

The U.S. Geological Survey New Jersey Water Science Center maintains a World Wide Web site which has water-resource related information for New Jersey and information on New Jersey Water Science Center activities. Links to other USGS and Federal web sites are also available. We invite you to visit us at: <http://nj.usgs.gov/>.

## COOPERATION

The U.S. Geological Survey and agencies of the State of New Jersey have had joint-funding agreements for the collection of water-resource records since 1921. Organizations that assisted in collecting the data in this report through joint-funding agreements with the USGS are--

New Jersey Department of Environmental Protection, Lisa P. Jackson, Commissioner

North Jersey District Water Supply Commission, Michael E. Restaino, Executive Director

Passaic Valley Water Commission, Joseph A. Bella, Executive Director

Delaware River Basin Commission, Carol R. Collier, Executive Director

New Jersey Water Supply Authority, Henry Patterson, III, Executive Director

National Park Service, Fran P. Mainella, Director

Pinelands Commission, John Stokes, Executive Director

The New Jersey Department of Environmental Protection aided in collecting records.

Organizations that supplied data are acknowledged in station descriptions.

## SUMMARY OF HYDROLOGIC CONDITIONS

### Yearly Trend of Precipitation, Stream Discharge, and Physical Water-Quality Characteristics Monitored at Several Index Stations

New Jersey received a statewide average of 39.38 inches of precipitation during the 2005 water year (October 2004 to September 2005), making it the 25<sup>th</sup> driest water year since 1895. Monthly mean precipitation was below average for 7 months of the 2005 water year (fig. 1) (Monthly Precipitation in New Jersey, Office of the State Climatologist, Rutgers University; accessed at [http://climate.rutgers.edu/stateclim\\_v1/data/njihistprecip.html](http://climate.rutgers.edu/stateclim_v1/data/njihistprecip.html)). Mean values for November and January were 1.37 and 0.86 inches above average, but values for October, May, August, and September were 1.09, 0.91, 2.89, and 2.52 inches below average, respectively. Overall, precipitation was 5.33 inches (12 percent) below average during the 2005 water year.

Water year 2005 was the 9<sup>th</sup> warmest year since 1895 with a statewide average ambient temperature of 12.1 °C, 0.9 °C above the long-term (1895-2004) mean for the State (Monthly Mean Temperatures in New Jersey, Office of the State Climatologist, Rutgers University; accessed at [http://climate.rutgers.edu/stateclim\\_v1/data/njihisttemp.html](http://climate.rutgers.edu/stateclim_v1/data/njihisttemp.html)). Monthly ambient air temperatures were above long-term means for 8 months of the 2005 water year (fig. 2).

Monthly mean streamflow was near or above normal throughout the first half of the year (October through April) at three index gaging stations (fig. 3). Streamflow was below normal throughout the second half of the year (May through September) except at Folsom during July. No historic extremes were exceeded during the water year.

Streamflow had an inverse effect on specific conductance (SC), an indicator of solute concentration, which was measured at the continuous water-quality monitoring station on the Delaware River at Trenton. Monthly mean SC values were below long-term (1968-2004) monthly mean values during October, December, and January when streamflow was above normal (fig. 4). Similarly, monthly mean SC values were above long-term means during June through September when streamflow was below normal. Historic maximum values were tied in July and exceeded in June and August. SC values were not recorded on a daily basis during most of April and May because severe flooding affected the river intake at the monitoring location. Therefore, monthly mean SC values could not be computed for April and May.

Monthly mean water temperature values measured at the Delaware River at Trenton were above long-term mean monthly values during January, June, July, August, and September in water year 2005 (fig. 5). The historic maximum monthly mean value was exceeded in August. Mean ambient air temperatures were above normal during June through September.

Dissolved oxygen (DO) concentrations generally exhibit an inverse relation to water temperature. DO, therefore, varies seasonally. Yearly maximums occur in winter, and yearly minimums occur in summer. Daily variation of DO, affected by aquatic plant life and sunlight, sometimes overrides the yearly pattern. As expected, the lowest monthly median of daily minimum DO concentrations, 6.8 milligrams per liter (mg/L), occurred in July when the monthly mean water temperature was at its highest, 27.5 °C (fig. 6). The highest monthly median of daily maximum DO concentrations, 15.8 mg/L, occurred in March when warming water temperatures may have stimulated algal growth.

### Ambient Surface-Water-Quality Monitoring Network

The U. S. Geological Survey (USGS), in cooperation with the New Jersey Department of Environmental Protection (NJDEP), operates the cooperative Ambient Surface-Water-Quality Monitoring Network (ASWQMN), which is designed to determine statewide water-quality status and trends, measure water quality near the downstream end of each NJDEP Watershed Management Area (WMA), define background water quality in each of the four physiographic provinces of New Jersey, and measure nonpoint source contributions from major land-use areas and atmospheric deposition. The ASWQMN consists of as many as 119 stations located throughout the 20 WMAs. Four

stations are located on the Delaware River main stem. Seven background stations are located on reaches of streams that remain relatively unaffected by human activity, in order to develop a baseline water-quality database. Twenty-three Watershed Integrator (WI) stations are located near the farthest downstream point, not affected by tide, in one of the large drainage basins in each WMA, except 5, 9, and 16. The WI stations provide information on large drainage areas that integrate the effects of different types of land use and point and nonpoint contributions to surface-water quality within each WMA. Land Use Indicator (LUI) stations are used to monitor the effects of the dominant land use in each WMA and provide data on nonpoint source loading of contaminants to streams. Of the 43 LUI stations, 15 are designated undeveloped, 9 agriculture, 13 urban, and 6 mixed. Forty-two statewide status (SS) stations are chosen randomly to obtain a statistical basis that can be used to estimate values of water-quality indicators statewide. In water year 2005, five of the SS stations were co-located at existing WI or LUI stations, reducing the number of total stations sampled to 114. Analytical results from water-column samples collected at each station and bed-sediment samples collected at a subset of stations were tabulated by station number and are located in “Surface-Water-Quality Station Records” in this report. In addition to the regularly scheduled samples, a reconnaissance study was initiated in water year 2005 to document the 24-hour variability of various physical properties of water at six stations in the network. This is discussed further in “Ambient Surface-Water-Quality Monitoring Network Reconnaissance Study” in this summary.

## Distribution and Concentration of Selected Constituents in Filtered and Unfiltered Surface Water from Stations in the ASWQMN

Physical characteristics and concentrations of filtered and unfiltered nutrients, filtered organic carbon, total dissolved solids (TDS, parameter code 70300, residue upon evaporation), and biochemical oxygen demand (BOD) were determined in samples from 110 stations in the ASWQMN. Samples were collected at each station four times a year during the periods November to December, February to March, May to June, and August to September. The analyzing laboratory used two different methods and reporting conventions for establishing the minimum concentration above which a quantitative measurement could be made. These reporting conventions were laboratory reporting level (LRL) and minimum reporting level (MRL). LRL was computed as twice the long-term method detection level (LT-MDL). Values reported less than the LRL or MRL were included in each distribution as a value equal to the LT-MDL or one-half the MRL, respectively. Values reported as “E”—estimated to be greater than the LT-MDL but less than the LRL—also were included. Refer to “Definition of Terms” in this report for further explanation of these reporting conventions. Data from the stations on the Delaware river main stem - the border between New Jersey and Pennsylvania - were excluded.

Samples from agriculture-LUI, urban-LUI, or integrator stations had the lowest median level of DO in the growing season (May – October); the highest median levels of temperature, BOD, and turbidity; and the highest median concentrations of total dissolved solids (TDS), ammonia, ammonia-plus-organic nitrogen, nitrite-plus-nitrate, and phosphorus (fig. 7). In contrast, samples from background and undeveloped-LUI stations had the lowest median levels of temperature, BOD, and turbidity, and the lowest median concentrations of TDS, ammonia, ammonia-plus-organic nitrogen, nitrite-plus-nitrate, and phosphorus. [Concentrations of filtered ammonia were determined by two laboratories; values reported less than their respective LRL were censored to equal one-half the higher of the two LRLs.]

Dissolved organic carbon (DOC) is a heterogeneous mixture of many organic materials, mostly high molecular-weight organic acids that result from the oxidation of organic matter. Organic matter can originate from anthropogenic or natural sources. Streams in urban areas have been found to have high levels of organic carbon caused by nutrient enrichment. Streams in undeveloped areas have been found to have high levels caused by naturally occurring organic matter. The highest median concentrations of DOC during 2005 were found in samples from undeveloped-LUI stations.

## Distribution, Concentration, and Detection Frequency of Recoverable Trace Elements in Unfiltered Water and Bed Sediment, Nutrients and Organic Compounds in Bed Sediment, and Pesticides in Filtered Water from Selected Stations in the ASWQMN

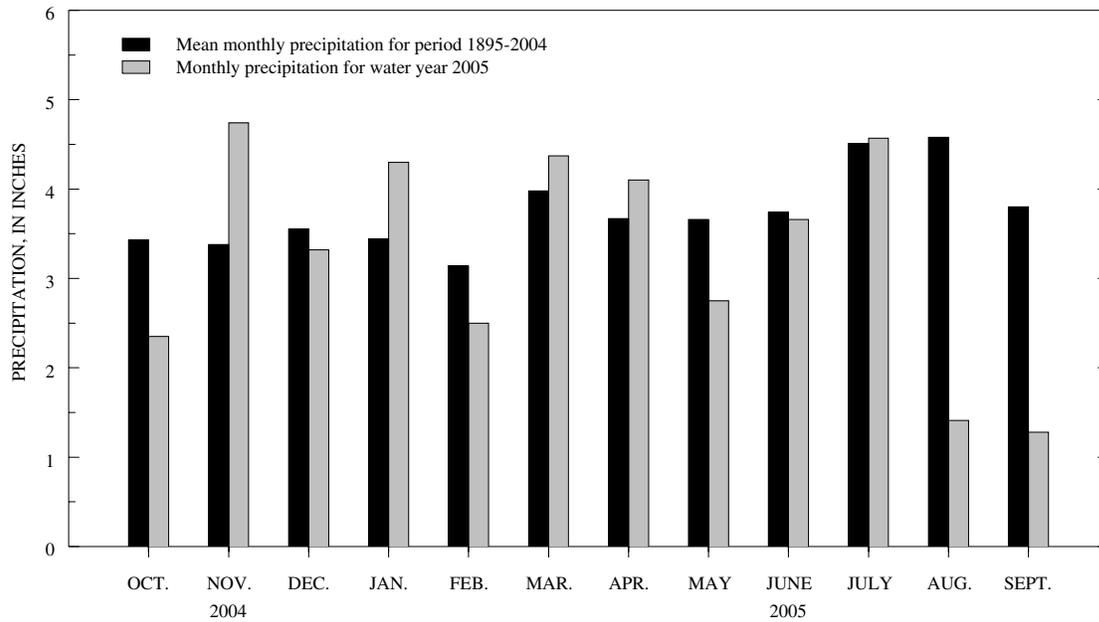
Unfiltered samples for the analysis of recoverable trace elements (TE) were collected during February to March and August to September at 7 background stations to develop a baseline with which to compare the water quality at other stations and at 42 SS stations to provide a general overview of water quality statewide and of the areal distribution of these compounds. Filtered samples for the analysis of dissolved arsenic also were collected. TE detected in at least 75 percent of samples are presented in figure 8 (values reported less than the LRL were included in each distribution as a value equal to the LT-MDL; values reported as “E”—estimated to be greater than the LT-MDL but less than the LRL—also were included). In general, median concentrations were lower in samples from background stations, which are located on reaches of streams that remain relatively unaffected by human activity. TE detected in fewer than 75 percent of samples are presented in figure 9 (values reported by the analyzing laboratory as “<”—less than the LRL—were considered to be not detected and were excluded from these plots; values reported as “E”—estimated below the LRL—were included). Samples from background stations had the lowest frequencies of detection. Silver was not found in any sample from background stations, and mercury in just one.

Bed-sediment samples for the analysis of nutrients, trace elements, polycyclic aromatic hydrocarbons (PAHs), and total polychlorinated biphenyls (PCBs) were collected at low-flow conditions during August and September at 2 background and 20 SS stations. Two of the seven background stations are sampled for bed sediment each year and are resampled every third year. Twenty of the 42 SS stations were selected for sampling on the basis of the availability of bed sediment at each station. Ammonia-plus-organic nitrogen, phosphorus, and total carbon were detected in all samples; the lowest median concentrations were present in samples from SS stations (fig. 10). Arsenic, cadmium, chromium, cobalt, iron, lead, manganese, and nickel were detected in 100 percent of the samples (fig. 11). Selenium was detected the least. Of the 30 PAH compounds in the laboratory schedule, only those with surface-water-quality standards are shown in figure 12. Fluoranthene was the most frequently detected compound. Total PCBs and dibenz(a,h)anthracene were the least frequently detected compounds at 18 and 59 percent, respectively. PCBs were not detected in samples from either of the background stations.

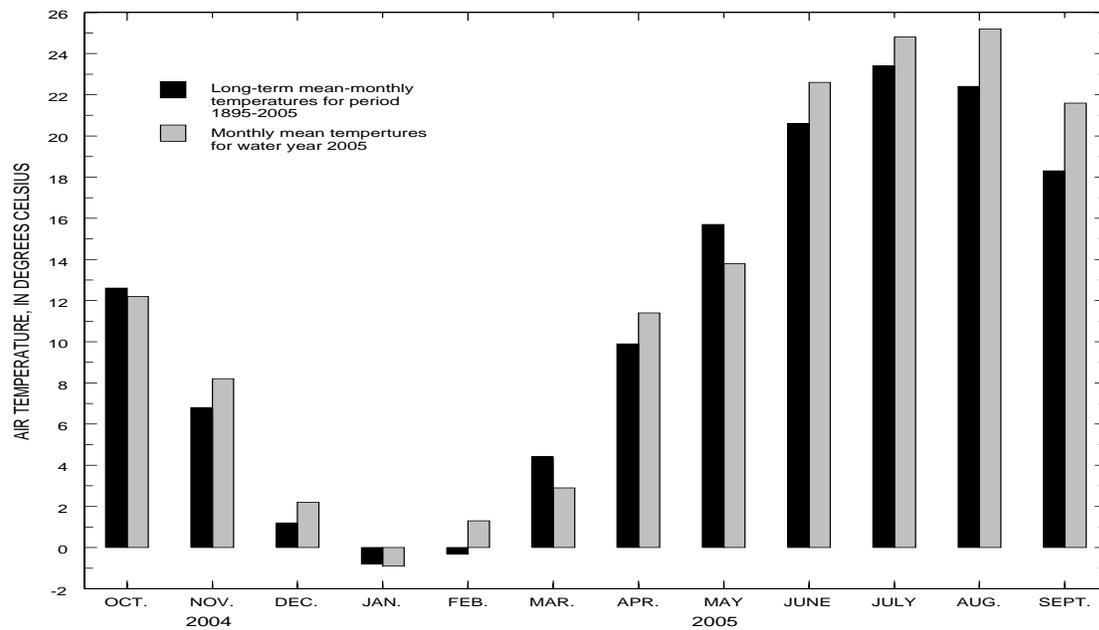
Filtered samples for the analysis of pesticides (laboratory schedule 2001) were collected during May and June at 7 background and 41 SS stations. Only compounds detected in one or more samples are discussed here. Refer to “Laboratory Measurements” in “Explanation of Water-Quality Records” in this report for the complete list of compounds in the schedule and the LRL for each compound. Twenty-eight pesticides were detected in low concentrations and were widely distributed throughout the State; all 28 compounds were detected in samples from one or more SS stations (table 1). Five of the detected compounds are insecticides—Carbaryl, Carbofuran, Chlorpyrifos, Diazinon, and Dieldrin. The remaining compounds are herbicides or fungicides. Atrazine, Metolachlor, and 2-chloro-4-isopropylamino-6-amino-s-triazine (CIAT, a degradation product of atrazine) were the most frequently detected pesticides at 77, 58, and 58 percent, respectively. Only four compounds, all commonly used herbicides, were detected in samples from background stations.

### Ambient Surface-Water-Quality Monitoring Network Reconnaissance Study

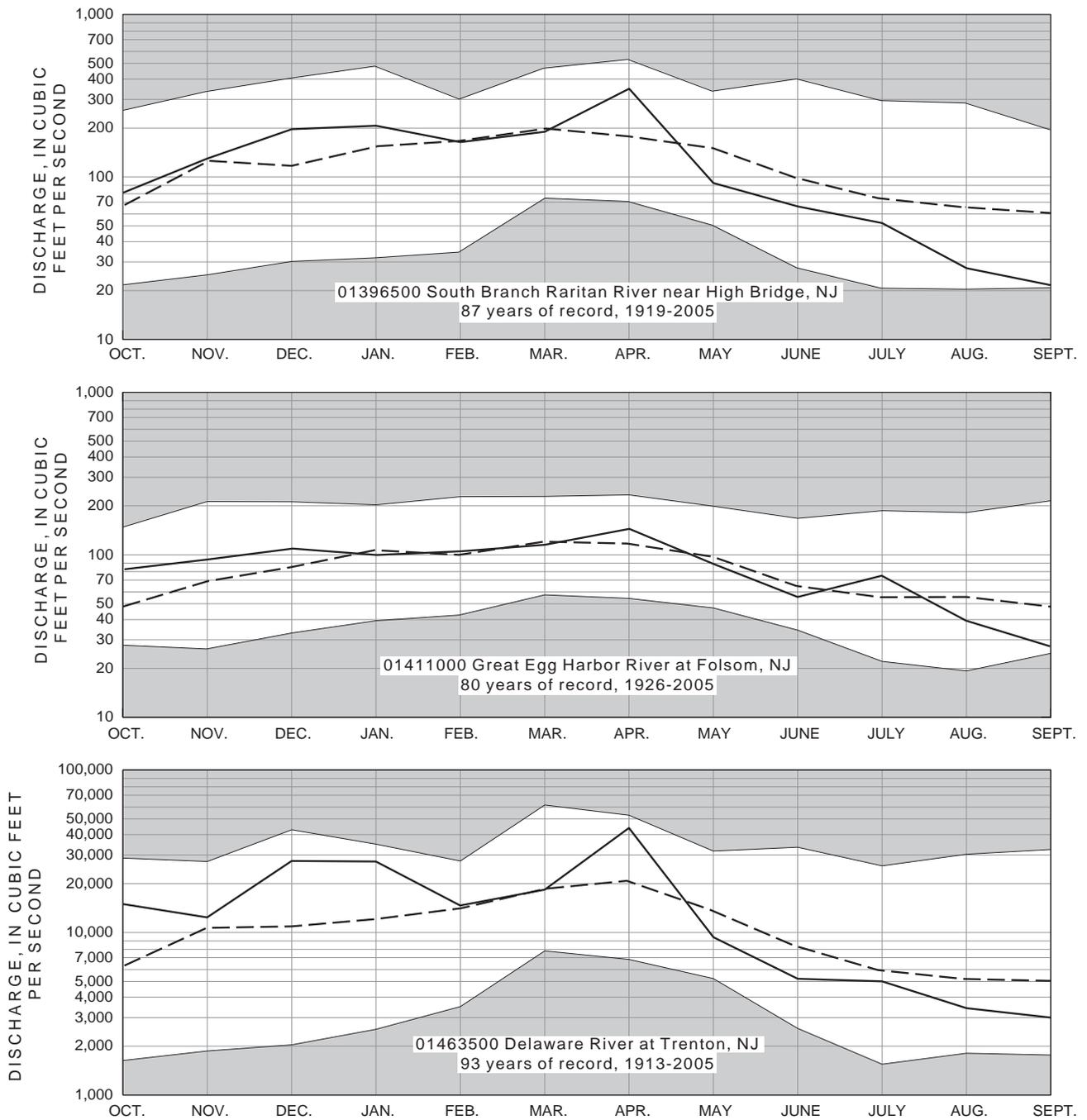
The 2005 reconnaissance study documented the 24-hour variability of continuously monitored DO concentration, DO percent of saturation, specific conductance, water temperature, and pH at six network stations during autumnal base-flow conditions. The stations are 01379580, Passaic River near Hanover Neck; 01382000, Passaic River at Two Bridges; 01393960, West Branch Rahway River at Northfield Ave. at West Orange; 01396800, Spruce Run at Clinton; 01408710, Jakes Branch at South Toms River; and 01464020, Assunpink Creek at Memorial Drive (Peace St) at Trenton. In-situ multi-constituent sensors, or monitors, recorded the occurrence and magnitude of diurnal variations that could not be observed when instantaneous samples were collected during quarterly station visits – generally between the hours of 8 a.m. and 2 p.m. The monitors were deployed for 7-day periods during September and early October; readings were recorded hourly. Graphs of hourly values recorded at each station are included in “Surface-Water-Quality Station Records” in this report (figs. 28, 29, 34-36, and 39). The selection of reconnaissance



**Figure 1.** Monthly mean precipitation for water year 2005 and mean monthly precipitation for 1895-2004. [Monthly mean and mean monthly precipitation are spatially weighted averages of several dozen stations throughout the State.]



**Figure 2.** Monthly mean temperatures for water year 2005 and mean monthly temperatures for 1895-2005. [Monthly mean and mean monthly temperatures are spatially weighted averages of several dozen stations throughout the State.]



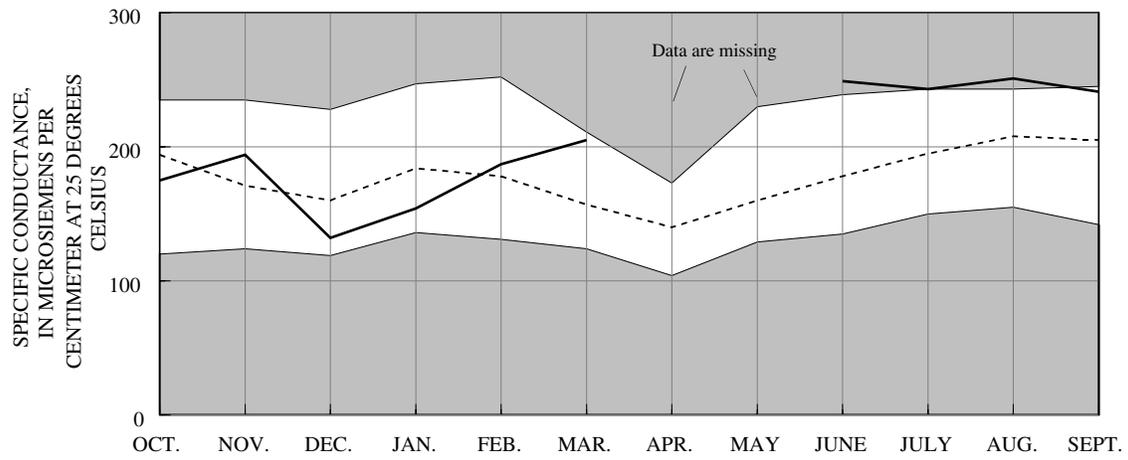
EXPLANATION

UNSHADED AREA--Indicates range between highest and lowest mean discharge recorded for the month, prior to 2005 water year

BROKEN LINE--Indicates normal discharge (median of the monthly means) for the standard reference period, 1971-2000

SOLID LINE--Indicates observed monthly mean discharge for the 2005 water year

Figure 3. Monthly mean discharge at index gaging stations, water year 2005.



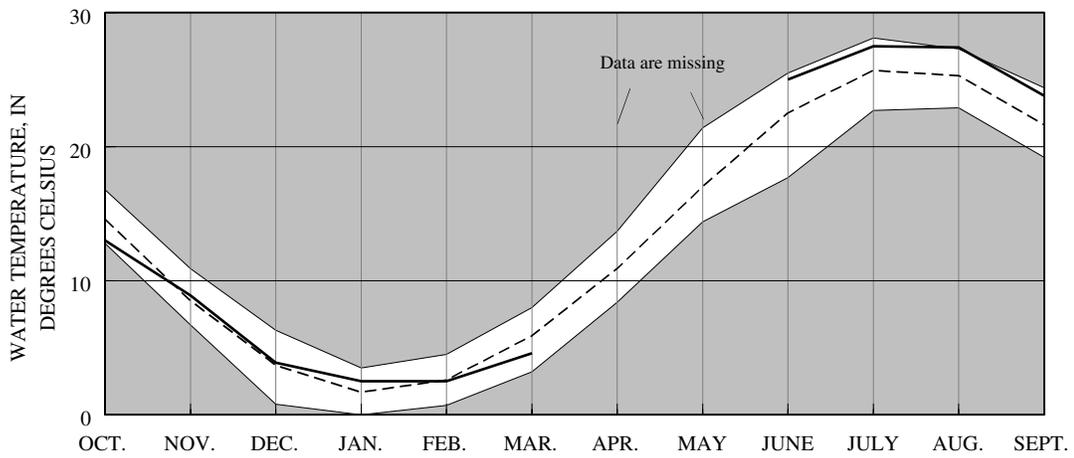
EXPLANATION

UNSHADED AREA -- Indicates the range between the highest and lowest monthly mean values, water years 1968-2004.

SOLID LINE -- Indicates the monthly mean values for water year 2005.

BROKEN LINE -- Indicates the mean monthly values for water years 1968-2004.

Figure 4. Monthly mean specific conductance at Delaware River at Trenton, New Jersey, water year 2005.



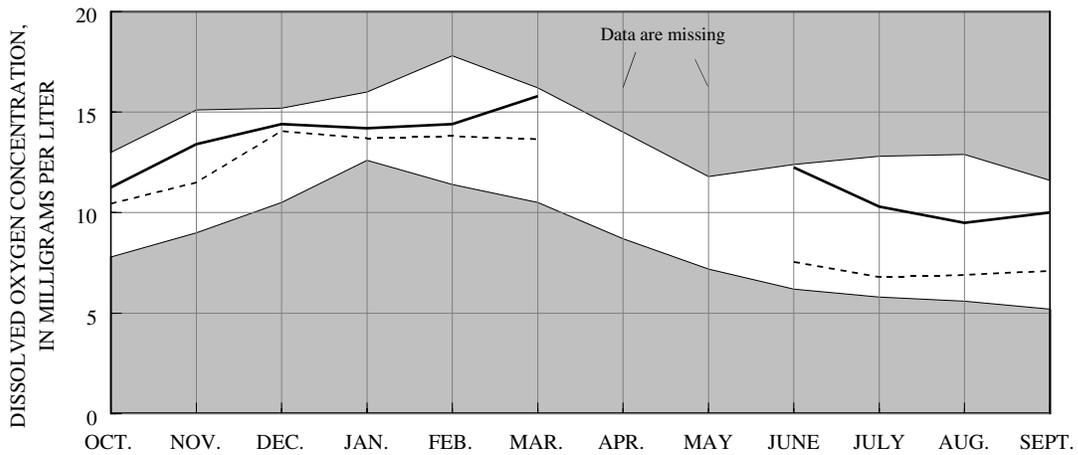
EXPLANATION

UNSHADED AREA -- Indicates the range between the highest and lowest monthly mean values, water years 1968-2004.

SOLID LINE -- Indicates the monthly mean values for water year 2005.

BROKEN LINE -- Indicates the mean monthly values for water years 1968-2004.

Figure 5. Monthly mean water temperature at Delaware River at Trenton, New Jersey, water year 2005.



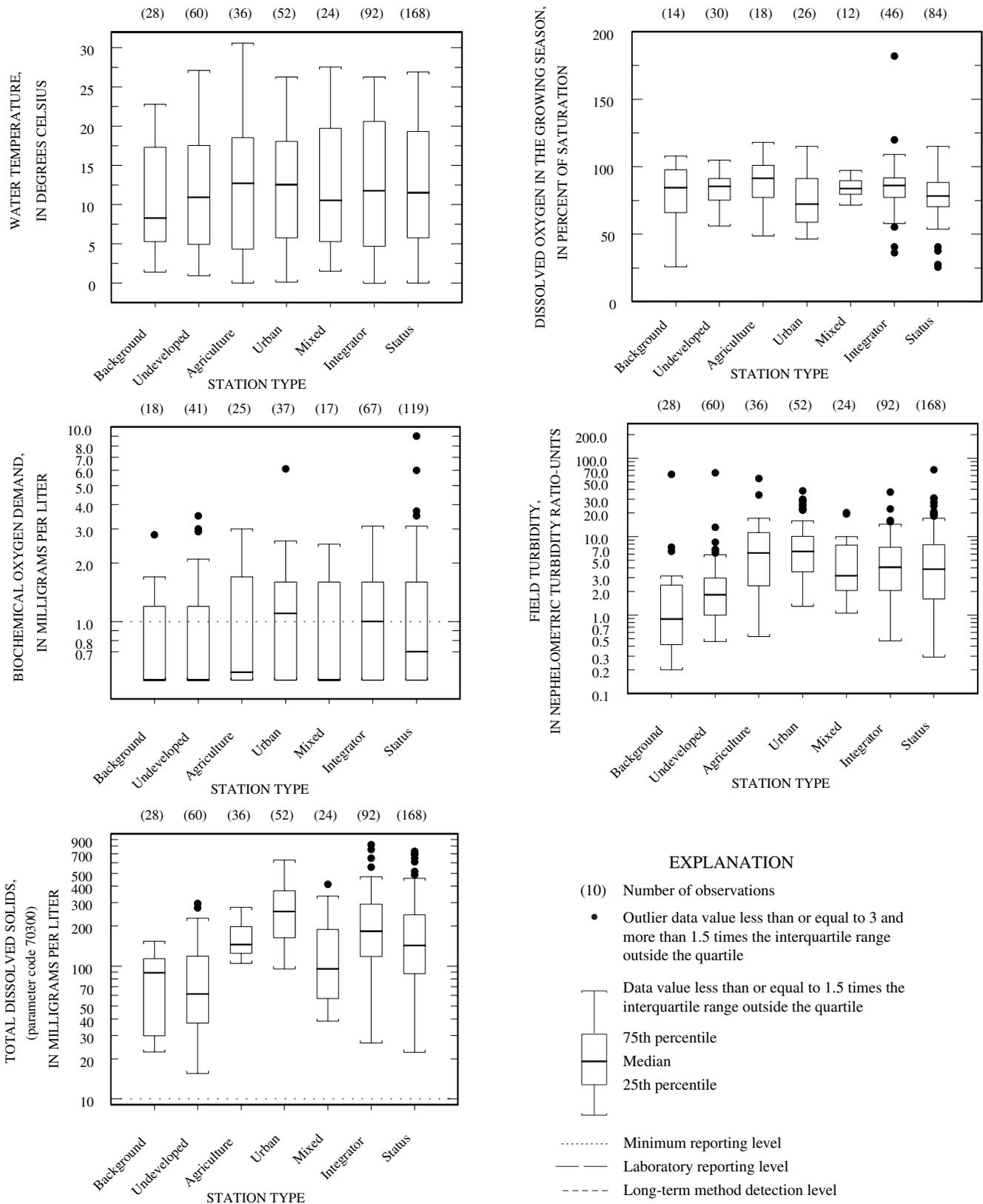
EXPLANATION

UNSHADED AREA -- Indicates the range between the highest monthly median of daily maximum values and the lowest monthly median of daily minimum values, water years 1968-2004.

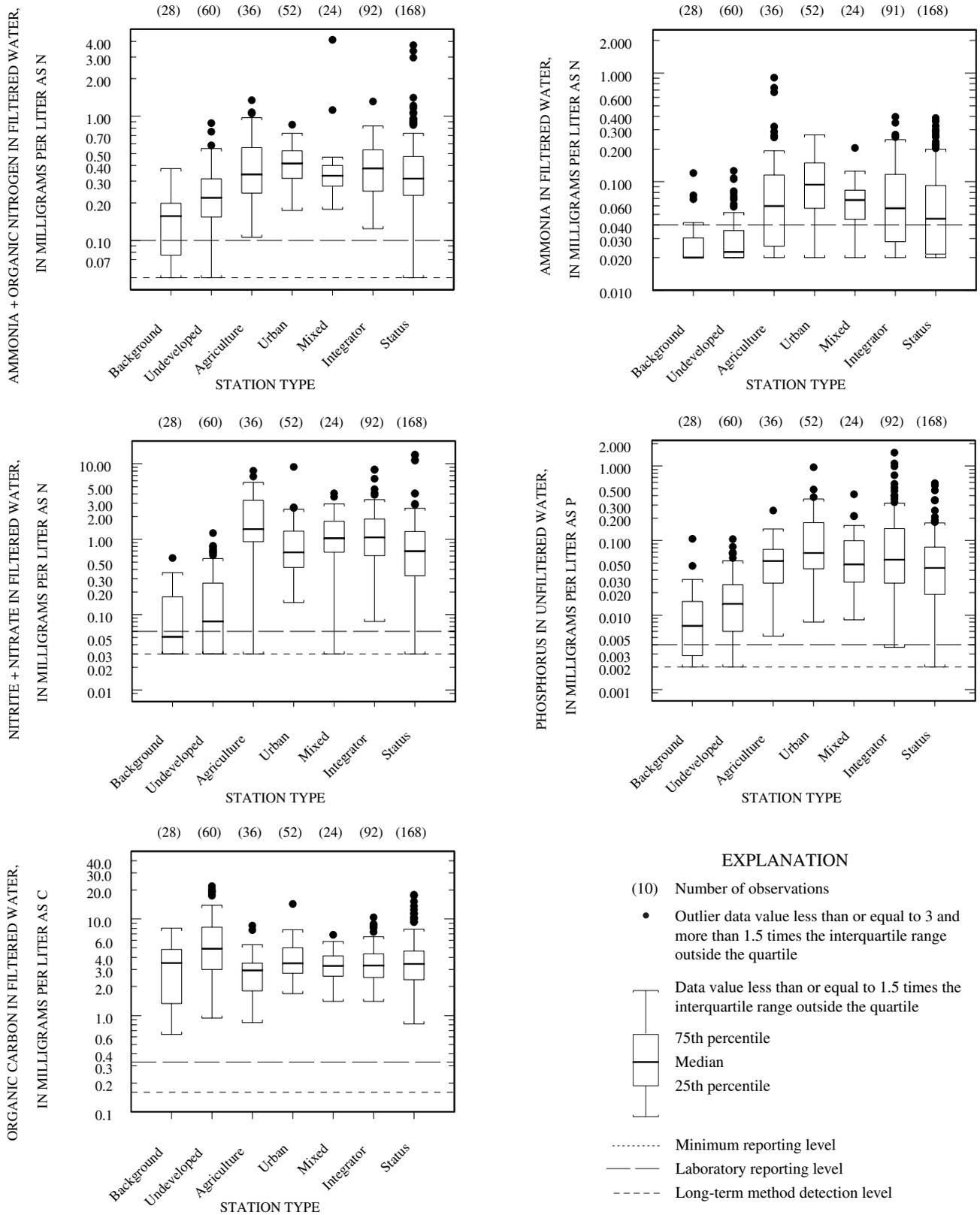
SOLID LINE -- Indicates the monthly median of daily maximum values for water year 2005.

BROKEN LINE -- Indicates the monthly median of daily minimum values for water year 2005.

**Figure 6.** Monthly medians of daily maximum and minimum dissolved oxygen concentrations at Delaware River at Trenton, New Jersey, water year 2005.

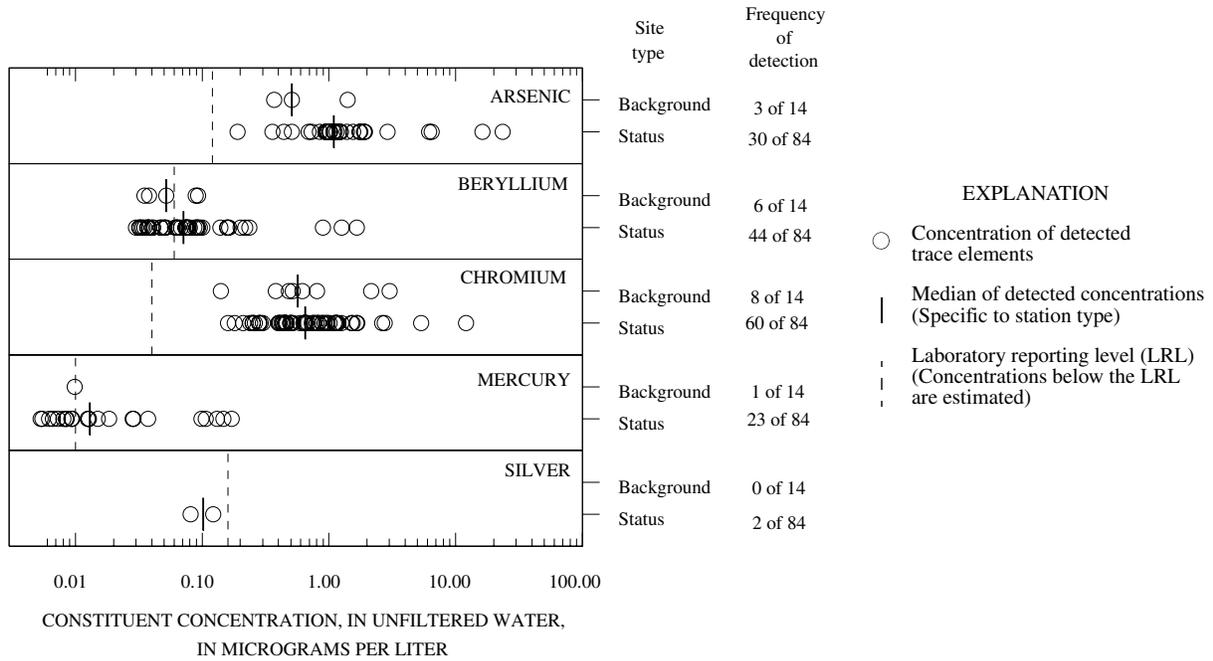


**Figure 7.** Distribution of physical characteristics of, and constituent concentrations in, samples from 110 stations in the Ambient Surface-Water-Quality Monitoring Network, water year 2005. [Five of the status stations are colocated at other station types; data are included in both distributions. “Less-than” values are shown as equal to the long-term method detection level or one-half the minimum reporting level. Excludes data from Delaware River main stem stations 01438500, 01443000, 01457500, and 01461000. Growing season is May through October.]

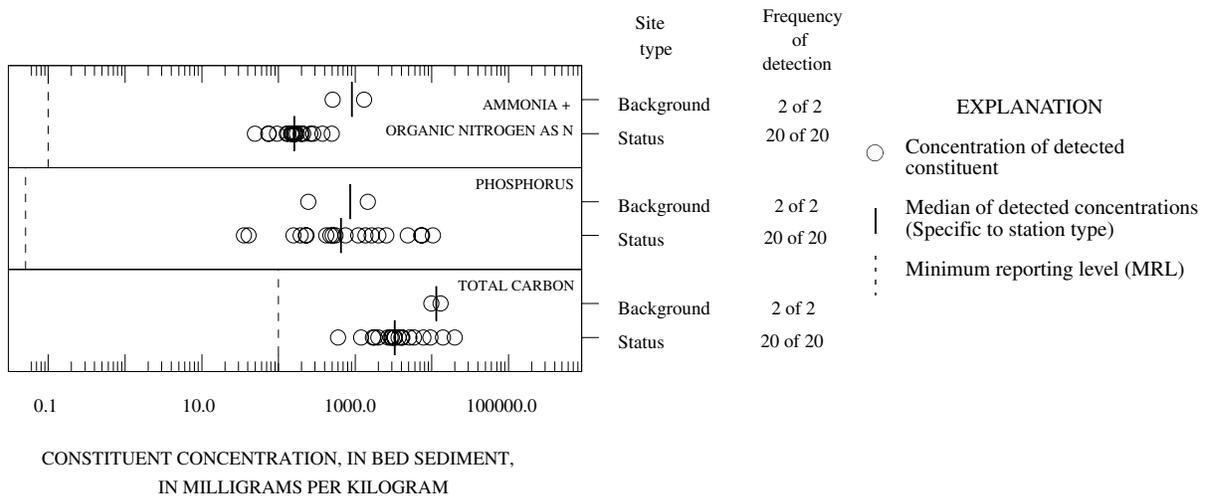


**Figure 7.** Distribution of physical characteristics of, and constituent concentrations in, samples from 110 stations in the Ambient Surface-Water-Quality Monitoring Network, water year 2005--continued. [Five of the status stations are colocated at other station types; data are included in both distributions. "Less-than" values are shown as equal to the long-term method detection level or one-half the minimum reporting level. Excludes data from Delaware River main stem stations 01438500, 01443000, 01457500, and 01461000. Growing season is May through October.]

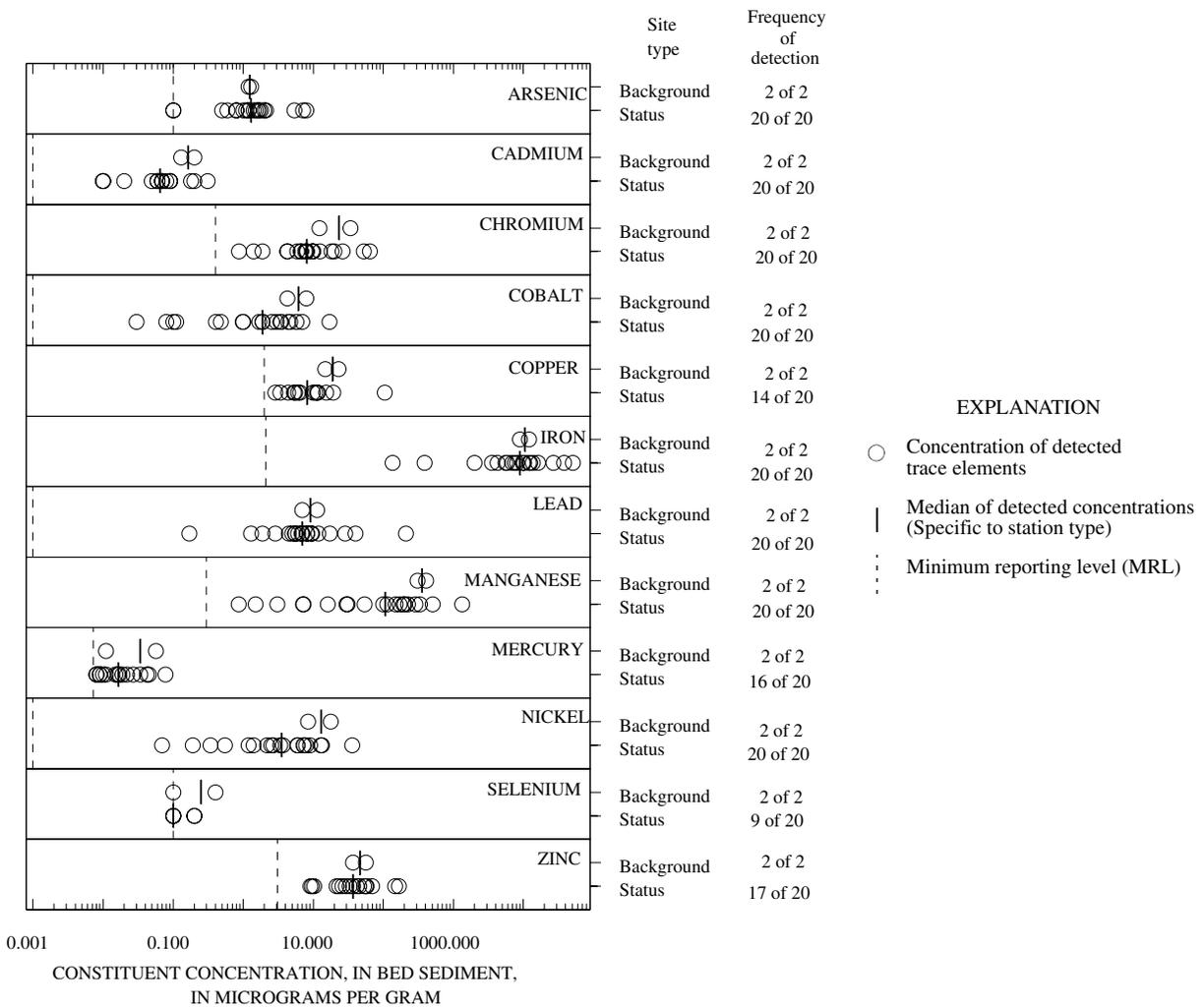




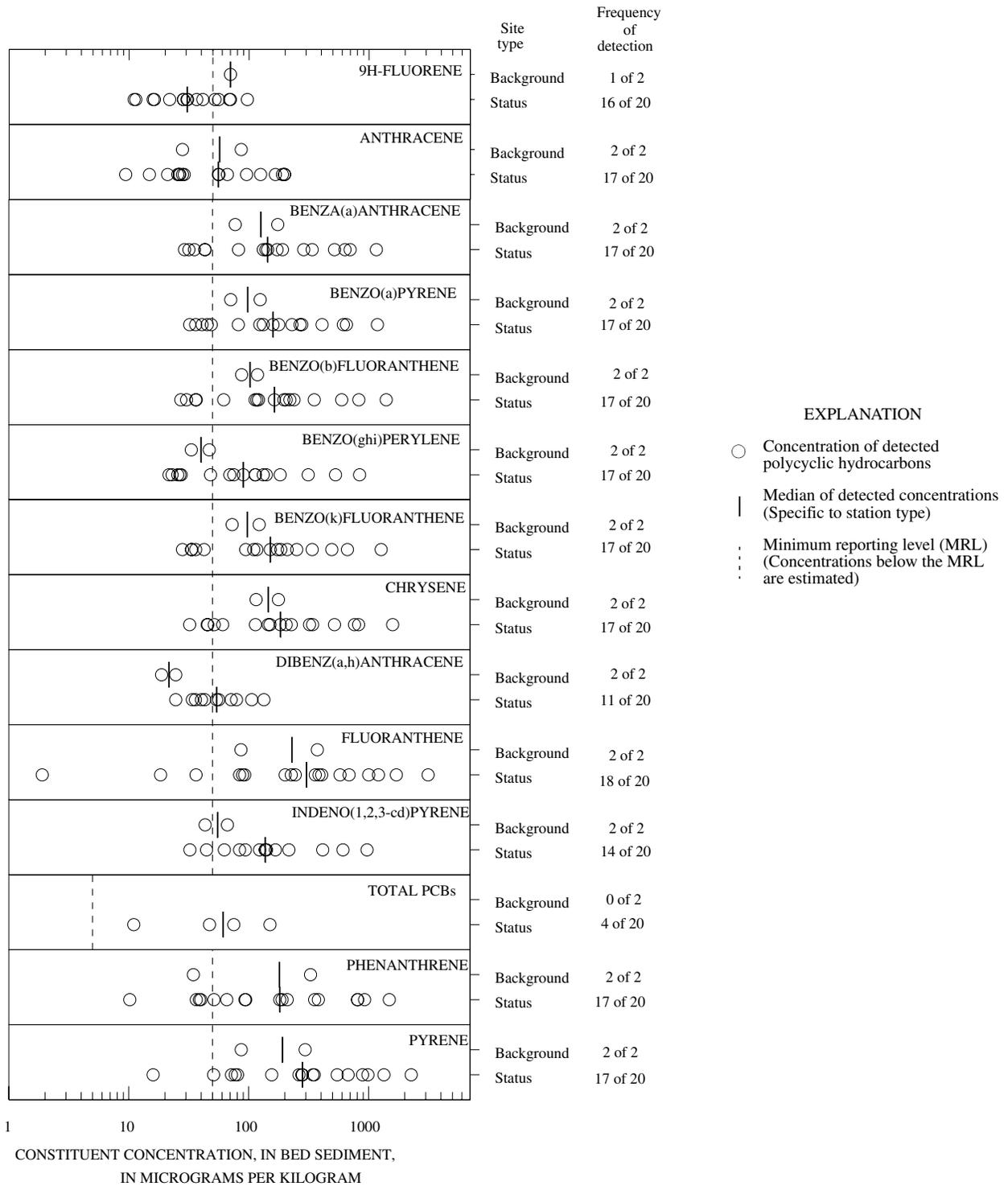
**Figure 9.** Concentration and detection frequency of trace elements in unfiltered samples from 49 stations in the Ambient Surface-Water-Quality Monitoring Network, water year 2005. [Constituents whose values were reported by the laboratory as less than the LRL are considered to be not detected]



**Figure 10.** Concentration and detection frequency of nutrients detected in bed-sediment samples from 22 stations in the Ambient Surface-Water-Quality Monitoring Network, water year 2005.



**Figure 11.** Concentration and detection frequency of trace elements detected in bed-sediment samples from 22 stations in the Ambient Surface-Water-Quality Monitoring Network, water year 2005. [Constituents whose values were reported by the laboratory as less than the MRL are considered to be not detected]



**Figure 12.** Concentration and detection frequency of selected polycyclic aromatic hydrocarbons detected in bed-sediment samples from 22 stations in the Ambient Surface-Water-Quality Monitoring Network, water year 2005. [Constituents whose values were reported by the laboratory as less than the MRL are considered to be not detected]

**Table 1.** Detection frequency of selected pesticides in filtered samples from 48 stations in the Ambient Surface-Water-Quality Monitoring Network, water year 2005.

[\* All values are estimated due to high variability within analysis method; Azinphos-methyl, Carbaryl, Carbofuran, CIAT (2-Chloro-4-Isopropyl-Amino-6-Amino-S-Triazine), Desulfinylfipronil Amide, Fipronil, and Terbacil]

| CONSTITUENT               | STATEWIDE STATUS | BACKGROUND |
|---------------------------|------------------|------------|
| ACETOCHLOR                | 7 of 41          | 0 of 7     |
| ALACHLOR                  | 6 of 41          | 0 of 7     |
| ATRAZINE                  | 33 of 41         | 4 of 7     |
| AZINPHOS-METHYL*          | 1 of 41          | 0 of 7     |
| BENFLURALIN               | 2 of 41          | 0 of 7     |
| CARBARYL*                 | 9 of 41          | 0 of 7     |
| CARBOFURAN*               | 3 of 41          | 0 of 7     |
| CHLORPYRIFOS              | 3 of 41          | 0 of 7     |
| CIAT*                     | 26 of 41         | 2 of 7     |
| DACTHAL                   | 1 of 41          | 0 of 7     |
| DESULFINYLFIPRONIL AMIDE* | 3 of 41          | 0 of 7     |
| DESULFINYLFIPRONIL        | 4 of 41          | 0 of 7     |
| DIAZINON                  | 3 of 41          | 0 of 7     |
| DIELDRIN                  | 1 of 41          | 0 of 7     |
| FIPRONIL SULFIDE          | 3 of 41          | 0 of 7     |
| FIPRONIL SULFONE          | 4 of 41          | 0 of 7     |
| FIPRONIL*                 | 5 of 41          | 0 of 7     |
| LINURON                   | 2 of 41          | 0 of 7     |
| METOLACHLOR               | 25 of 41         | 3 of 7     |
| METRIBUZIN                | 3 of 41          | 0 of 7     |
| NAPROPAMIDE               | 2 of 41          | 0 of 7     |
| PENDIMETHALIN             | 1 of 41          | 0 of 7     |
| PROMETON                  | 19 of 41         | 2 of 7     |
| PROPYZAMIDE               | 1 of 41          | 0 of 7     |
| SIMAZINE                  | 15 of 41         | 0 of 7     |
| TEBUTHIURON               | 2 of 41          | 0 of 7     |
| TERBACIL*                 | 3 of 41          | 0 of 7     |
| TRIFLURALIN               | 3 of 41          | 0 of 7     |

stations was based on previous occurrences of DO super-saturation (greater than 120 percent of saturation), DO under-saturation (less than 60 percent of saturation), or exceedances of New Jersey surface-water-quality standards. Three stations exhibited diminished DO levels. At Passaic River near Hanover Neck, the minimum DO recorded during the period was 2.1 mg/L on Sept. 17 at 1800 hours. At WB Rahway River, the minimum recorded was 5.1 mg/L on Sept. 3 at 1200. At Jakes Branch, the minimum recorded was 6.6 mg/L on Oct. 7 at 0100 and 1000. The result of increased streamflow from precipitation can be seen in the data from Assunpink Creek at Trenton. DO, pH, and SC decreased and water temperature increased as daily mean discharge increased from 17 cubic feet per second (ft<sup>3</sup>/s) on Sept. 13, to 165 ft<sup>3</sup>/s on Sept. 14.

## Ambient Ground-Water-Quality Monitoring Network

The USGS, in cooperation with the NJDEP, operates the cooperative Ambient Ground-Water-Quality Monitoring Network (AGWQMN), which is designed to assess the status of ground-water quality by examining the concentrations of various constituents that can be used as environmental indicators, assess long-term water-quality trends, determine the effects of land use on shallow ground-water quality, identify threats from nonpoint sources of contamination, and identify emerging or new environmental issues of concern to the public. The network consists of 150 shallow ground-water wells distributed throughout New Jersey within three land-use types. Sixty wells are located in agricultural areas, 60 in urban/suburban areas, and 30 in undeveloped areas within New Jersey's five watershed management regions (WMRs)—the Passaic, the Raritan, the Upper Delaware, the Lower Delaware, and the Atlantic Coastal. These five WMRs are further divided into 20 watershed-management areas (WMAs).

Thirty observation wells were sampled in water year 2005. Fourteen wells are located in the Lower Delaware WMR throughout WMAs 17-20, and 16 are located in the Atlantic Coastal WMR throughout WMAs 13-16. The wells have 2-inch polyvinyl chloride casings; range in depth from 8.0 to 49.0 feet; and represent three land-use types, nine water-chemistry types, and seven hydrogeologic units (table 2). Samples from the wells were analyzed for physical characteristics, major ions, nutrients, organic carbon, trace elements, volatile organic compounds, pesticides, and gross alpha and beta radioactivity. A summary of the water chemistry of the 30 wells is listed in table 2. Analytical records were tabulated by WMA and station number, and are located in "Ground-Water-Quality Station Records" in this report.

## Distribution, Concentration, and Detection Frequency of Physical Measurements, Ions, and Nutrients in Filtered and Unfiltered Water from 30 Sites in the AGWQMN

The effect of land use on the proportions of the major ions in water samples from the wells can be observed in the data presented in the trilinear (Piper) diagrams (figs. 13-15). The diagrams depict major cations (calcium, sodium, magnesium, potassium) and anions (bicarbonate, chloride, sulfate, fluoride, nitrate) as percentages of milliequivalents of total cations or total anions in the two base triangles. The individual points then are projected to the quadrilateral along parallel lines following the magnesium and sulfate axes. The relative proportions of major ions in an individual sample can be inferred by the position of the well symbol in the diagram. Similarity or dissimilarity between samples can be inferred from the clustering or scattering of symbols in the diagram.

Samples from wells in undeveloped areas had the lowest median temperature and concentrations of hardness and TDS, those in agricultural areas had the highest median temperature and concentration of hardness, and those in urban areas had the lowest median DO and highest median concentration of TDS (fig. 16). Medians and ranges of DOC concentrations were similar among the three land-use types – undeveloped, agriculture, and urban. The outlier value of 29.5 is associated with a well (395417074143401, 291402-DoubleTroubleMW60) located in a bog, 0.2 miles from Cedar Creek, in Double Trouble State Forest. The driller's log notes a six-foot surface layer of organic matter. Concentrations, medians, and frequencies of detection of nutrients detected in filtered samples are presented in figure 17 (values reported as less than the LRL were excluded; values reported as estimated were included). Ammonia and orthophosphorus were detected infrequently. The highest median concentration of nitrite-plus-nitrate was present in samples from wells in agricultural areas.

**Table 2.** Hydrogeologic unit and land use at 30 wells sampled as part of the U.S. Geological Survey-N.J. Department of Environmental Protection (cooperative) Ambient Ground-Water-Quality Monitoring Network, water year 2005.

| NJ-WRD well number | WMA number | Hydrogeologic unit aquifer code | Predominant land use <sup>1</sup> | Water type (dominant cation-anion) | Dissolved oxygen (mg/L) | Nitrogen NO <sub>2</sub> +NO <sub>3</sub> dissolved (mg/L) | Total dissolved solids (mg/L) | Number of pesticides detected <sup>2</sup> | Number of VOCs detected <sup>2</sup> | Number of trace elements detected <sup>2</sup> | Well depth (ft bls) |
|--------------------|------------|---------------------------------|-----------------------------------|------------------------------------|-------------------------|--|-------------------------------|--|--------------------------------------|--|---------------------|
| 151515             | 18         | 11HPPM                          | Agricultural                      | Sodium-Chloride                    | 0.5                     | 0.90   | 484                           | 3  | 2                                    | 15   | 12.7                |
| 151516             | 18         | 121CKKD                         | Agricultural                      | Sodium-Chloride                    | 9.6                     | 5.60   | 119                           | 0  | 0                                    | 13   | 29.5                |
| 151514             | 17         | 121CKKD                         | Agricultural                      | Calcium-Sulfate                    | 10.8                    | 8.74   | 127                           | 2  | 0                                    | 15   | 24.2                |
| 250790             | 20         | 211MLRL                         | Agricultural                      | Sodium-Chloride                    | 0.3                     | <0.6   | 258                           | 2  | 0                                    | 15   | 14.2                |
| 151207             | 15         | 121CKKD                         | Agricultural                      | Magnesium-Nitrate                  | 5.5                     | 51.7   | 372                           | 1  | 1                                    | 13   | 24.0                |
| 330939             | 18         | 211MRSL                         | Agricultural                      | Calcium-Nitrate                    | 3.5                     | 13.8   | 205                           | 2  | 0                                    | 14   | 19.5                |
| 111154             | 17         | 121CKKD                         | Agricultural                      | Potassium-Nitrate                  | 1.6                     | 24.7   | 411                           | 3  | 0                                    | 13   | 17.7                |
| 11240              | 15         | 121CKKD                         | Urban                             | Sodium-Chloride                    | 2.8                     | 2.57   | 74                            | 0  | 2                                    | 13   | 19.0                |
| 90509              | 15         | 121CKKD                         | Urban                             | Calcium-Sulfate                    | 9.2                     | 1.08   | 40                            | 0  | 0                                    | 13   | 25.0                |
| 71004              | 18         | 211MCSV                         | Urban                             | Sodium-Chloride                    | 0.7                     | <0.6   | 960                           | 0  | 0                                    | 13   | 18.7                |
| 51498              | 19         | 211MRSL                         | Urban                             | Sodium-Chloride                    | 8.0                     | 4.89   | 694                           | 0  | 3                                    | 15   | 26.0                |
| 51499              | 19         | 211MRPAU                        | Urban                             | Calcium-Bicarbonate                | 0.6                     | <0.6   | 370                           | 0  | 1                                    | 7  | 49.0                |
| 11401              | 14         | 121CKKD                         | Urban                             | Sodium-Sulfate                     | 2.0                     | 0.92   | 70                            | 0  | 1                                    | 14   | 12.5                |
| 51500              | 19         | 211EGLS                         | Urban                             | Sodium-Chloride                    | 3.6                     | <0.6   | 208                           | 1  | 0                                    | 12   | 19.5                |
| 71005              | 18         | 211EGLS                         | Urban                             | Sodium-Chloride                    | 0.2                     | <0.6   | 440                           | 0  | 2                                    | 14   | 13.6                |
| 11403              | 15         | 121CKKD                         | Urban                             | Sodium-Chloride                    | 4.6                     | 3.89   | 421                           | 1  | 0                                    | 15   | 23.0                |
| 70842              | 15         | 121CKKD                         | Undeveloped                       | Sodium-Sulfate                     | 0.8                     | <0.6   | 19                            | 0  | 0                                    | 12   | 14.0                |
| 51496              | 14         | 121CKKD                         | Undeveloped                       | Sodium-Sulfate                     | 4.3                     | <0.6   | 19                            | 0  | 1                                    | 12   | 16.0                |
| 111152             | 17         | 121CKKD                         | Undeveloped                       | Sodium-Chloride                    | 5.7                     | <0.6   | 16                            | 0  | 1                                    | 12   | 12.0                |
| 291405             | 13         | 121CKKD                         | Undeveloped                       | Sodium-Chloride                    | 8.6                     | <0.6   | 60                            | 0  | 1                                    | 10   | 18.0                |
| 291404             | 13         | 121CKKD                         | Undeveloped                       | Magnesium-Sulfate                  | 7.4                     | 0.84   | 29                            | 0  | 0                                    | 10   | 17.3                |
| 291403             | 13         | 121CKKD                         | Undeveloped                       | Sodium-Sulfate                     | 5.0                     | <0.6   | 258                           | 0  | 1                                    | 10   | 10.5                |
| 291402             | 13         | 121CKKD                         | Undeveloped                       | Sodium-Chloride                    | 0.4                     | <0.6   | 71                            | 0  | 0                                    | 12   | 8.0                 |
| 11400              | 15         | 121CKKD                         | Undeveloped                       | Sodium-Sulfate                     | 2.8                     | <0.6   | 26                            | 0  | 1                                    | 12   | 13.5                |
| 51501              | 14         | 121CKKD                         | Undeveloped                       | Sodium-Sulfate                     | 6.6                     | <0.6   | 27                            | 0  | 1                                    | 14   | 17.5                |
| 51497              | 14         | 121CKKD                         | Undeveloped                       | Sodium-Sulfate                     | 5.3                     | <0.6   | 27                            | 0  | 1                                    | 12   | 13.8                |
| 51502              | 19         | 121CKKD                         | Undeveloped                       | Sodium-Chloride                    | 6.4                     | <0.6   | 25                            | 0  | 1                                    | 14   | 39.0                |
| 111153             | 17         | 121CKKD                         | Undeveloped                       | Sodium-Chloride                    | 9.1                     | <0.6   | 19                            | 0  | 1                                    | 10   | 32.5                |
| 11402              | 14         | 121CKKD                         | Undeveloped                       | Sodium-Sulfate                     | 0.7                     | <0.6   | 32                            | 1  | 0                                    | 11   | 11.5                |
| 90510              | 16         | 121CKKD                         | Undeveloped                       | Calcium-Chloride                   | 3.6                     | <0.6   | 21                            | 0  | 1                                    | 10   | 11.0                |

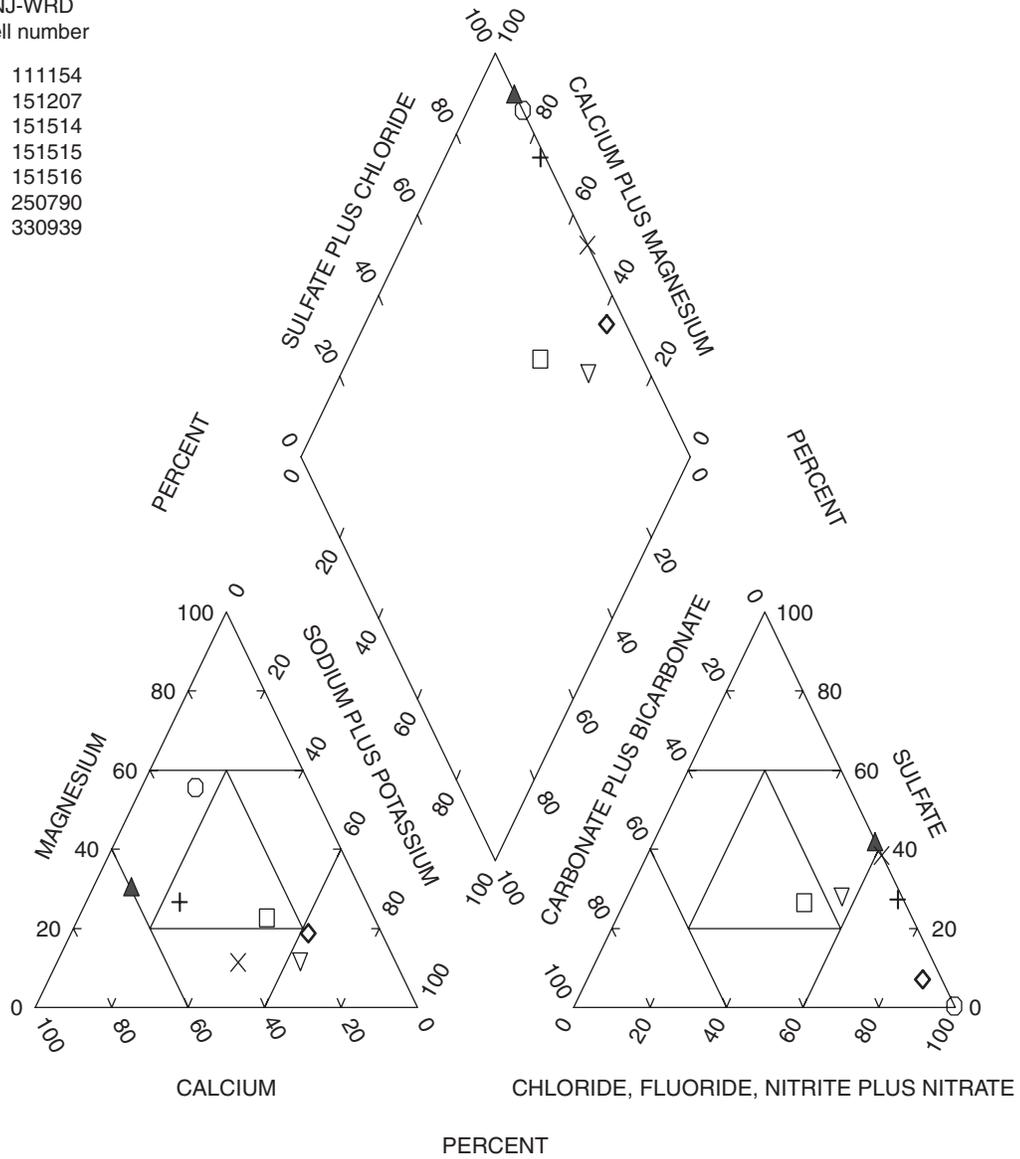
<sup>1</sup> Land use based on New Jersey geographic information system (New Jersey Department of Environmental Protection, 1996).

<sup>2</sup> Includes compounds with estimated concentrations, defined as positive detections of a compound, but measured as less than the laboratory's reporting levels.



EXPLANATION

- NJ-WRD  
well number
- 111154
  - 151207
  - ▲ 151514
  - ◇ 151515
  - × 151516
  - ▽ 250790
  - + 330939



**Figure 14.** Trilinear diagram showing the distribution of major ions in filtered samples from 7 sites in agricultural land-use areas in the Ambient Ground-Water-Quality Monitoring Network, water year 2005.

EXPLANATION

NJ-WRD  
well number

- + 011240
- ▲ 011401
- 011403
- \* 051498
- ⊠ 051499
- ▽ 051500
- ◇ 071004
- × 071005
- 090509

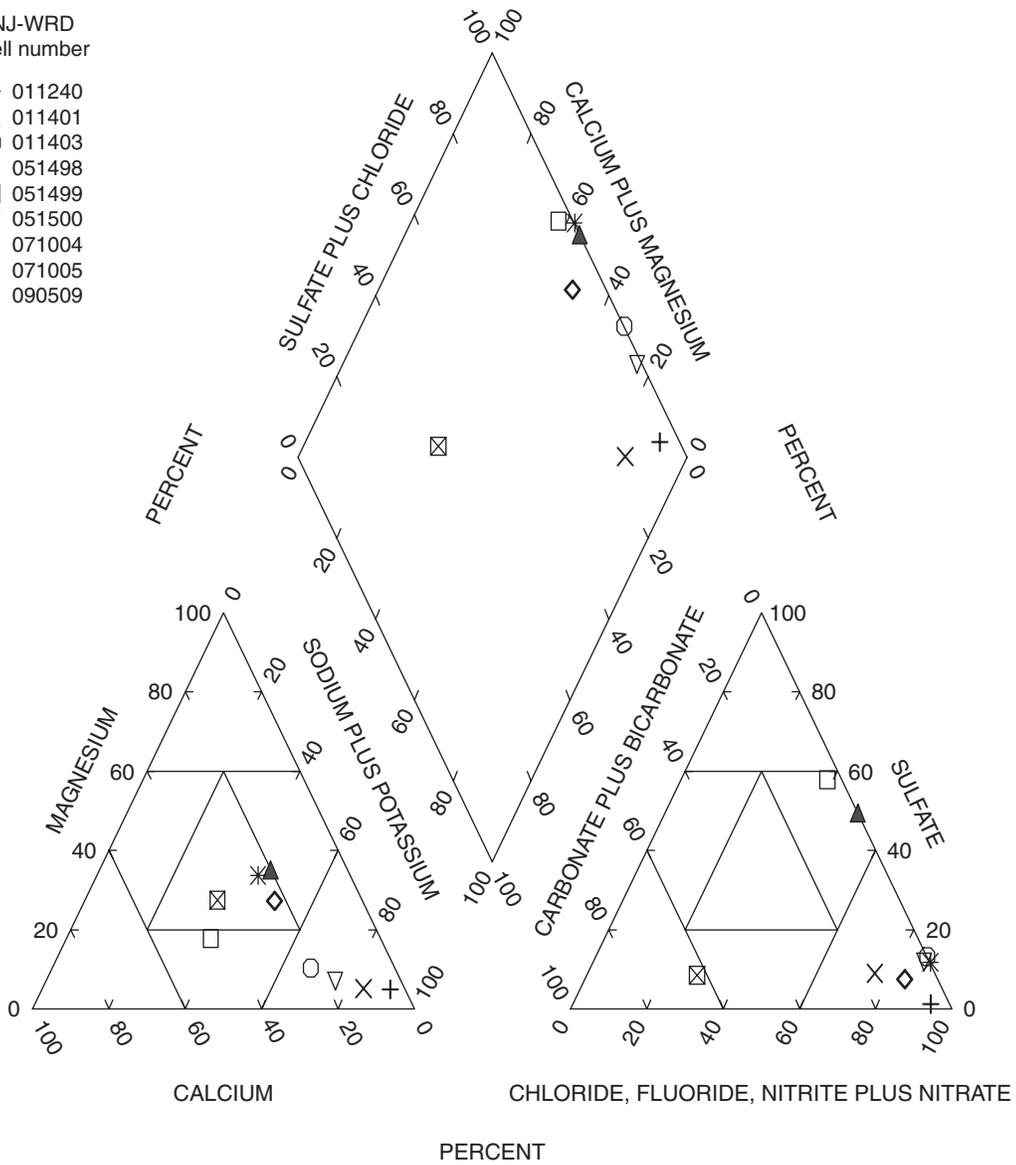
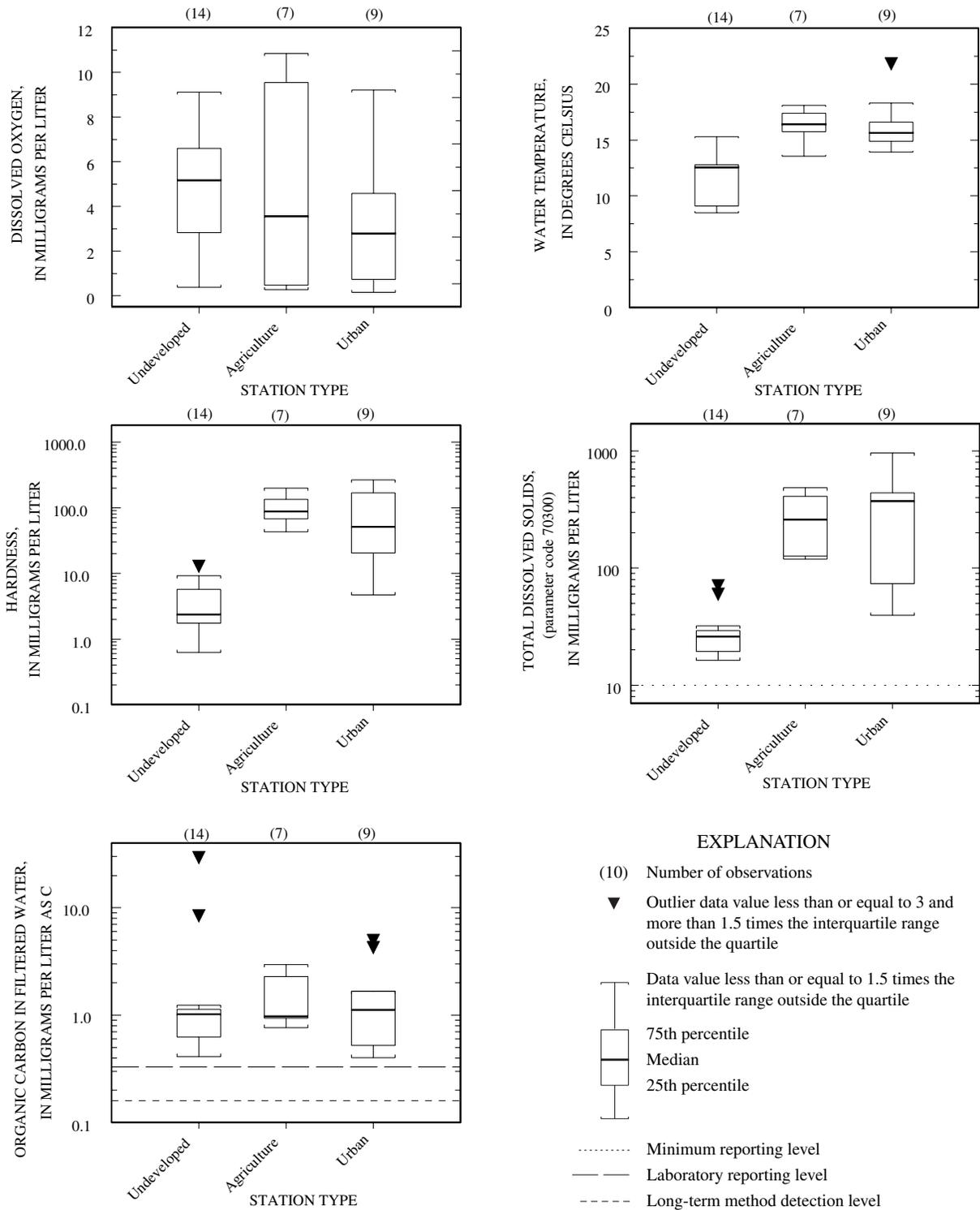
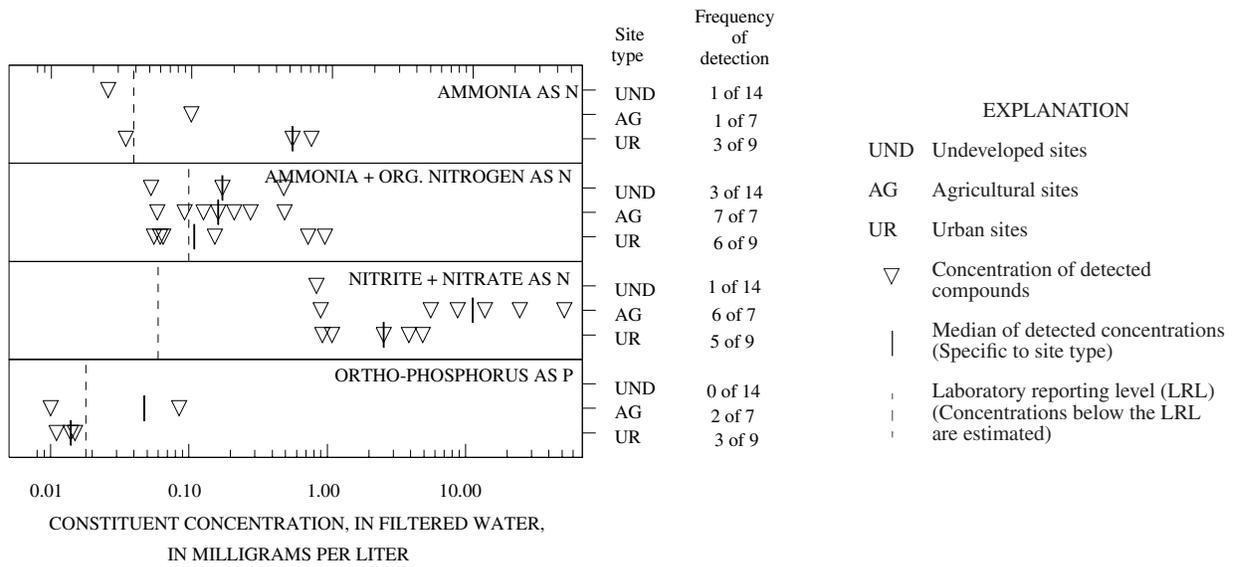


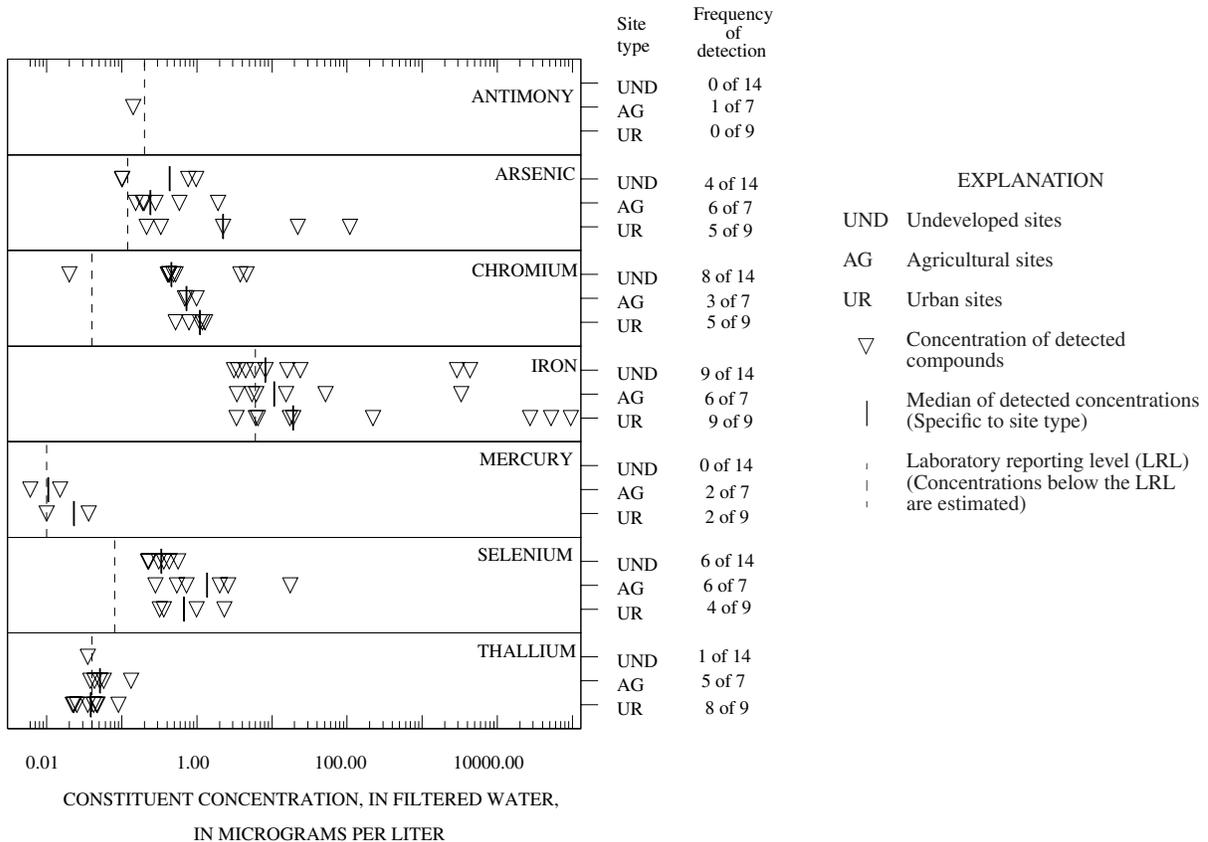
Figure 15. Trilinear diagram showing the distribution of major ions in filtered samples from 9 sites in urban land-use areas in the Ambient Ground-Water-Quality Monitoring Network, water year 2005.



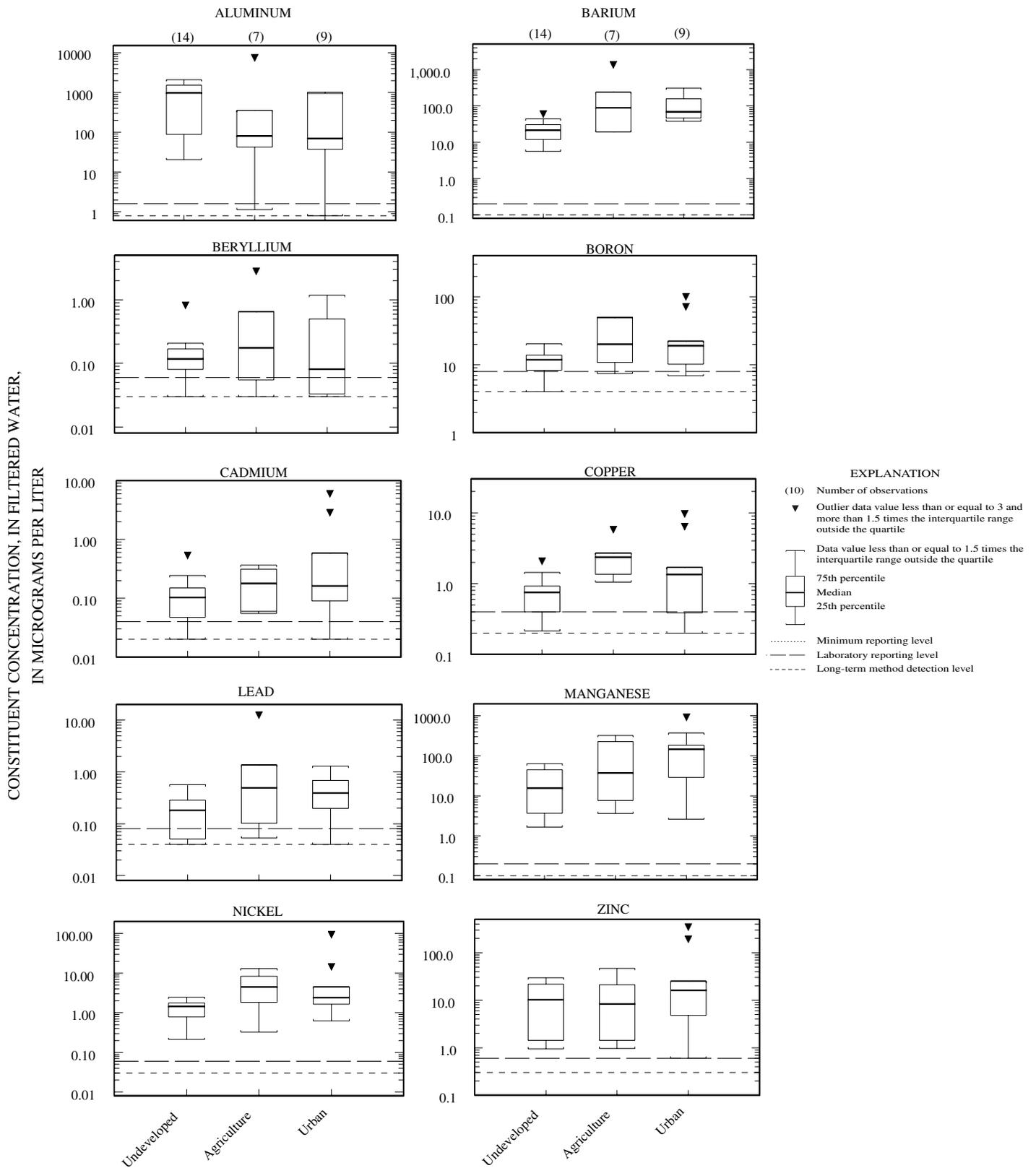
**Figure 16.** Distribution of physical characteristics of, and constituent concentrations in, samples from 30 sites in the Ambient Ground-Water-Quality Monitoring Network, water year 2005.



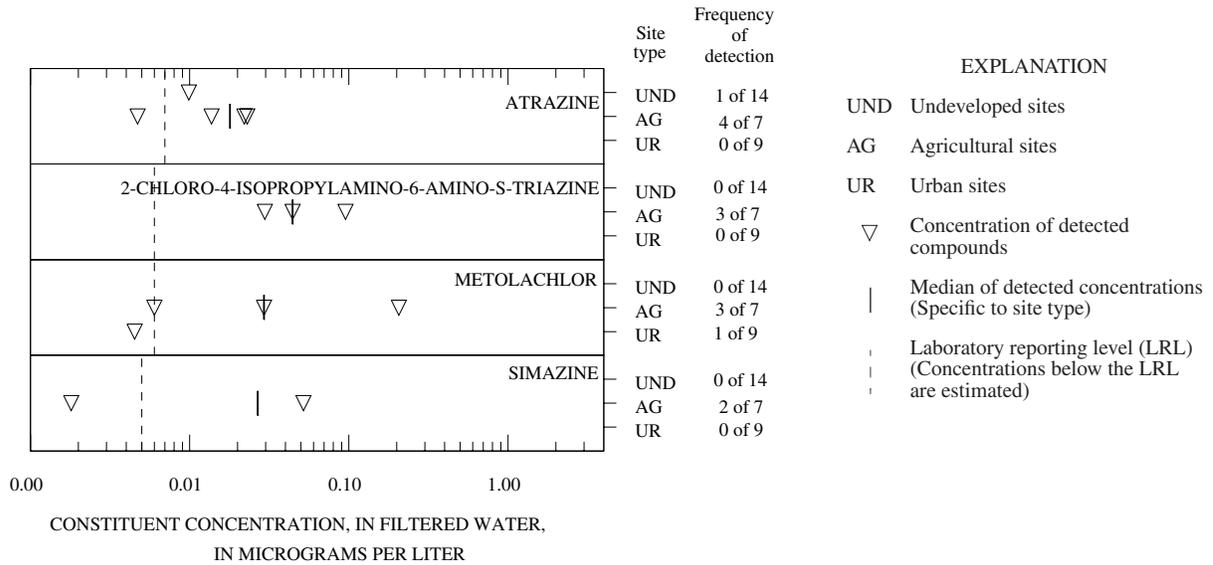
**Figure 17.** Concentration and detection frequency of selected constituents detected in filtered samples from 30 sites in the Ambient Ground-Water-Quality Monitoring Network, water year 2005. [Constituents whose values were reported by the laboratory as less than the LRL are considered to be not detected]



**Figure 18.** Concentration and detection frequency of trace elements detected in filtered samples from 30 sites in the Ambient Ground-Water-Quality Monitoring Network, water year 2005. [Constituents whose values were reported by the laboratory as less than the LRL are considered to be not detected]



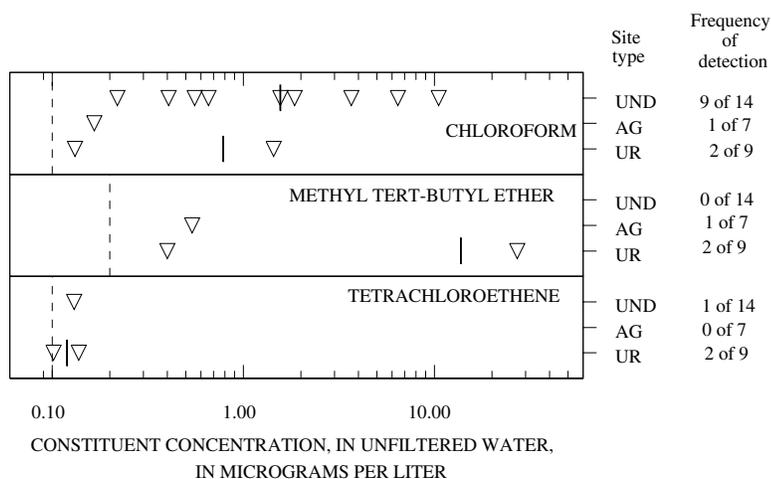
**Figure 19.** Distribution and concentration of trace elements in filtered samples from 30 sites in the Ambient Ground-Water-Quality Monitoring Network, water year 2005. ["Less-than" values are shown as equal to the long-term method detection level or one-half the minimum reporting level]



**Figure 20.** Concentration and detection frequency of selected pesticides detected in filtered samples from 30 sites in the Ambient Ground-Water-Quality Monitoring Network, water year 2005. [Constituents whose values were reported by the laboratory as less than the LRL are considered to be not detected]

**Table 3.** Concentration of pesticides detected only once in filtered samples from 30 sites in the Ambient Ground-Water-Quality Monitoring Network, water year 2005. [AG, agriculture; UR, urban]

| CONSTITUENT | CONCENTRATION (micrograms per liter) | SITE TYPE |
|-------------|--------------------------------------|-----------|
| PROMETON    | 0.037                                | UR        |
| TEBUTHIURON | 0.0368                               | AG        |



## EXPLANATION

- UND Undeveloped sites
- AG Agricultural sites
- UR Urban sites
- ▽ Concentration of detected compounds
- | Median of detected concentrations (Specific to site type)
- ⋮ Laboratory reporting level (LRL) (Concentrations below the LRL are estimated)

**Figure 21.** Concentration and detection frequency of selected volatile organic compounds detected in unfiltered samples from 30 sites in the Ambient Ground-Water-Quality Monitoring Network, water year 2005. [Constituents whose values were reported by the laboratory as less than the LRL are considered to be not detected]

**Table 4.** Concentration of volatile organic compounds detected only once in unfiltered samples from 30 sites in the Ambient Ground-Water-Quality Monitoring Network, water year 2005. [AG, agriculture; UR, urban]

| CONSTITUENT              | CONCENTRATION<br>(micrograms per liter) | SITE TYPE |
|--------------------------|---|-----------|
| 1,2 - DICHLOROPROPANE    | 0.2609                                  | AG        |
| cis-1,2-DICHLOROETHYLENE | 0.5493                                  | UR        |
| DIISOPROPYL ETHER        | 7.543                                   | UR        |
| TRICHLOROETHYLENE        | 0.1753                                  | UR        |

## Distribution, Concentration, and Detection Frequency of Trace Elements in Filtered Water from 30 Sites in the AGWQMN

The least frequently detected TEs in samples from wells in all land-use areas were silver, detected in no sample; antimony, detected in 3 percent of samples; and mercury, detected in 13 percent (fig. 18; silver not included). Antimony and mercury were not detected in any sample from wells in undeveloped areas. Each TE shown in figure 19 was detected in at least 85 percent of the samples (values reported as less than the LRL were included in each distribution as a value equal to the LT-MDL; values reported as estimated were included). Samples from wells in undeveloped areas had the lowest median concentrations of barium, boron, cadmium, copper, lead, manganese and nickel. Those in agricultural areas had the highest median concentration of copper as well as the highest concentrations (outliers) of aluminum, barium, beryllium, and lead. Those outliers represent a well located in a narrow wood line surrounded by cultivated fields. Samples from wells in urban areas had the highest concentrations of boron, cadmium, copper, manganese, nickel, and zinc. Several of those outliers represent a well located in a narrow grass strip surrounded by commercial properties and a highway.

## Concentration and Detection Frequency of Pesticides in Filtered Water and VOCs in Unfiltered Water from 30 Sites in the AGWQMN

Filtered samples from 30 wells were analyzed for 52 pesticides by use of USGS National Water Quality Laboratory schedule 2001. Only pesticides detected in one or more samples are included in the figure or table. Refer to “Laboratory Measurements” in “Explanation of Water-Quality Records” in this report for the complete list of those pesticides and the LRL for each compound. Four pesticide compounds – all herbicides – were detected in more than one sample, and all but one detection were in samples from wells in agricultural areas (fig. 20). Atrazine was most frequently detected; it was present in 17 percent of the samples. Two herbicides were detected only once (table 3).

Samples from 30 wells were analyzed for 34 volatile organic compounds (VOCs). Only VOCs detected in one or more samples are included in the figure or table. Three compounds were detected in more than one sample (fig. 21). Chloroform (trichloromethane) was the most frequently detected VOC; it was present in 40 percent of the samples. Four VOCs were detected only once (table 4).

## DOWNSTREAM ORDER AND STATION NUMBER

Since October 1, 1950, hydrologic-station records in USGS reports have been listed in order of downstream direction along the main stream. All stations on a tributary entering upstream from a main-stream station are listed before that station. A station on a tributary entering between two main-stream stations is listed between those stations. A similar order is followed in listing stations on first rank, second rank, and other ranks of tributaries. The rank of any tributary on which a station is located with respect to the stream to which it is immediately tributary is indicated by an indentation in that list of stations in the front of this report. Each indentation represents one rank. This downstream order and system of indentation indicates which stations are on tributaries between any two stations and the rank of the tributary on which each station is located.

As an added means of identification, each hydrologic station and partial-record station has been assigned a station number. These station numbers are in the same downstream order used in this report. In assigning a station number, no distinction is made between partial-record stations and other stations; therefore, the station number for a partial-record station indicates downstream-order position in a list composed of both types of stations. Gaps are consecutive. The complete 8-digit (or 10-digit) number for each station such as 01396500, which appears just to the left of the station name, includes a 2-digit part number “01” plus the 6-digit (or 8-digit) downstream order number “396500.” In areas of high station density, an additional two digits may be added to the station identification number

to yield a 10-digit number. The stations are numbered in downstream order as described above between stations of consecutive 8-digit numbers.

## NUMBERING SYSTEM FOR WELLS AND MISCELLANEOUS SITES

The USGS well and miscellaneous site-numbering system is based on the grid system of latitude and longitude. The system provides the geographic location of the well or miscellaneous site and a unique number for each site. The number consists of 15 digits. The first 6 digits denote the degrees, minutes, and seconds of latitude, and the next 7 digits denote degrees, minutes, and seconds of longitude; the last 2 digits are a sequential number for wells within a 1-second grid. In the event that the latitude-longitude coordinates for a well and miscellaneous site are the same, a sequential number such as "01," "02," and so forth, would be assigned as one would for wells (fig. 22). The 8-digit, downstream order station numbers are not assigned to wells and miscellaneous sites where only random water-quality samples or discharge measurements are taken.

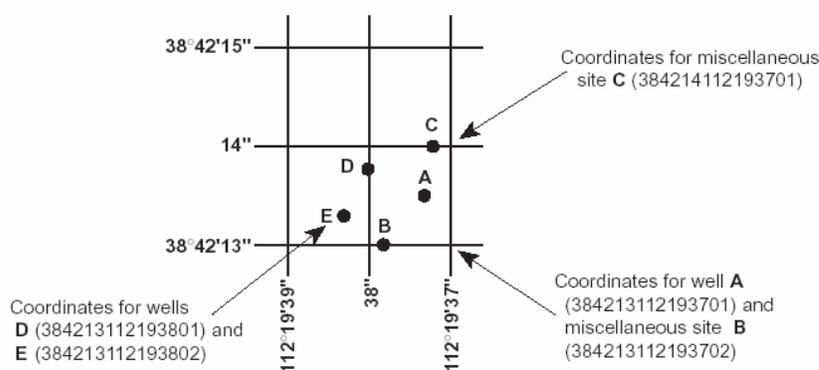


Figure 22. System for numbering wells and miscellaneous sites (latitude and longitude).

## SPECIAL NETWORKS AND PROGRAMS

**Hydrologic Benchmark Network** is a network of 61 sites in small drainage basins in 39 States that was established in 1963 to provide consistent streamflow data representative of undeveloped watersheds nationwide, and from which data could be analyzed on a continuing basis for use in comparison and contrast with conditions observed in basins more obviously affected by human activities. At selected sites, water-quality information is being gathered on major ions and nutrients, primarily to assess the effects of acid deposition on stream chemistry. Additional information on the Hydrologic Benchmark Program may be accessed from <http://ny.cf.er.usgs.gov/hbn/>.

**National Stream-Quality Accounting Network (NASQAN)** is a network of sites used to monitor the water quality of large rivers within the Nation's largest river basins. From 1995 through 1999, a network of approximately 40 stations was operated in the Mississippi, Columbia, Colorado, and Rio Grande River basins. For the period 2000 through 2004, sampling was reduced to a few index stations on the Colorado and Columbia Rivers so that a network of five stations could be implemented on the Yukon River. Samples are collected with sufficient frequency that the flux of a wide range of constituents can be estimated. The objective of NASQAN is to characterize the water quality of these large rivers by measuring concentration and mass transport of a wide range of dissolved and suspended constituents, including nutrients, major ions, dissolved and sediment-bound heavy metals, common pesticides, and inorganic and organic forms of carbon. This information will be used (1) to describe the long-term trends and changes in concentration and transport of these constituents; (2) to test findings of the National Water-Quality Assessment (NAWQA) Program; (3) to characterize processes unique to large-river systems such as storage and re-mobilization of sediments and associated contaminants; and (4) to refine existing estimates of off-continent transport of water, sediment, and chemicals for assessing human effects on the world's oceans and for determining global cycles of

carbon, nutrients, and other chemicals. Additional information about the NASQAN Program may be accessed from <http://water.usgs.gov/nasqan/>.

**The National Atmospheric Deposition Program/National Trends Network (NADP/NTN)** is a network of monitoring sites that provides continuous measurement and assessment of the chemical constituents in precipitation throughout the United States. As the lead Federal agency, the USGS works together with over 100 organizations to provide a long-term, spatial and temporal record of atmospheric deposition generated from this network of 250 precipitation-chemistry monitoring sites. The USGS supports 74 of these 250 sites. This long-term, nationally consistent monitoring program, coupled with ecosystem research, provides critical information toward a national scorecard to evaluate the effectiveness of ongoing and future regulations intended to reduce atmospheric emissions and subsequent impacts to the Nation's land and water resources. Reports and other information on the NADP/NTN Program, as well as data from the individual sites, may be accessed from <http://bqs.usgs.gov/acidrain/>.

**The USGS National Water-Quality Assessment (NAWQA) Program** is a long-term program with goals to describe the status and trends of water-quality conditions for a large, representative part of the Nation's ground- and surface-water resources; to provide an improved understanding of the primary natural and human factors affecting these observed conditions and trends; and to provide information that supports development and evaluation of management, regulatory, and monitoring decisions by other agencies.

Assessment activities are being conducted in 42 study units (major watersheds and aquifer systems) that represent a wide range of environmental settings nationwide and that account for a large percentage of the Nation's water use. A wide array of chemical constituents is measured in ground water, surface water, streambed sediments, and fish tissues. The coordinated application of comparative hydrologic studies at a wide range of spatial and temporal scales will provide information for water-resources managers to use in making decisions and a foundation for aggregation and comparison of findings to address water-quality issues of regional and national interest.

Communication and coordination between USGS personnel and other local, State, and Federal interests are critical components of the NAWQA Program. Each study unit has a local liaison committee consisting of representatives from key Federal, State, and local water-resources agencies, Indian nations, and universities in the study unit. Liaison committees typically meet semiannually to discuss their information needs, monitoring plans and progress, desired information products, and opportunities for collaboration among the agencies. Additional information about the NAWQA Program may be accessed from <http://water.usgs.gov/nawqa/>.

**The USGS National Streamflow Information Program (NSIP)** is a long-term program with goals to provide framework streamflow data across the Nation. Included in the program are creation of a permanent Federally funded streamflow network, research on the nature of streamflow, regional assessments of streamflow data and databases, and upgrades in the streamflow information delivery systems. Additional information about NSIP may be accessed from <http://water.usgs.gov/nsip/>.

## LOCAL NETWORKS AND PROGRAMS

**The Ambient Surface-Water-Quality Monitoring Network (ASWQMN) and Ambient Ground-Water-Quality Monitoring Network (AGWQMN)** are USGS/New Jersey Department of Environmental Protection (NJDEP) cooperative networks designed to meet the expanding need for surface- and ground-water-quality data in the State of New Jersey. The major objectives of the networks are to (1) support the National Environmental Performance Partnership System agreement (a program set up to control long-term environmental planning) and the watershed-management process; (2) to work synergistically with the NJDEP Ambient Biomonitoring Network, and atmospheric, ground-water, and coastal water-quality networks; (3) determine statewide water-quality status and trends; (4) measure water-quality near the downstream end of each Watershed Management Area (WMA); (5) define background water quality in each of the four physiographic provinces of New Jersey; (6) measure nonpoint source contributions from major landuse areas, atmospheric deposition, and ground-water; (7) facilitate response of state and local water-management officials to emerging or watershed-specific water-quality issues.

The Ambient Surface-Water-Quality Monitoring Network consists of up to 118 stations located in 20 WMA's (fig. 23). These stations are segregated into five distinct types that together are used to define the surface-water-quality in the State. Background stations are located on reaches of streams that have remained relatively unaffected by human activity, to develop a baseline water-quality data base (fig. 24). Data from these stations are used in the development of water-quality standards and initiatives. Watershed Integrator stations are located near the furthest downstream point possible in each WMA to provide information on the combined water-quality effects within each WMA. Land Use Indicator stations are used to monitor the effects of the dominant land use in each WMA and provide data on nonpoint-source loading of contaminants to streams. Statewide Status stations are chosen randomly each year within the 20 WMA's to obtain a statistical basis that can be used to estimate water-quality indicators statewide. Four stations are located on the Delaware Main Stem—the border between New Jersey and Pennsylvania. Watershed Reconnaissance stations are also selected annually on the basis of specific project needs, determined by a committee of USGS and NJDEP personnel.

The stream-monitoring network is sampled in four periods throughout the water year: November to December, February to March, May to June, and August to September. Samples for the analyses of nutrients, major ions, biochemical oxygen demand, and suspended solids are collected for the entire network each sampling period. Samples for the analysis of filtered organic pesticides during May to June and whole-water-recoverable trace elements during February to March and August to September are collected at all Statewide Status and Background stations. Samples for the analyses of trace elements and polycyclic aromatic hydrocarbons in streambed sediments are also collected in August to September at 20 Statewide Status stations and 2 Background stations. Samples for the analyses of fecal coliform, *E. coli*, and enterococcus bacteria are collected synoptically—5 times in a 30-day period during the summer.

The Ambient Ground-Water-Quality Monitoring Network is a long-term monitoring network with goals to assess the status of ground-water quality by examining the concentrations of various constituents that can be used as environmental indicators, assess water-quality trends by examining data collected on a 5-year cycle, determine the effects of land use on shallow ground-water quality, identify threats from nonpoint sources of contamination, and identify emerging or new environmental issues of concern to the public. The ground-water network consists of 150 wells distributed throughout the State of New Jersey within three land-use types. Sixty wells are located in agricultural areas, 60 in urban/suburban areas, and 30 in undeveloped areas. These areas are located throughout New Jersey's five Watershed Management Regions (WMR), which are further divided into 20 watershed-management areas (WMA) (fig. 25). The Passaic Region encompasses WMAs 3-6; the Lower Delaware Region, WMAs 17-20; the Raritan Region, WMAs 7-10; the Upper Delaware Region, WMAs 1, 2, and 11; and, the Atlantic Coastal Region, WMAs 12-16.

**The Long Island-New Jersey Coastal Plain (LINJ)** and **The Delaware River Basin (DELR)** are two NAWQA study units currently operating in the New Jersey Water Science Center. The LINJ study unit conducted intensive sampling from 1996 through 1998 and the DELR study unit from 1999 through 2001. Both study units are currently in low-intensity phases. The LINJ study unit is slated to resume intensive sampling starting in 2006 and the DELR study unit in 2010. The LINJ-NAWQA fixed station published in this report is: Raritan River at Queens Bridge, at Bound Brook, NJ (01403300). The DELR-NAWQA fixed station published in this report is: Delaware River at Trenton, NJ (01463500).

One **Hydrological Benchmark Network** station is currently operating in New Jersey—McDonald's Branch in Lebanon State Forest, 01466500. In addition to the sampling requirements of the ASWQMN, the station is sampled several times a year during periods of changing stage for analysis of physical parameters, major cations and anions, nutrients, and aluminum.

## EXPLANATION OF WATER-QUALITY RECORDS

### Collection and Examination of Data

Records of surface-water quality ordinarily are obtained at or near stream-gaging stations because discharge data is useful in the interpretation of surface-water quality. Records of surface-water quality in this report involve a variety of types of data and measurement frequencies.

The descriptive heading for water-quality records gives the period of record for all water-quality data; the period of daily record for parameters that are measured on a daily basis (specific conductance, water temperature, sediment discharge, and so forth); extremes for the current year; and general remarks.

For ground-water records, no descriptive statements are given; however, the well number, depth of well, sampling date, or other pertinent data are given in the table containing the chemical analyses of the ground water.

### Water Analysis

Most of the methods used for collecting and analyzing water samples are described in the TWRIs, which may be accessed from <http://water.usgs.gov/pubs/twri/>.

One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled at several verticals to obtain a representative sample needed for an accurate mean concentration and for use in calculating load.

Chemical-quality data published in this report are considered to be the most representative values available for the stations listed. The values reported represent water-quality conditions at the time of sampling as much as possible, consistent with available sampling techniques and methods of analysis. In the rare case where an apparent inconsistency exists between a reported pH value and the relative abundance of carbon dioxide species (carbonate and bicarbonate), the inconsistency is the result of a slight uptake of carbon dioxide from the air by the sample between measurement of pH in the field and determination of carbonate and bicarbonate in the laboratory.

For chemical-quality stations equipped with digital monitors, the records consist of daily maximum and minimum values (and sometimes mean or median values) for each constituent measured and are based on 15-minute or 1-hour intervals of recorded data beginning at 0000 hours and ending at 2400 hours for the day of record.

### Classification of Records

Water-quality data for surface-water sites are grouped into one of three classifications. A *continuous-record station* is a site where data are collected on a regularly scheduled basis. Frequency may be one or more times daily, weekly, monthly, or quarterly. A *partial-record station* is a site where limited water-quality data are collected systematically over a period of years. Frequency of sampling is usually less than quarterly. A *miscellaneous sampling site* is a location other than a continuous- or partial-record station, where samples are collected to give better areal coverage to define water-quality conditions in the river basin.

A careful distinction needs to be made between *continuous records* as used in this report and *continuous recordings* that refer to a continuous graph or a series of discrete values recorded at short intervals. Some records of water quality, such as temperature and specific conductance, may be obtained through continuous recordings; however, because of costs, most data are obtained only monthly or less frequently.

## Accuracy of the Records

Continuous-record water-quality data for periods for which the difference between the sensor's response and a known value did not exceed recalibration criteria were considered to be reliable and were not adjusted. Differences between sensor responses documented during cleaning or verification of sensor calibration that exceeded the recalibration criteria indicated the need for sensor recalibration and adjustment of the recorded data for the period between inspections. Continuous-record water-quality data for periods for which the differences between the sensor's response and a known value exceeded the maximum allowable limits were considered to be unreliable and were not published.

| Measured physical property | Recalibration criteria                                    | Maximum allowable limits                                   |
|----------------------------|---|--|
| Water temperature          | $\pm 0.2$ °C  | $\pm 1.5$ °C   |
| Specific conductance       | the greater of $\pm 5$ uS/cm or 3% of the measured value  | $\pm 25\%$   |
| Dissolved oxygen           | the greater of $\pm 0.3$ mg/L or 5% of the measured value | the greater of $\pm 1.5$ mg/L or 25% of the measured value |
| pH                         | $\pm 0.3$ units   | $\pm 1.5$ units  |
| Turbidity                  | the greater of $\pm 2$ NTU or 5% of the measured value    | $\pm 25\%$   |

## Arrangement of Records

Water-quality records from continuing-record and continuous-recording stations are listed in downstream order immediately after the "Introduction." Water-quality data for partial-record stations and for miscellaneous sampling sites appear in separate tables following the continuing-record stations.

## Onsite Measurements and Sample Collection

In obtaining water-quality data, a major concern is assuring that the data obtained represent the naturally occurring quality of the water. To ensure this, certain measurements, such as water temperature, pH, and dissolved oxygen, must be made onsite when the samples are collected. To assure that measurements made in the laboratory also represent the naturally occurring water, carefully prescribed procedures must be followed in collecting the samples, in treating the samples to prevent changes in quality pending analysis, and in shipping the samples to the laboratory. Procedures for onsite measurements and for collecting, treating, and shipping samples are given in TWRIs Book 1, Chapter D2; Book 3, Chapters A1, A3, and A4; and Book 9, Chapters A1-A9. These TWRIs can be accessed from <http://water.usgs.gov/pubs/twri/>. Also, detailed information on collecting, treating, and shipping samples can be obtained from the USGS Water Science Center (see address that is shown on the back of title page in this report).

## Water Temperature

Water temperatures are measured at most of the water-quality stations. In addition, water temperatures are taken at the time of discharge measurements for water-discharge stations. For stations where water temperatures are taken manually once or twice daily, the water temperatures are taken at about the same time each day. Large streams have a small diurnal temperature change; shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where recording instruments are used, either mean temperatures or maximum and minimum temperatures for each day are published. Water temperatures measured at the time of water-discharge measurements are on file in the USGS Water Science Center.

## Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross section.

During periods of rapidly changing flow or rapidly changing concentration, samples may be collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration are computed by the subdivided-day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method. For periods when no samples were collected, daily discharges of suspended sediment were estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples are collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observation, such data are useful in establishing seasonal relations between quality and streamflow and in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of suspended-sediment discharge, records of the periodic measurements of the particle-size distribution of the suspended sediment and bed material are included for some stations.

## Laboratory Measurements

Surface-water samples for biochemical oxygen demand (BOD), indicator bacteria, hexavalent chromium, total suspended solids, and selected nutrients, and bed-sediment samples for total ammonia plus organic nitrogen and total phosphorus, are analyzed locally. Surface-water samples for dissolved ammonia plus organic nitrogen, dissolved nitrite plus nitrate, dissolved phosphorus, and total phosphorus collected for the Ambient Surface-Water-Quality Monitoring Network from Nov. 2003 to June 2004 were analyzed in the USGS laboratory in Ocala, Florida. All other samples are analyzed in the USGS laboratory in Lakewood, Colorado, unless otherwise noted. Names of cooperating laboratories are listed in the station records. Methods used in analyzing sediment samples and computing sediment records are given in TWRI, Book 5, Chapter C1. Methods used by the USGS laboratories are given in the TWRI, Book 1, Chapter D2; Book 3, Chapter C2; and Book 5, Chapters A1, A3, and A4. The TWRI publications may be accessed from <http://water.usgs.gov/pubs/twri/>. These methods are consistent with ASTM standards and generally follow ISO standards.

## Analyses of wastewater compounds in groundwater (schedule 1433)

Selected water samples from Radium Sampling of Water From The Kirkwood-Cohansey Aquifer System and of Backwash brine From Ion-Exchange Treatment Systems, and Morristown National Historical Park study sites were analyzed for waste water compounds by use of schedule 1433. This table lists the waste water compounds on the schedule, the unit of measure (micrograms per liter, ug/L), the U.S. Geological Survey National Water Information System parameter code, and the reporting level. Only waste water compounds that routinely cannot be detected in sampling equipment blanks are listed in the water-quality table.

**SCHEDULE DESCRIPTION.**--Wastewater compounds after filtration through glass fiber filter (0.7-micron nominal pore size), extracted on solid-phase extraction (SPE) cartridge with polystyrene-divinylbenzene resin extractant within polypropylene housing, eluted with a 4:1 mixture of dichloromethane and diethyl ether, and analyzed by Gas Chromatography/Mass Spectrometry (GC/MS).

**PCODE.**--The USGS/EPA parameter code.

COMMON NAME.--Common or trade name(s) for constituent.

LRL.--Laboratory reporting level.

| PCode | Common Name                                    | LRL<br>(ug/L) | PCode | Common Name                     | LRL<br>(ug/L) |
|-------|--|---------------|-------|---------------------------------|---------------|
| 62005 | Cotinine                                       | 1.0           | 62077 | Isoborneol                      | 0.5           |
| 62052 | Ethynyl estradiol                              | 5.0           | 34409 | Isophorone                      | 0.5           |
| 62063 | 5-Methyl-1H-benzotriazole                      | 2.0           | 62079 | Isoquinoline                    | 0.5           |
| 62066 | Anthraquinone                                  | 0.5           | 62073 | d-Limonene                      | 0.5           |
| 62064 | Acetophenone                                   | 0.5           | 62080 | Menthol                         | 0.5           |
| 62065 | Acetyl hexamethyl tetrahydronaphthalene (AHTN) | 0.5           | 50359 | Metalaxyl                       | 0.5           |
| 34221 | Anthracene                                     | 0.5           | 39415 | Metolachlor                     | 0.5           |
| 34572 | 1,4-Dichlorobenzene                            | 0.5           | 34443 | Naphthalene                     | 0.5           |
| 34248 | Benzo[a]pyrene                                 | 0.5           | 62054 | 1-Methylnaphthalene             | 0.5           |
| 62067 | Benzophenone                                   | 0.5           | 62055 | 2,6-Dimethylnaphthalene         | 0.5           |
| 04029 | Bromacil                                       | 0.5           | 62056 | 2-Methylnaphthalene             | 0.5           |
| 34288 | Bromoform                                      | 0.5           | 62083 | 4-Nonylphenol diethoxylates     | 5.0           |
| 62059 | 3-tert-Butyl-4-hydroxy anisole (BHA)           | 5.0           | 61705 | 4-Octylphenol diethoxylates     | 1.0           |
| 50305 | Caffeine                                       | 0.5           | 61706 | 4-Octylphenol monoethoxylates   | 1.0           |
| 62070 | Camphor  | 0.5           | 62084 | p-Cresol                        | 1.0           |
| 82680 | Carbaryl                                       | 1.0           | 62060 | 4-Cumylphenol                   | 1.0           |
| 62071 | Carbazole                                      | 0.5           | 62085 | para-Nonylphenol (total)        | 5.0           |
| 38933 | Chlorpyrifos                                   | 0.5           | 62061 | 4-n-Octylphenol                 | 1.0           |
| 62072 | Cholesterol                                    | 2.0           | 62062 | 4-tert-Octylphenol              | 1.0           |
| 62057 | 3-beta-Coprostanol                             | 2.0           | 34462 | Phenanthrene                    | 0.5           |
| 62078 | Isopropylbenzene                               | 0.5           | 34466 | Phenol                          | 0.5           |
| 99585 | Decafluorobiphenyl                             |               | 34459 | Pentachlorophenol               | 2.0           |
| 62082 | N,N-diethyl-meta-toluamide (DEET)              | 0.5           | 62089 | Tributyl phosphate              | 0.5           |
| 39572 | Diazinon                                       | 0.5           | 62092 | Triphenyl phosphate             | 0.5           |
| 38775 | Dichlorvos                                     | 1.0           | 62093 | Tris(2-butoxyethyl)phosphate    | 0.5           |
| 62069 | Bisphenol A                                    | 1.0           | 62087 | Tris(2-chloroethyl)phosphate    | 0.5           |
| 62074 | Equilenin                                      | 5.0           | 04037 | Prometon                        | 0.5           |
| 62053 | 17-beta-Estradiol                              | 5.0           | 34470 | Pyrene                          | 0.5           |
|       |  |               | 62081 | Methyl salicylate               | 0.5           |
| 62091 | Triethyl citrate (ethyl citrate)               | 0.5           | 62058 | 3-Methyl-1(H)-indole (Skatole)  | 1.0           |
| 34476 | Tetrachloroethylene                            | 0.5           | 62068 | beta-Sitosterol                 | 2.0           |
| 34377 | Fluoranthene                                   | 0.5           | 62086 | beta-Stigmastanol               | 2.0           |
| 62075 | Hexahydrohexamethylcyclopentabenzopyran (HHCB) | 0.5           | 62090 | Triclosan                       | 1.0           |
| 62076 | Indole   | 0.5           | 62088 | Tris(dichlorisopropyl)phosphate | 0.5           |

### Analyses of pesticides in surface-water and ground-water samples (schedule 2001)

Selected water samples from ASWQMN, AGWQMN, and NAWQA study sites were analyzed for pesticides by use of NWQL schedule 2001. This table lists the pesticides on the schedule, the unit of measure (micrograms per liter,

ug/L), the USGS National Water Information System parameter code, and the reporting level. Only pesticides measured at or above the minimum reporting level for one or more samples are listed in the water-quality tables.

**SCHEDULE DESCRIPTION.**--Pesticides in filtered water extracted on C-18 Solid Phase Extraction (SPE) cartridge and analyzed by Gas Chromatography/Mass Spectrometry (GC/MS).

**PCODE.**--The USGS/EPA parameter code.

**COMMON NAME.**--Common or trade name(s) for constituent.

**LRL.**--Laboratory reporting level.

| PCode | Common Name   | LRL<br>(ug/L) | PCode | Common Name      | LRL<br>(ug/L) |
|-------|---|---------------|-------|------------------|---------------|
| 34253 | alpha-HCH   | 0.005         | 04095 | Fonofos          | 0.003         |
| 82660 | 2,6-Diethylaniline                                      | 0.006         | 39341 | Lindane          | 0.004         |
| 04040 | 2-Chloro-4-isopropylamino-6-amino-<br>s-triazine (CIAT) | 0.006         | 82666 | Linuron          | 0.035         |
| 49260 | Acetochlor  | 0.006         | 39532 | Malathion        | 0.027         |
| 46342 | Alachlor  | 0.005         | 39415 | Metolachlor      | 0.006         |
| 39632 | Atrazine  | 0.007         | 82630 | Metribuzin       | 0.006         |
| 82686 | Azinphos-methyl   | 0.05          | 82671 | Molinate         | 0.003         |
| 82673 | Benfluralin   | 0.010         | 82684 | Napropamide      | 0.007         |
| 04028 | Butylate  | 0.004         | 34653 | p,p'-DDE         | 0.003         |
| 82680 | Carbaryl  | 0.041         | 39542 | Parathion        | 0.010         |
| 82674 | Carbofuran  | 0.02          | 82667 | Parathion-methyl | 0.015         |
| 38933 | Chlorpyrifos  | 0.005         | 82669 | Pebulate         | 0.004         |
| 82687 | cis-Permethrin  | 0.006         | 82683 | Pendimethalin    | 0.022         |
| 04041 | Cyanazine   | 0.018         | 82664 | Phorate          | 0.011         |
| 82682 | Dacthal   | 0.003         | 04037 | Prometon         | 0.005         |
| 62170 | Desulfinylfipronil                                      | 0.012         | 04024 | Propachlor       | 0.025         |
| 62169 | Desulfinylfipronil amide                                | 0.029         | 82679 | Propanil         | 0.011         |
| 39572 | Diazinon  | 0.005         | 82685 | Propargite       | 0.023         |
| 39381 | Dieldrin  | 0.009         | 82676 | Propyzamide      | 0.004         |
| 82677 | Disulfoton  | 0.021         | 04035 | Simazine         | 0.005         |
| 82668 | EPTC  | 0.004         | 82670 | Tebuthiuron      | 0.016         |
| 82663 | Ethalfuralin  | 0.009         | 82665 | Terbacil         | 0.034         |
| 82672 | Ethoprophos   | 0.005         | 82675 | Terbufos         | 0.017         |
| 62166 | Fipronil  | 0.016         | 82681 | Thiobencarb      | 0.010         |
| 62167 | Fipronil sulfide  | 0.013         | 82678 | Tri-allate       | 0.006         |
| 62168 | Fipronil sulfone  | 0.024         | 82661 | Trifluralin      | 0.009         |

### Analyses of pesticides in surface-water samples (schedule 2003)

Selected water samples from NAWQA study sites were analyzed for pesticides by use of NWQL schedule 2003. This table lists the pesticides on the schedule, the unit of measure (micrograms per liter, ug/L), the USGS National Water Information System parameter code, and the reporting level. Only pesticides measured at or above the minimum reporting level for one or more samples are listed in the water-quality tables.

SCHEDULE DESCRIPTION.--Moderate-use pesticides and selected degradates in filtered water extracted on C-18 Solid Phase Extraction (SPE) cartridge and analyzed by Gas Chromatography/Mass Spectrometry (GC/MS).

PCODE.--The USGS/EPA parameter code.

COMMON NAME.--Common or trade name(s) for constituent.

LRL.--Laboratory reporting level.

| PCode | Common Name                                     | LRL<br>(ug/L) | PCode | Common Name                    | LRL<br>(ug/L) |
|-------|---|---------------|-------|--------------------------------|---------------|
| 49295 | 1-Naphthol                                      | 0.0882        | 62169 | Desulfinylfipronil amide       | 0.029         |
| 61618 | 2-Chloro-2,6-diethylacetanilide                 | 0.005         | 62167 | Fipronil sulfide               | 0.013         |
| 61620 | 2-Ethyl-6-methylaniline                         | 0.0045        | 62168 | Fipronil sulfone               | 0.024         |
| 61625 | 3,4-Dichloroaniline                             | 0.0045        | 62170 | Desulfinylfipronil             | 0.012         |
| 61633 | 4-Chloro-2-methylphenol                         | 0.0056        | 62166 | Fipronil                       | 0.016         |
| 49260 | Acetochlor                                      | 0.006         | 04095 | Fonofos                        | 0.003         |
| 46342 | Alachlor  | 0.005         | 04025 | Hexazinone                     | 0.0129        |
| 82660 | 2,6-Diethylaniline                              | 0.006         | 61593 | Iprodione                      | 0.538         |
| 39632 | Atrazine  | 0.007         | 61594 | Isofenphos                     | 0.0034        |
| 82686 | Azinphos-methyl                                 | 0.05          | 61652 | Malaoxon                       | 0.0298        |
| 61635 | Azinphos-methyl-oxon                            | 0.07          | 39532 | Malathion                      | 0.027         |
| 82673 | Benfluralin                                     | 0.01          | 61596 | Metalaxyl                      | 0.0051        |
| 82680 | Carbaryl  | 0.041         | 61598 | Methidathion                   | 0.0058        |
| 38933 | Chlorpyrifos                                    | 0.005         | 82667 | Parathion-methyl               | 0.015         |
| 61636 | Chlorpyrifos-oxygen analog                      | 0.0562        | 39415 | Methachlor                     | 0.006         |
| 82687 | cis-Permethrin                                  | 0.006         | 82630 | Metribuzin                     | 0.006         |
| 61585 | Cyfluthrin                                      | 0.0267        | 61599 | Myclobutanil                   | 0.008         |
| 61586 | Cypermethrin                                    | 0.0086        | 61664 | Paraoxon-methyl                | 0.0299        |
| 82682 | Dacthal   | 0.003         | 82683 | Pendimethalin                  | 0.022         |
| 04040 | 2-Chloro-4-isopropylamino-6-amino-<br>s-trizine | 0.006         | 82664 | Phorate                        | 0.011         |
| 39572 | Diazinon  | 0.005         | 61666 | Phorate oxygen analog          | 0.1048        |
| 61638 | Diazinon, oxygen analog                         | 0.006         | 61601 | Phosmet                        | 0.0079        |
| 38775 | Dichlorvos                                      | 0.0118        | 61668 | Phosmet oxon                   | 0.0511        |
| 38454 | Dicrotophos                                     | 0.0843        | 04037 | Prometon                       | 0.01          |
| 39381 | Dieldrin  | 0.009         | 04036 | Prometryn                      | 0.0054        |
| 82662 | Dimethoate                                      | 0.0061        | 82676 | Propyzamide                    | 0.004         |
| 82346 | Ethion  | 0.004         | 04035 | Simazine                       | 0.005         |
| 61644 | Ethion monoxon                                  | 0.002         | 82670 | Tebuthiuron                    | 0.016         |
| 61591 | Fenamiphos                                      | 0.029         | 82675 | Terbufos                       | 0.017         |
| 61645 | Fenamiphos sulfone                              | 0.0491        | 61674 | Terbufos oxygen analog sulfone | 0.0676        |
| 61646 | Fenamiphos sulfoxide                            | 0.0387        | 04022 | Terbutylazine                  | 0.0102        |
| 61649 | Fonofos oxon                                    | 0.003         | 82661 | Trifluralin                    | 0.009         |

### Analyses of pesticides in surface-water samples (schedule 2033)

Selected water samples from NAWQA study sites were analyzed for pesticides by use of NWQL schedule 2033. This table lists the pesticides on the schedule, the unit of measure (micrograms per liter, ug/L), the USGS National

Water Information System parameter code, and the reporting level. Only pesticides measured at or above the minimum reporting level for one or more samples are listed in the water-quality tables.

SCHEDULE DESCRIPTION.--Moderate-use pesticides and selected degradates in filtered water extracted on C-18 Solid Phase Extraction (SPE) cartridge and analyzed by Gas Chromatography/Mass Spectrometry (GC/MS).

PCODE.--The USGS/EPA parameter code.

COMMON NAME.--Common or trade name(s) for constituent.

LRL.--Laboratory reporting level.

| PCode | Common Name                                      | LRL<br>(ug/L) | PCode | Common Name              | LRL<br>(ug/L) |
|-------|--|---------------|-------|--------------------------|---------------|
| 49295 | 1-Naphthol                                       | 0.0882        | 61591 | Fenamiphos               | 0.029         |
| 61618 | 2-Chloro-2,6-diethylacetanilide                  | 0.005         | 61645 | Fenamiphos sulfone       | 0.0491        |
| 61620 | 2-Ethyl-6-methylaniline                          | 0.0045        | 61646 | Fenamiphos sulfoxide     | 0.0387        |
| 61625 | 3,4-Dichloroaniline                              | 0.0045        | 62169 | Desulfinylfipronil amide | 0.029         |
| 61627 | 3,5-Dichloroaniline                              | 0.0043        | 62167 | Fipronil sulfide         | 0.013         |
| 61633 | 4-Chloro-2-methylphenol                          | 0.0056        | 62168 | Fipronil sulfone         | 0.024         |
| 49260 | Acetochlor                                       | 0.006         | 62170 | Desulfinylfipronil       | 0.012         |
| 46342 | Alachlor   | 0.005         | 62166 | Fipronil                 | 0.016         |
| 82660 | 2,6-Diethylaniline                               | 0.006         | 04095 | Fonofos                  | 0.003         |
| 39632 | Atrazine   | 0.007         | 04025 | Hexazinone               | 0.0129        |
| 82686 | Azinphos-methyl                                  | 0.05          | 61593 | Iprodione                | 0.538         |
| 61635 | Azinphos-methyl-oxon                             | 0.07          | 61594 | Isofenphos               | 0.0034        |
| 82673 | Benfluralin                                      | 0.01          | 61595 | lambda-Cyhalothrin       | 0.0089        |
| 82680 | Carbaryl   | 0.041         | 61652 | Malaoxon                 | 0.0298        |
| 82674 | Carbofuran                                       | 0.02          | 39532 | Malathion                | 0.027         |
| 38933 | Chlorpyrifos                                     | 0.005         | 61596 | Metalaxyl                | 0.0051        |
| 61636 | Chlorpyrifos-oxygen analog                       | 0.0562        | 61598 | Methidathion             | 0.0058        |
| 82687 | cis-Permethrin                                   | 0.006         | 82667 | Parathion-methyl         | 0.015         |
| 79846 | cis-Propiconazole                                | 0.008         | 39415 | Methachlor               | 0.006         |
| 04041 | Cyanazine  | 0.018         | 82630 | Metribuzin               | 0.006         |
| 61585 | Cyfluthrin                                       | 0.0267        | 82671 | Molinate                 | 0.003         |
| 61586 | Cypermethrin                                     | 0.0086        | 61599 | Myclobutanil             | 0.008         |
| 82682 | Dacthal  | 0.003         | 61600 | Oxyfluorfen              | 0.0073        |
| 04040 | 2-Chloro-4-isopropylamino-6-amino-<br>s-triazine | 0.006         | 61664 | Paraoxon-methyl          | 0.0299        |
| 39572 | Diazinon   | 0.005         | 82683 | Pendimethalin            | 0.022         |
| 61638 | Diazinon, oxygen analog                          | 0.006         | 82664 | Phorate                  | 0.011         |
| 38775 | Dichlorvos                                       | 0.0118        | 61666 | Phorate oxygen analog    | 0.1048        |
| 38454 | Dicrotophos                                      | 0.0843        | 61601 | Phosmet                  | 0.0079        |
| 39381 | Dieldrin   | 0.009         | 61668 | Phosmet oxon             | 0.0511        |
| 82662 | Dimethoate                                       | 0.0061        | 04037 | Prometon                 | 0.01          |
| 82677 | Disulfoton                                       | 0.021         | 04036 | Prometryn                | 0.0054        |
| 61640 | Disulfoton sulfone                               | 0.0059        | 82676 | Propyzamide              | 0.004         |
| 34362 | alpha-Endosulfan                                 | 0.0047        | 82679 | Propanil                 | 0.011         |
| 61590 | Endosulfan sulfate                               | 0.0138        | 82685 | Propargite               | 0.023         |
| 82668 | EPTC   | 0.004         | 04035 | Simazine                 | 0.005         |
| 82346 | Ethion   | 0.004         | 62852 | Tebuconazole             | 0.0136        |
| 61644 | Ethion monoxon                                   | 0.002         | 82670 | Tebuthiuron              | 0.016         |

| PCode | Common Name                    | LRL<br>(ug/L) | PCode | Common Name         | LRL<br>(ug/L) |
|-------|--------------------------------|---------------|-------|---------------------|---------------|
| 82672 | Ethoprophos                    | 0.005         | 61606 | Tefluthrin          | 0.0077        |
| 82675 | Terbufos                       | 0.017         | 79847 | trans-Propiconazole | 0.0133        |
| 61674 | Terbufos oxygen analog sulfone | 0.0676        | 61610 | Tribufos            | 0.0044        |
| 04022 | Terbuthylazine                 | 0.0102        | 82661 | Trifluralin         | 0.009         |
| 82681 | Thiobencarb                    | 0.010         |       |                     |               |

## Data Presentation

For continuing-record stations, information pertinent to the history of station operation is provided in descriptive headings preceding the tabular data. These descriptive headings give details regarding location, drainage area, period of record, type of data available, instrumentation, general remarks, cooperation, and extremes for parameters currently measured daily. Tables of chemical, physical, biological, radiochemical data, and so forth, obtained at a frequency less than daily are presented first. Tables of “daily values” of specific conductance, pH, water temperature, and dissolved oxygen then follow in sequence.

The following information, as appropriate, is provided with each continuous-record station. Comments that follow clarify information presented under the various headings of the station description.

**LOCATION.**—Location information is obtained from the most accurate maps available. The location of the gaging station with respect to the cultural and physical features in the vicinity and with respect to the reference place mentioned in the station name is given. River mileages, given for only a few stations, were determined by methods given in “River Mileage Measurement,” Bulletin 14, Revision of October 1968, prepared by the Water Resources Council or were provided by the U.S. Army Corps of Engineers.

**DRAINAGE AREA.**—Drainage areas are measured using the most accurate maps available. Because the type of maps available varies from one drainage basin to another, the accuracy of drainage areas likewise varies. Drainage areas are updated as better maps become available.

**PERIOD OF RECORD.**—This indicates the time periods for which published water-quality records for the station are available. The periods are shown separately for records of parameters measured daily or continuously and those measured less than daily. For those measured daily or continuously, periods of record are given for the parameters individually.

**INSTRUMENTATION.**—Information on instrumentation is given only if a water-quality monitor, sediment pumping sampler, or other sampling device is in operation at a station.

**REMARKS.**—Remarks provide added information pertinent to the collection, analysis, or computation of the records.

**COOPERATION.**—Records provided by a cooperating organization or obtained for the USGS by a cooperating organization are identified here.

**EXTREMES.**—Maximums and minimums are given only for parameters measured daily or more frequently. For parameters measured weekly or less frequently, true maximums or minimums may not have been obtained. Extremes, when given, are provided for both the period of record and for the current water year.

**REVISIONS.**—Records are revised if errors in published water-quality records are discovered. Appropriate updates are made in the USGS distributed data system, NWIS, and subsequently to its Web-based national data system, NWISWeb (<http://waterdata.usgs.gov/nwis>). Users of USGS water-quality data are encouraged to obtain all required

data from NWIS or NWISWeb to ensure that they have the most recent updates. Updates to the NWISWeb are made on an annual basis.

The surface-water-quality records for partial-record stations and miscellaneous sampling sites are published in separate tables following the tables of ground-water-quality records. No descriptive statements are given for these records. Each station is published with its own station number and name in the regular downstream-order sequence.

## Remark Codes

The following remark codes may appear with the water-quality data in this section:

| Printed Output | Remark   |
|----------------|--|
| E or e         | Estimated value.   |
| >              | Actual value is known to be greater than the value shown.                        |
| <              | Actual value is known to be less than the value shown.                           |
| M              | Presence of material verified, but not quantified.                               |
| N              | Presumptive evidence of presence of material.                                    |
| U              | Material specifically analyzed for, but not detected.                            |
| A              | Value is an average.   |
| V              | Analyte was detected in both the environmental sample and the associated blanks. |
| S              | Most probable value.   |

## Water-Quality Control Data

The USGS National Water Quality Laboratory collects quality-control data on a continuing basis to evaluate selected analytical methods to determine long-term method detection levels (LT-MDLs) and laboratory reporting levels (LRLs). These values are re-evaluated each year on the basis of the most recent quality-control data and, consequently, may change from year to year.

This reporting procedure limits the occurrence of false positive error. Falsely reporting a concentration greater than the LT-MDL for a sample in which the analyte is not present is 1 percent or less. Application of the LRL limits the occurrence of false negative error. The chance of falsely reporting a nondetection for a sample in which the analyte is present at a concentration equal to or greater than the LRL is 1 percent or less.

Accordingly, concentrations are reported as less than LRL for samples in which the analyte either was not detected or did not pass identification. Analytes detected at concentrations between the LT-MDL and the LRL and that pass identification criteria are estimated. Estimated concentrations will be noted with a remark code of "E." These data should be used with the understanding that their uncertainty is greater than that of data reported without the E remark code.

Data generated from quality-control (QC) samples are a requisite for evaluating the quality of the sampling and processing techniques as well as data from the actual samples themselves. Without QC data, environmental sample data cannot be adequately interpreted because the errors associated with the sample data are unknown. The various types of QC samples collected by this USGS Water Science Center are described in the following section. Procedures have been established for the storage of water-quality-control data within the USGS. These procedures allow for storage of all derived QC data and are identified so that they can be related to corresponding environmental samples.

## Blank samples

Blank samples are collected and analyzed to ensure that environmental samples have not been contaminated in the overall data-collection process. The blank solution used to develop specific types of blank samples is a solution

that is free of the analytes of interest. Any measured value signal in a blank sample for an analyte (a specific component measured in a chemical analysis) that was absent in the blank solution is believed to be due to contamination. Many types of blank samples are possible; each is designed to segregate a different part of the overall data-collection process. The types of blank samples collected by this USGS Water Science Center are:

**Ambient blank**—A blank solution that is put in the same type of bottle used for an environmental sample, kept with the set of sample bottles before sample collection, and opened at the site and exposed to the ambient conditions.

**Field blank**—A blank solution that is subjected to all aspects of sample collection, field processing preservation, transportation, and laboratory handling as an environmental sample.

**Trip blank**—A blank solution that is put in the same type of bottle used for an environmental sample and kept with the set of sample bottles before and after sample collection.

**Equipment blank**—A blank solution that is processed through all equipment used for collecting and processing an environmental sample (similar to a field blank but normally done in the more controlled conditions of the office).

**Sampler blank**—A blank solution that is poured or pumped through the same field sampler used for collecting an environmental sample.

**Filter blank**—A blank solution that is filtered in the same manner and through the same filter apparatus used for an environmental sample.

**Splitter blank**—A blank solution that is mixed and separated using a field splitter in the same manner and through the same apparatus used for an environmental sample.

**Preservation blank**—A blank solution that is treated with the sampler preservatives used for an environmental sample.

## Reference samples

Reference material is a solution or material prepared by a laboratory. The reference material composition is certified for one or more properties so that it can be used to assess a measurement method. Samples of reference material are submitted for analysis to ensure that an analytical method is accurate for the known properties of the reference material. Generally, the selected reference material properties are similar to the environmental sample properties.

## Replicate samples

Replicate samples are a set of environmental samples collected in a manner such that the samples are thought to be essentially identical in composition. Replicate is the general case for which a duplicate is the special case consisting of two samples. Replicate samples are collected and analyzed to establish the amount of variability in the data contributed by some part of the collection and analytical process. Many types of replicate samples are possible, each of which may yield slightly different results in a dynamic hydrologic setting, such as a flowing stream. The types of replicate samples collected in this district are:

**Concurrent samples**—A type of replicate sample in which the samples are collected simultaneously with two or more samplers or by using one sampler and alternating the collection of samples into two or more compositing containers.

**Sequential samples**—A type of replicate sample in which the samples are collected one after the other, typically over a short time.

Split sample—A type of replicate sample in which a sample is split into subsamples, each subsample contemporaneous in time and space.

## Spike samples

Spike samples are samples to which known quantities of a solution with one or more well-established analyte concentrations have been added. These samples are analyzed to determine the extent of matrix interference or degradation on the analyte concentration during sample processing and analysis.

## ACCESS TO USGS WATER DATA

The USGS provides near real-time stage and discharge data for many of the gaging stations equipped with the necessary telemetry and historic daily-mean and peak-flow discharge data for most current or discontinued gaging stations through the World Wide Web (WWW). These data may be accessed from <http://water.usgs.gov>.

Water-quality data and ground-water data also are available through the WWW. In addition, data can be provided in various machine-readable formats on various media. Information about the availability of specific types of data or products, and user charges, can be obtained locally from each USGS Water Science Center. (See address that is shown on the back of the title page of this report.)

## CURRENT WATER-RESOURCES PROJECTS IN NEW JERSEY

The Geological Survey is currently involved in a number of hydrologic investigations in the State of New Jersey. The following is a list of these investigations. Results are published at the conclusion of short-term projects or periodically in the case of long-term projects. Hydrologic data from these projects are entered into the NWIS data base.

- An application to integrate GIS and database processing steps for conducting public supply susceptibility assessments Delaware River Basin National Water Quality Assessment
- Determination of the hydrologic and ecological effects of ground-water diversions from the Kirkwood-Cohansey aquifer system in the Pinelands area
- Determining impacts on Special Protection Waters in the Delaware Water Gap National Recreation Area EPA Technical Assistance Program
- Evaluation of the changes in hydrology and ground- and surface-water quality in an urban wetland as part of a wetlands restoration effort
- Flood characteristics of New Jersey streams
- Flow characteristics and Basis for development of ecological goals for New Jersey streams
- Geohydrology of the Naval Air Warfare Center, West Trenton, New Jersey
- Ground-water data collection network
- Ground-water levels and chloride concentrations in major aquifers of the Coastal Plain
- Ground-water supply availability in southern Ocean County
- Head of tide sampling program for the New Jersey Harbor Toxic Contaminant Assessment Reduction Program
- Hydrogeologic investigation to ensure sustainable water supply for Cape May County
- Identification of sources of arsenic to the Wallkill River Watershed
- Investigation of hydrogeology and volatile organic compound contamination in Fair Lawn, New Jersey
- Investigation of hydrogeology and volatile organic compound contamination in the Pohatcong Valley, New Jersey

## **CURRENT WATER-RESOURCES PROJECTS IN NEW JERSEY--Continued**

Investigation of potential threats to water supply from the Potomac-Raritan-Magothy Aquifer in Salem and western Gloucester Counties, New Jersey

Lower Delaware non-point source

Low-flow characteristics of New Jersey streams

Methodology for estimating flood magnitude and frequency of flood for New Jersey streams.

Modeling and experimental investigation of hydrocarbon transport and biodegradation in the unsaturated zone

Movement of chromium in the ground water of Pennsauken Township, Camden County

New Jersey Drought Monitoring System

New Jersey-Long Island National Water Quality Assessment

New Jersey Tide Telemetry System

Occurrence and distribution of trace level organics in waste water and streams

Pascack Brook Flood Warning System

Passaic Flood Warning System

Passaic River Basin Flow Model

Program to maintain and update ground-water models to evaluate continued water-supply development

Quality of water data collection network

Quantification of radium mass loading and radioactivity in the shallow aquifer from the water-softening-treatment backwash waste stream that is discharged to septic systems

Radionuclides in public water supply systems

Rahway Flood Warning System

Refinement of a data model for watershed water transfer analysis, Phase 2

Small watershed flood data collection

Somerset County Flood-Information System

Surface water data collection network

Validation of membrane diffusion sampler for soluble inorganic and all organic (volatile/nonvolatile) contaminants in ground water

Water budget analysis of confined aquifers for water-supply planning and regulation

Water budgets and ground-water availability in the Delaware River Basin

Water-quality characteristics of Upper-Delaware Watershed

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## DEFINITION OF TERMS

Specialized technical terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined below. Terms such as algae, water level, and precipitation are used in their common everyday meanings, definitions of which are given in standard dictionaries. Not all terms defined in this alphabetical list apply to every State. See also table for converting English units to International System (SI) Units. Other glossaries that also define water-related terms are accessible from <http://water.usgs.gov/glossaries.html>.

**Acid neutralizing capacity (ANC)** is the equivalent sum of all bases or base-producing materials, solutes plus particulates, in an aqueous system that can be titrated with acid to an equivalence point. This term designates titration of an “unfiltered” sample (formerly reported as alkalinity).

**Acre-foot (AC-FT, acre-ft)** is a unit of volume, commonly used to measure quantities of water used or stored, equivalent to the volume of water required to cover 1 acre to a depth of 1 foot and equivalent to 43,560 cubic feet, 325,851 gallons, or 1,233 cubic meters. (See also “Annual runoff”)

**Adenosine triphosphate (ATP)** is an organic, phosphate-rich compound important in the transfer of energy in organisms. Its central role in living cells makes ATP an excellent indicator of the presence of living material in water. A measurement of ATP therefore provides a sensitive and rapid estimate of biomass. ATP is reported in micrograms per liter.

**Adjusted discharge** is discharge data that have been mathematically adjusted (for example, to remove the effects of a daily tide cycle or reservoir storage).

**Algal growth potential (AGP)** is the maximum algal dry weight biomass that can be produced in a natural water sample under standardized laboratory conditions. The growth potential is the algal biomass present at stationary phase and is expressed as milligrams dry weight of algae produced per liter of sample. (See also “Biomass” and “Dry weight”)

**Alkalinity** is the capacity of solutes in an aqueous system to neutralize acid. This term designates titration of a “filtered” sample.

**Annual runoff** is the total quantity of water that is discharged (“runs off”) from a drainage basin in a year. Data reports may present annual runoff data as volumes in acre-feet, as discharges per unit of drainage area in cubic feet per second per square mile, or as depths of water on the drainage basin in inches.

**Annual 7-day minimum** is the lowest mean value for any 7-consecutive-day period in a year. Annual 7-day minimum values are reported herein for the calendar year and the water year (October 1 through September 30). Most low-flow frequency analyses use a climatic year (April 1-March 31), which tends to prevent the low-flow period from being artificially split between adjacent years. The date shown in the summary statistics table is the initial date of the 7-day period. (This value should not be confused with the 7-day, 10-year low-flow statistic.)

**Aroclor** is the registered trademark for a group of poly-chlorinated biphenyls that were manufactured by the Monsanto Company prior to 1976. Aroclors are assigned specific 4-digit reference numbers dependent upon molecular type and degree of substitution of the biphenyl ring hydrogen atoms by chlorine atoms. The first two digits of a numbered aroclor represent the molecular type, and the last two digits represent the percentage weight of the hydrogen-substituted chlorine.

**Artificial substrate** is a device that purposely is placed in a stream or lake for colonization of organisms. The artificial substrate simplifies the community structure by standardizing the substrate from which each sample is collected. Examples of artificial substrates are basket samplers (made of wire cages filled with clean streamside rocks) and multiplate samplers (made of hardboard) for benthic organism collection, and plexiglass strips for periphyton collection. (See also “Substrate”)

**Ash mass** is the mass or amount of residue present after the residue from a dry-mass determination has been ashed in a muffle furnace at a temperature of 500 °C for 1 hour. Ash mass of zooplankton and phytoplankton is expressed in grams per cubic meter ( $\text{g}/\text{m}^3$ ), and periphyton and benthic organisms in grams per square meter ( $\text{g}/\text{m}^2$ ). (See also “Biomass” and “Dry mass”)

**Aspect** is the direction toward which a slope faces with respect to the compass.

**Bacteria** are microscopic unicellular organisms, typically spherical, rodlike, or spiral and threadlike in shape, often clumped into colonies. Some bacteria cause disease, whereas others perform an essential role in nature in the recycling of materials; for example, by decomposing organic matter into a form available for reuse by plants.

**Bankfull stage**, as used in this report, is the stage at which a stream first overflows its natural banks formed by floods with 1- to 3-year recurrence intervals.

**Base discharge** (for peak discharge) is a discharge value, determined for selected stations, above which peak discharge data are published. The base discharge at each station is selected so that an average of about three peak flows per year will be published. (See also “Peak flow”)

**Base flow** is sustained flow of a stream in the absence of direct runoff. It includes natural and human-induced streamflows. Natural base flow is sustained largely by ground-water discharge.

**Bed material** is the sediment mixture of which a stream-bed, lake, pond, reservoir, or estuary bottom is composed. (See also “Bedload” and “Sediment”)

**Bedload** is material in transport that primarily is supported by the streambed. In this report, bedload is considered to consist of particles in transit from the bed to the top of the bedload sampler nozzle (an elevation ranging from 0.25 to 0.5 foot). These particles are retained in the bedload sampler. A sample collected with a pressure-differential bedload sampler also may contain a component of the suspended load.

**Bedload discharge** (tons per day) is the rate of sediment moving as bedload, reported as dry weight, that passes through a cross section in a given time. NOTE: Bedload discharge values in this report may include a component of the suspended-sediment discharge. A correction may be necessary when computing the total sediment discharge by

summing the bedload discharge and the suspended-sediment discharge. (See also “Bedload,” “Dry weight,” “Sediment,” and “Suspended-sediment discharge”)

**Benthic organisms** are the group of organisms inhabiting the bottom of an aquatic environment. They include a number of types of organisms, such as bacteria, fungi, insect larvae and nymphs, snails, clams, and crayfish. They are useful as indicators of water quality.

**Biochemical oxygen demand (BOD)** is a measure of the quantity of dissolved oxygen, in milligrams per liter, necessary for the decomposition of organic matter by microorganisms, such as bacteria.

**Biomass** is the amount of living matter present at any given time, expressed as mass per unit area or volume of habitat.

**Biomass pigment ratio** is an indicator of the total proportion of periphyton that are autotrophic (plants). This also is called the Autotrophic Index.

**Blue-green algae** (*Cyanophyta*) are a group of phytoplankton and periphyton organisms with a blue pigment in addition to a green pigment called chlorophyll. Blue-green algae can cause nuisance water-quality conditions in lakes and slow-flowing rivers; however, they are found commonly in streams throughout the year. The abundance of blue-green algae in phytoplankton samples is expressed as the number of cells per milliliter (cells/mL) or biovolume in cubic micrometers per milliliter ( $\mu\text{m}^3/\text{mL}$ ). The abundance of blue-green algae in periphyton samples is given in cells per square centimeter (cells/cm<sup>2</sup>) or biovolume per square centimeter ( $\mu\text{m}^3/\text{cm}^2$ ). (See also “Phytoplankton” and “Periphyton”)

**Bottom material** (See “Bed material”)

**Bulk electrical conductivity** is the combined electrical conductivity of all material within a doughnut-shaped volume surrounding an induction probe. Bulk conductivity is affected by different physical and chemical properties of the material including the dissolved-solids content of the pore water, and the lithology and porosity of the rock.

**Canadian Geodetic Vertical Datum 1928** is a geodetic datum derived from a general adjustment of Canada’s first order level network in 1928.

**Cell volume** (biovolume) determination is one of several common methods used to estimate biomass of algae in aquatic systems. Cell members of algae are used frequently in aquatic surveys as an indicator of algal production. However, cell numbers alone cannot represent true biomass because of considerable cell-size variation among the algal species. Cell volume ( $\mu\text{m}^3$ ) is determined by obtaining critical cell measurements or cell dimensions (for example, length, width, height, or radius) for 20 to 50 cells of each important species to obtain an average biovolume per cell. Cells are categorized according to the correspondence of their cellular shape to the nearest geometric solid or combinations of simple solids (for example, spheres, cones, or cylinders). Representative formulae used to compute biovolume are as follows:

$$\text{sphere } \frac{4}{3} \pi r^3 \quad \text{cone } \frac{1}{3} \pi r^2 h \quad \text{cylinder } \pi r^2 h.$$

pi ( $\pi$ ) is the ratio of the circumference to the diameter of a circle;  $\pi = 3.14159\dots$

From cell volume, total algal biomass expressed as biovolume ( $\mu\text{m}^3/\text{mL}$ ) is thus determined by multiplying the number of cells of a given species by its average cell volume and then summing these volumes for all species.

**Cells/volume** refers to the number of cells of any organism that is counted by using a microscope and grid or counting cell. Many planktonic organisms are multicelled and are counted according to the number of contained cells per sample volume, and generally are reported as cells or units per milliliter (mL) or liter (L).

**Cfs-day** (See “Cubic foot per second-day”)

**Channel bars**, as used in this report, are the lowest prominent geomorphic features higher than the channel bed.

**Chemical oxygen demand (COD)** is a measure of the chemically oxidizable material in the water and furnishes an approximation of the amount of organic and reducing material present. The determined value may correlate with BOD or with carbonaceous organic pollution from sewage or industrial wastes. [See also “Biochemical oxygen demand (BOD)”]

***Clostridium perfringens* (*C. perfringens*)** is a spore-forming bacterium that is common in the feces of human and other warmblooded animals. Clostridial spores are being used experimentally as an indicator of past fecal contamination and the presence of microorganisms that are resistant to disinfection and environmental stresses. (See also “Bacteria”)

**Coliphages** are viruses that infect and replicate in coliform bacteria. They are indicative of sewage contamination of water and of the survival and transport of viruses in the environment.

**Color unit** is produced by 1 milligram per liter of platinum in the form of the chloroplatinate ion. Color is expressed in units of the platinum-cobalt scale.

**Confined aquifer** is a term used to describe an aquifer containing water between two relatively impermeable boundaries. The water level in a well tapping a confined aquifer stands above the top of the confined aquifer and can be higher or lower than the water table that may be present in the material above it. In some cases, the water level can rise above the ground surface, yielding a flowing well.

**Contents** is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

**Continuous-record station** is a site where data are collected with sufficient frequency to define daily mean values and variations within a day.

**Control** designates a feature in the channel that physically affects the water-surface elevation and thereby determines the stage-discharge relation at the gage. This feature may be a constriction of the channel, a bedrock outcrop, a gravel bar, an artificial structure, or a uniform cross section over a long reach of the channel.

**Control structure**, as used in this report, is a structure on a stream or canal that is used to regulate the flow or stage of the stream or to prevent the intrusion of saltwater.

**Cubic foot per second (CFS, ft<sup>3</sup>/s)** is the rate of discharge representing a volume of 1 cubic foot passing a given point in 1 second. It is equivalent to approximately 7.48 gallons per second or approximately 449 gallons per minute, or 0.02832 cubic meters per second. The term “second-foot” sometimes is used synonymously with “cubic foot per second” but is now obsolete.

**Cubic foot per second-day (CFS-DAY, Cfs-day, [(ft<sup>3</sup>/s)/d])** is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, 1.98347 acre-feet, 646,317 gallons, or 2,446.6 cubic meters. The daily mean discharges reported in the daily value data tables numerically are equal to the daily volumes in cfs-days, and the totals also represent volumes in cfs-days.

**Cubic foot per second per square mile [CFSM, (ft<sup>3</sup>/s)/mi<sup>2</sup>]** is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming the runoff is distributed uniformly in time and area. (See also “Annual runoff”)

**Daily mean suspended-sediment concentration** is the time-weighted mean concentration of suspended sediment passing a stream cross section during a 24-hour day. (See also “Sediment” and “Suspended-sediment concentration”)

**Daily record station** is a site where data are collected with sufficient frequency to develop a record of one or more data values per day. The frequency of data collection can range from continuous recording to data collection on a daily or near-daily basis.

**Data collection platform (DCP)** is an electronic instrument that collects, processes, and stores data from various sensors, and transmits the data by satellite data relay, line-of-sight radio, and/or landline telemetry.

**Data logger** is a microprocessor-based data acquisition system designed specifically to acquire, process, and store data. Data usually are downloaded from onsite data loggers for entry into office data systems.

**Datum** is a surface or point relative to which measurements of height and/or horizontal position are reported. A vertical datum is a horizontal surface used as the zero point for measurements of gage height, stage, or elevation; a horizontal datum is a reference for positions given in terms of latitude-longitude, State Plane coordinates, or Universal Transverse Mercator (UTM) coordinates. (See also “Gage datum,” “Land-surface datum,” “National Geodetic Vertical Datum of 1929,” and “North American Vertical Datum of 1988”)

**Diatoms (*Bacillariophyta*)** are unicellular or colonial algae with a siliceous cell wall. The abundance of diatoms in phytoplankton samples is expressed as the number of cells per milliliter (cells/mL) or biovolume in cubic micrometers per milliliter ( $\mu\text{m}^3/\text{mL}$ ). The abundance of diatoms in periphyton samples is given in cells per square centimeter (cells/cm<sup>2</sup>) or biovolume per square centimeter ( $\mu\text{m}^3/\text{cm}^2$ ). (See also “Phytoplankton” and “Periphyton”)

**Diel** is of or pertaining to a 24-hour period of time; a regular daily cycle.

**Discharge, or flow**, is the rate that matter passes through a cross section of a stream channel or other water body per unit of time. The term commonly refers to the volume of water (including, unless otherwise stated, any sediment or other constituents suspended or dissolved in the water) that passes a cross section in a stream channel, canal, pipeline, and so forth, within a given period of time (cubic feet per second). Discharge also can apply to the rate at which constituents, such as suspended sediment, bedload, and dissolved or suspended chemicals, pass through a cross section, in which cases the quantity is expressed as the mass of constituent that passes the cross section in a given period of time (tons per day).

**Dissolved** refers to that material in a representative water sample that passes through a 0.45-micrometer membrane filter. This is a convenient operational definition used by Federal and State agencies that collect water-quality data. Determinations of “dissolved” constituent concentrations are made on sample water that has been filtered.

**Dissolved oxygen (DO)** is the molecular oxygen (oxygen gas) dissolved in water. The concentration in water is a function of atmospheric pressure, temperature, and dissolved-solids concentration of the water. The ability of water to retain oxygen decreases with increasing temperature or dissolved-solids concentration. Photosynthesis and respiration by plants commonly cause diurnal variations in dissolved-oxygen concentration in water from some streams.

**Dissolved-solids concentration** in water is the quantity of dissolved material in a sample of water. It is determined either analytically by the “residue-on-evaporation” method, or mathematically by totaling the concentrations of individual constituents reported in a comprehensive chemical analysis. During the analytical determination, the bicarbonate (generally a major dissolved component of water) is converted to carbonate. In the mathematical calculation, the bicarbonate value, in milligrams per liter, is multiplied by 0.4917 to convert it to carbonate. Alternatively, alkalinity concentration (as mg/L CaCO<sub>3</sub>) can be converted to carbonate concentration by multiplying by 0.60.

**Diversity index (H)** (Shannon index) is a numerical expression of evenness of distribution of aquatic organisms. The formula for diversity index is:

$$\bar{d} = - \sum_{i=1}^s \frac{n_i}{n} \log_2 \frac{n_i}{n}$$

where  $n_i$  is the number of individuals per taxon,  $n$  is the total number of individuals, and  $s$  is the total number of taxa in the sample of the community. Index values range from zero, when all the organisms in the sample are the same, to some positive number, when some or all of the organisms in the sample are different.

**Drainage area** of a stream at a specific location is that area upstream from the location, measured in a horizontal plane, that has a common outlet at the site for its surface runoff from precipitation that normally drains by gravity into a stream. Drainage areas given herein include all closed basins, or noncontributing areas, within the area unless otherwise specified.

**Drainage basin** is a part of the Earth's surface that contains a drainage system with a common outlet for its surface runoff. (See "Drainage area")

**Dry mass** refers to the mass of residue present after drying in an oven at 105 °C, until the mass remains unchanged. This mass represents the total organic matter, ash and sediment, in the sample. Dry-mass values are expressed in the same units as ash mass. (See also "Ash mass," "Biomass," and "Wet mass")

**Dry weight** refers to the weight of animal tissue after it has been dried in an oven at 65 °C until a constant weight is achieved. Dry weight represents total organic and inorganic matter in the tissue. (See also "Wet weight")

**Embeddedness** is the degree to which gravel-sized and larger particles are surrounded or enclosed by finer-sized particles. (See also "Substrate embeddedness class")

**Enterococcus bacteria** commonly are found in the feces of humans and other warmblooded animals. Although some strains are ubiquitous and not related to fecal pollution, the presence of enterococci in water is an indication of fecal pollution and the possible presence of enteric pathogens. Enterococcus bacteria are those bacteria that produce pink to red colonies with black or reddish-brown precipitate after incubation at 41 °C on mE agar (nutrient medium for bacterial growth) and subsequent transfer to EIA medium. Enterococci include *Streptococcus feacalis*, *Streptococcus feacium*, *Streptococcus avium*, and their variants. (See also "Bacteria")

**EPT Index** is the total number of distinct taxa within the insect orders Ephemeroptera, Plecoptera, and Trichoptera. This index summarizes the taxa richness within the aquatic insects that generally are considered pollution sensitive; the index usually decreases with pollution.

**Escherichia coli** (*E. coli*) are bacteria present in the intestine and feces of warmblooded animals. *E. coli* are a member species of the fecal coliform group of indicator bacteria. In the laboratory, they are defined as those bacteria that produce yellow or yellow-brown colonies on a filter pad saturated with urea substrate broth after primary culturing for 22 to 24 hours at 44.5 °C on mTEC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample. (See also "Bacteria")

**Estimated (E) value** of a concentration is reported when an analyte is detected and all criteria for a positive result are met. If the concentration is less than the method detection limit (MDL), an E code will be reported with the value. If the analyte is identified qualitatively as present, but the quantitative determination is substantially more uncertain, the National Water Quality Laboratory will identify the result with an E code even though the measured value is greater than the MDL. A value reported with an E code should be used with caution. When no analyte is detected in a sample, the default reporting value is the MDL preceded by a less than sign (<). For bacteriological data, concentrations are reported as estimated when results are based on non-ideal colony counts.

**Euglenoids** (*Euglenophyta*) are a group of algae that usually are free-swimming and rarely creeping. They have the ability to grow either photosynthetically in the light or heterotrophically in the dark. (See also "Phytoplankton")

**Extractable organic halides** (EOX) are organic compounds that contain halogen atoms such as chlorine. These organic compounds are semivolatile and extractable by ethyl acetate from air-dried streambed sediment. The ethyl acetate extract is combusted, and the concentration is determined by microcoulometric determination of the halides

formed. The concentration is reported as micrograms of chlorine per gram of the dry weight of the streambed sediment.

**Fecal coliform bacteria** are present in the intestines or feces of warmblooded animals. They often are used as indicators of the sanitary quality of the water. In the laboratory, they are defined as all organisms that produce blue colonies within 24 hours when incubated at 44.5 °C plus or minus 0.2 °C on M-FC medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample. (See also “Bacteria”)

**Fecal streptococcal bacteria** are present in the intestines of warmblooded animals and are ubiquitous in the environment. They are characterized as gram-positive, cocci bacteria that are capable of growth in brain-heart infusion broth. In the laboratory, they are defined as all the organisms that produce red or pink colonies within 48 hours at 35 °C plus or minus 1.0 °C on KF-streptococcus medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 mL of sample. (See also “Bacteria”)

**Filtered** pertains to constituents in a water sample passed through a filter of specified pore diameter, most commonly 0.45 micrometer or less for inorganic analytes and 0.7 micrometer for organic analytes.

**Filtered, recoverable** is the amount of a given constituent that is in solution after the part of a representative water-suspended sediment sample that has passed through a filter has been extracted. Complete recovery is not achieved by the extraction procedure and thus the analytical determination represents something less than 95 percent of the total constituent concentration in the sample. To achieve comparability of analytical data, equivalent extraction procedures are required of all laboratories performing such analyses because different procedures are likely to produce different analytical results.

**Fire algae** (*Pyrrophyta*) are free-swimming unicells characterized by a red pigment spot. (See also “Phytoplankton”)

**Flow-duration percentiles** are values on a scale of 100 that indicate the percentage of time for which a flow is exceeded. For example, the 90th percentile of river flow is the streamflow exceeded 90 percent of the time in the period of interest.

**Gage datum** is a horizontal surface used as a zero point for measurement of stage or gage height. This surface usually is located slightly below the lowest point of the stream bottom such that the gage height is usually slightly greater than the maximum depth of water. Because the gage datum is not an actual physical object, the datum is usually defined by specifying the elevations of permanent reference marks such as bridge abutments and survey monuments, and the gage is set to agree with the reference marks. Gage datum is a local datum that is maintained independently of any national geodetic datum. However, if the elevation of the gage datum relative to the national datum (North American Vertical Datum of 1988 or National Geodetic Vertical Datum of 1929) has been determined, then the gage readings can be converted to elevations above the national datum by adding the elevation of the gage datum to the gage reading.

**Gage height** (G.H.) is the water-surface elevation, in feet above the gage datum. If the water surface is below the gage datum, the gage height is negative. Gage height often is used interchangeably with the more general term “stage,” although gage height is more appropriate when used in reference to a reading on a gage.

**Gage values** are values that are recorded, transmitted, and/or computed from a gaging station. Gage values typically are collected at 5-, 15-, or 30-minute intervals.

**Gaging station** is a site on a stream, canal, lake, or reservoir where systematic observations of stage, discharge, or other hydrologic data are obtained.

**Gas chromatography/flame ionization detector** (GC/FID) is a laboratory analytical method used as a screening technique for semivolatile organic compounds that are extractable from water in methylene chloride.

**Geomorphic channel units**, as used in this report, are fluvial geomorphic descriptors of channel shape and stream velocity. Pools, riffles, and runs are types of geomorphic channel units considered for National Water-Quality Assessment (NAWQA) Program habitat sampling.

**Green algae** (*Chlorophyta*) are unicellular or colonial algae with chlorophyll pigments similar to those in terrestrial green plants. Some forms of green algae produce mats or floating “moss” in lakes. The abundance of green algae in phytoplankton samples is expressed as the number of cells per milliliter (cells/mL) or biovolume in cubic micrometers per milliliter ( $\mu\text{m}^3/\text{mL}$ ). The abundance of green algae in periphyton samples is given in cells per square centimeter (cells/cm<sup>2</sup>) or biovolume per square centimeter ( $\mu\text{m}^3/\text{cm}^2$ ). (See also “Phytoplankton” and “Periphyton”)

**Habitat**, as used in this report, includes all nonliving (physical) aspects of the aquatic ecosystem, although living components like aquatic macrophytes and riparian vegetation also are usually included. Measurements of habitat typically are made over a wider geographic scale than are measurements of species distribution.

**Habitat quality index** is the qualitative description (level 1) of instream habitat and riparian conditions surrounding the reach sampled. Scores range from 0 to 100 percent with higher scores indicative of desirable habitat conditions for aquatic life. Index only applicable to wadable streams.

**Hardness** of water is a physical-chemical characteristic that commonly is recognized by the increased quantity of soap required to produce lather. It is computed as the sum of equivalents of polyvalent cations (primarily calcium and magnesium) and is expressed as the equivalent concentration of calcium carbonate (CaCO<sub>3</sub>).

**High tide** is the maximum height reached by each rising tide. The high-high and low-high tides are the higher and lower of the two high tides, respectively, of each tidal day. See NOAA Web site: <http://www.csc.noaa.gov/text/glossary.html> (see “High water”)

**Hilsenhoff’s Biotic Index** (HBI) is an indicator of organic pollution that uses tolerance values to weight taxa abundances; usually increases with pollution. It is calculated as follows:

$$HBI = \frac{\sum (n)(a)}{N},$$

where  $n$  is the number of individuals of each taxon,  $a$  is the tolerance value of each taxon, and  $N$  is the total number of organisms in the sample.

**Horizontal datum** (See “Datum”)

**Hydrologic index stations** referred to in this report are continuous-record gaging stations that have been selected as representative of streamflow patterns for their respective regions. Station locations are shown on index maps.

**Hydrologic unit** is a geographic area representing part or all of a surface drainage basin or distinct hydrologic feature as defined by the former Office of Water Data Coordination and delineated on the State Hydrologic Unit Maps by the USGS. Each hydrologic unit is identified by an 8-digit number.

**Inch** (IN., in.), in reference to streamflow, as used in this report, refers to the depth to which the drainage area would be covered with water if all of the runoff for a given time period were distributed uniformly on it. (See also “Annual runoff”)

**Instantaneous discharge** is the discharge at a particular instant of time. (See also “Discharge”)

**International Boundary Commission Survey Datum** refers to a geodetic datum established at numerous monuments along the United States-Canada boundary by the International Boundary Commission.

**Island**, as used in this report, is a mid-channel bar that has permanent woody vegetation, is flooded once a year, on average, and remains stable except during large flood events.

**Laboratory reporting level (LRL)** generally is equal to twice the yearly determined long-term method detection level (LT-MDL). The LRL controls false negative error. The probability of falsely reporting a nondetection for a sample that contained an analyte at a concentration equal to or greater than the LRL is predicted to be less than or equal to 1 percent. The value of the LRL will be reported with a “less than” (<) remark code for samples in which the analyte was not detected. The National Water Quality Laboratory (NWQL) collects quality-control data from selected analytical methods on a continuing basis to determine LT-MDLs and to establish LRLs. These values are reevaluated annually on the basis of the most current quality-control data and, therefore, may change. The LRL replaces the term ‘non-detection value’ (NDV).

**Land-surface datum (lsd)** is a datum plane that is approximately at land surface at each ground-water observation well.

**Latent heat flux** (often used interchangeably with latent heat-flux density) is the amount of heat energy that converts water from liquid to vapor (evaporation) or from vapor to liquid (condensation) across a specified cross-sectional area per unit time. Usually expressed in watts per square meter.

**Light-attenuation coefficient**, also known as the extinction coefficient, is a measure of water clarity. Light is attenuated according to the Lambert-Beer equation:

$$I = I_o e^{-\lambda L},$$

where  $I_o$  is the source light intensity,  $I$  is the light intensity at length  $L$  (in meters) from the source,  $\lambda$  is the light-attenuation coefficient, and  $e$  is the base of the natural logarithm. The light-attenuation coefficient is defined as

$$\lambda = -\frac{1}{L} \log_e \frac{I}{I_o}.$$

**Lipid** is any one of a family of compounds that are insoluble in water and that make up one of the principal components of living cells. Lipids include fats, oils, waxes, and steroids. Many environmental contaminants such as organochlorine pesticides are lipophilic.

**Long-term method detection level (LT-MDL)** is a detection level derived by determining the standard deviation of a minimum of 24 method detection limit (MDL) spike-sample measurements over an extended period of time. LT-MDL data are collected on a continuous basis to assess year-to-year variations in the LT-MDL. The LT-MDL controls false positive error. The chance of falsely reporting a concentration at or greater than the LT-MDL for a sample that did not contain the analyte is predicted to be less than or equal to 1 percent.

**Low tide** is the minimum height reached by each falling tide. The high-low and low-low tides are the higher and lower of the two low tides, respectively, of each tidal day. See NOAA Website: <http://www.csc.noaa.gov/text/glossary.html> (see “Low water”)

**Macrophytes** are the macroscopic plants in the aquatic environment. The most common macrophytes are the rooted vascular plants that usually are arranged in zones in aquatic ecosystems and restricted in the area by the extent of illumination through the water and sediment deposition along the shoreline.

**Mean concentration of suspended sediment** (Daily mean suspended-sediment concentration) is the time-weighted concentration of suspended sediment passing a stream cross section during a given time period. (See also “Daily mean suspended-sediment concentration” and “Suspended-sediment concentration”)

**Mean discharge (MEAN)** is the arithmetic mean of individual daily mean discharges during a specific period. (See also “Discharge”)

**Mean high or low tide** is the average of all high or low tides, respectively, over a specific period.

**Mean sea level** is a local tidal datum. It is the arithmetic mean of hourly heights observed over the National Tidal Datum Epoch. Shorter series are specified in the name; for example, monthly mean sea level and yearly mean sea level. In order that they may be recovered when needed, such datums are referenced to fixed points known as benchmarks. (See also "Datum")

**Measuring point (MP)** is an arbitrary permanent reference point from which the distance to water surface in a well is measured to obtain water level.

**Megahertz** is a unit of frequency. One megahertz equals one million cycles per second.

**Membrane filter** is a thin microporous material of specific pore size used to filter bacteria, algae, and other very small particles from water.

**Metamorphic stage** refers to the stage of development that an organism exhibits during its transformation from an immature form to an adult form. This developmental process exists for most insects, and the degree of difference from the immature stage to the adult form varies from relatively slight to pronounced, with many intermediates. Examples of metamorphic stages of insects are egg-larva-adult or egg-nymph-adult.

**Method code** is a one-character code that identifies the analytical or field method used to determine a value stored in the National Water Information System (NWIS).

**Method detection limit (MDL)** is the minimum concentration of a substance that can be measured and reported with 99-percent confidence that the analyte concentration is greater than zero. It is determined from the analysis of a sample in a given matrix containing the analyte. At the MDL concentration, the risk of a false positive is predicted to be less than or equal to 1 percent.

**Method of Cubatures** is a method of computing discharge in tidal estuaries based on the conservation of mass equation.

**Methylene blue active substances (MBAS)** indicate the presence of detergents (anionic surfactants). The determination depends on the formation of a blue color when methylene blue dye reacts with synthetic anionic detergent compounds.

**Micrograms per gram (UG/G,  $\mu\text{g/g}$ )** is a unit expressing the concentration of a chemical constituent as the mass (micrograms) of the element per unit mass (gram) of material analyzed.

**Micrograms per kilogram (UG/KG,  $\mu\text{g/kg}$ )** is a unit expressing the concentration of a chemical constituent as the mass (micrograms) of the constituent per unit mass (kilogram) of the material analyzed. One microgram per kilogram is equivalent to 1 part per billion.

**Micrograms per liter (UG/L,  $\mu\text{g/L}$ )** is a unit expressing the concentration of chemical constituents in water as mass (micrograms) of constituent per unit volume (liter) of water. One thousand micrograms per liter is equivalent to 1 milligram per liter. One microgram per liter is equivalent to 1 part per billion.

**Microsiemens per centimeter (US/CM,  $\mu\text{S/cm}$ )** is a unit expressing the amount of electrical conductivity of a solution as measured between opposite faces of a centimeter cube of solution at a specified temperature. Siemens is the International System of Units nomenclature. It is synonymous with mhos and is the reciprocal of resistance in ohms.

**Milligrams per liter (MG/L,  $\text{mg/L}$ )** is a unit for expressing the concentration of chemical constituents in water as the mass (milligrams) of constituent per unit volume (liter) of water. Concentration of suspended sediment also is expressed in milligrams per liter and is based on the mass of dry sediment per liter of water-sediment mixture.

**Minimum reporting level (MRL)** is the smallest measured concentration of a constituent that may be reliably reported by using a given analytical method.

**Miscellaneous site**, miscellaneous station, or miscellaneous sampling site is a site where streamflow, sediment, and/or water-quality data or water-quality or sediment samples are collected once, or more often on a random or discontinuous basis to provide better areal coverage for defining hydrologic and water-quality conditions over a broad area in a river basin.

**Most probable number (MPN)** is an index of the number of coliform bacteria that, more probably than any other number, would give the results shown by the laboratory examination; it is not an actual enumeration. MPN is determined from the distribution of gas-positive cultures among multiple inoculated tubes.

**Multiple-plate samplers** are artificial substrates of known surface area used for obtaining benthic invertebrate samples. They consist of a series of spaced, hardboard plates on an eyebolt.

**Nanograms per liter (NG/L, ng/L)** is a unit expressing the concentration of chemical constituents in solution as mass (nanograms) of solute per unit volume (liter) of water. One million nanograms per liter is equivalent to 1 milligram per liter.

**National Geodetic Vertical Datum of 1929 (NGVD 29)** is a fixed reference adopted as a standard geodetic datum for elevations determined by leveling. It formerly was called “Sea Level Datum of 1929” or “mean sea level.” Although the datum was derived from the mean sea level at 26 tide stations, it does not necessarily represent local mean sea level at any particular place. *See NOAA Web site: <http://www.ngs.noaa.gov/faq.shtml#WhatVD29VD88>* (See “North American Vertical Datum of 1988”)

**Natural substrate** refers to any naturally occurring immersed or submersed solid surface, such as a rock or tree, upon which an organism lives. (See also “Substrate”)

**Nekton** are the consumers in the aquatic environment and consist of large, free-swimming organisms that are capable of sustained, directed mobility.

**Nonfilterable** refers to the portion of the total residue retained by a filter.

**North American Datum of 1927 (NAD 27)** is the horizontal control datum for the United States that was defined by a location and azimuth on the Clarke spheroid of 1866.

**North American Datum of 1983 (NAD 83)** is the horizontal control datum for the United States, Canada, Mexico, and Central America that is based on the adjustment of 250,000 points including 600 satellite Doppler stations that constrain the system to a geocentric origin. NAD 83 has been officially adopted as the legal horizontal datum for the United States by the Federal government.

**North American Vertical Datum of 1988 (NAVD 88)** is a fixed reference adopted as the official civilian vertical datum for elevations determined by Federal surveying and mapping activities in the United States. This datum was established in 1991 by minimum-constraint adjustment of the Canadian, Mexican, and United States first-order terrestrial leveling networks.

**Open or screened interval** is the length of unscreened opening or of well screen through which water enters a well, in feet below land surface.

**Organic carbon (OC)** is a measure of organic matter present in aqueous solution, suspension, or bottom sediment. May be reported as dissolved organic carbon (DOC), particulate organic carbon (POC), or total organic carbon (TOC).

**Organic mass** or **volatile mass** of a living substance is the difference between the dry mass and ash mass and represents the actual mass of the living matter. Organic mass is expressed in the same units as for ash mass and dry mass. (See also “Ash mass,” “Biomass,” and “Dry mass”)

**Organism count/area** refers to the number of organisms collected and enumerated in a sample and adjusted to the number per area habitat, usually square meter (m<sup>2</sup>), acre, or hectare. Periphyton, benthic organisms, and macrophytes are expressed in these terms.

**Organism count/volume** refers to the number of organisms collected and enumerated in a sample and adjusted to the number per sample volume, usually milliliter (mL) or liter (L). Numbers of planktonic organisms can be expressed in these terms.

**Organochlorine compounds** are any chemicals that contain carbon and chlorine. Organochlorine compounds that are important in investigations of water, sediment, and biological quality include certain pesticides and industrial compounds.

**Parameter code** is a 5-digit number used in the USGS computerized data system, National Water Information System (NWIS), to uniquely identify a specific constituent or property.

**Partial-record station** is a site where discrete measurements of one or more hydrologic parameters are obtained over a period of time without continuous data being recorded or computed. A common example is a crest-stage gage partial-record station at which only peak stages and flows are recorded.

**Particle size** is the diameter, in millimeters (mm), of a particle determined by sieve or sedimentation methods. The sedimentation method uses the principle of Stokes Law to calculate sediment particle sizes. Sedimentation methods (pipet, bottom-withdrawal tube, visual-accumulation tube, sedigraph) determine fall diameter of particles in either distilled water (chemically dispersed) or in native water (the river water at the time and point of sampling).

**Particle-size classification**, as used in this report, agrees with the recommendation made by the American Geophysical Union Subcommittee on Sediment Terminology. The classification is as follows:

| Classification | Size (mm)        | Method of analysis  |
|----------------|------------------|---------------------|
| Clay           | >0.00024 - 0.004 | Sedimentation       |
| Silt           | >0.004 - 0.062   | Sedimentation       |
| Sand           | >0.062 - 2.0     | Sedimentation/sieve |
| Gravel         | >2.0 - 64.0      | Sieve               |
| Cobble         | >64 - 256        | Manual measurement  |
| Boulder        | >256             | Manual measurement  |

The particle-size distributions given in this report are not necessarily representative of all particles in transport in the stream. For the sedimentation method, most of the organic matter is removed, and the sample is subjected to mechanical and chemical dispersion before analysis in distilled water. Chemical dispersion is not used for native water analysis.

**Peak flow (peak stage)** is an instantaneous local maximum value in the continuous time series of streamflows or stages, preceded by a period of increasing values and followed by a period of decreasing values. Several peak values ordinarily occur in a year. The maximum peak value in a year is called the annual peak; peaks lower than the annual peak are called secondary peaks. Occasionally, the annual peak may not be the maximum value for the year; in such

cases, the maximum value occurs at midnight at the beginning or end of the year, on the recession from or rise toward a higher peak in the adjoining year. If values are recorded at a discrete series of times, the peak recorded value may be taken as an approximation of the true peak, which may occur between the recording instants. If the values are recorded with finite precision, a sequence of equal recorded values may occur at the peak; in this case, the first value is taken as the peak.

**Percent composition** or **percent of total** is a unit for expressing the ratio of a particular part of a sample or population to the total sample or population, in terms of types, numbers, weight, mass, or volume.

**Percent shading** is a measure of the amount of sunlight potentially reaching the stream. A clinometer is used to measure left and right bank canopy angles. These values are added together, divided by 180, and multiplied by 100 to compute percentage of shade.

**Periodic-record station** is a site where stage, discharge, sediment, chemical, physical, or other hydrologic measurements are made one or more times during a year but at a frequency insufficient to develop a daily record.

**Periphyton** is the assemblage of microorganisms attached to and living upon submerged solid surfaces. Although primarily consisting of algae, they also include bacteria, fungi, protozoa, rotifers, and other small organisms. Periphyton are useful indicators of water quality.

**Pesticides** are chemical compounds used to control undesirable organisms. Major categories of pesticides include insecticides, miticides, fungicides, herbicides, and rodenticides.

**pH** of water is the negative logarithm of the hydrogen-ion activity. Solutions with pH less than 7.0 standard units are termed “acidic,” and solutions with a pH greater than 7.0 are termed “basic.” Solutions with a pH of 7.0 are neutral. The presence and concentration of many dissolved chemical constituents found in water are affected, in part, by the hydrogen-ion activity of water. Biological processes including growth, distribution of organisms, and toxicity of the water to organisms also are affected, in part, by the hydrogen-ion activity of water.

**Phytoplankton** is the plant part of the plankton. They usually are microscopic, and their movement is subject to the water currents. Phytoplankton growth is dependent upon solar radiation and nutrient substances. Because they are able to incorporate as well as release materials to the surrounding water, the phytoplankton have a profound effect upon the quality of the water. They are the primary food producers in the aquatic environment and commonly are known as algae. (See also “Plankton”)

**Picocurie** (PC, pCi) is one-trillionth ( $1 \times 10^{-12}$ ) of the amount of radioactive nuclide represented by a curie (Ci). A curie is the quantity of radioactive nuclide that yields  $3.7 \times 10^{10}$  radioactive disintegrations per second (dps). A picocurie yields 0.037 dps, or 2.22 dpm (disintegrations per minute).

**Plankton** is the community of suspended, floating, or weakly swimming organisms that live in the open water of lakes and rivers. Concentrations are expressed as a number of cells per milliliter (cells/mL) of sample.

**Polychlorinated biphenyls** (PCBs) are industrial chemicals that are mixtures of chlorinated biphenyl compounds having various percentages of chlorine. They are similar in structure to organochlorine insecticides.

**Polychlorinated naphthalenes** (PCNs) are industrial chemicals that are mixtures of chlorinated naphthalene compounds. They have properties and applications similar to polychlorinated biphenyls (PCBs) and have been identified in commercial PCB preparations.

**Pool**, as used in this report, is a small part of a stream reach with little velocity, commonly with water deeper than surrounding areas.

**Primary productivity** is a measure of the rate at which new organic matter is formed and accumulated through photo-synthetic and chemosynthetic activity of producer organisms (chiefly, green plants). The rate of primary production is estimated by measuring the amount of oxygen released (oxygen method) or the amount of carbon assimilated (carbon method) by the plants.

**Primary productivity (carbon method)** is expressed as milligrams of carbon per area per unit time [ $\text{mg C}/(\text{m}^2/\text{time})$ ] for periphyton and macrophytes or per volume [ $\text{mg C}/(\text{m}^3/\text{time})$ ] for phytoplankton. The carbon method defines the amount of carbon dioxide consumed as measured by radioactive carbon (carbon-14). The carbon-14 method is of greater sensitivity than the oxygen light- and dark-bottle method and is preferred for use with unenriched water samples. Unit time may be either the hour or day, depending on the incubation period. (See also “Primary productivity”)

**Primary productivity (oxygen method)** is expressed as milligrams of oxygen per area per unit time [ $\text{mg O}/(\text{m}^2/\text{time})$ ] for periphyton and macrophytes or per volume [ $\text{mg O}/(\text{m}^3/\text{time})$ ] for phytoplankton. The oxygen method defines production and respiration rates as estimated from changes in the measured dissolved-oxygen concentration. The oxygen light- and dark-bottle method is preferred if the rate of primary production is sufficient for accurate measurements to be made within 24 hours. Unit time may be either the hour or day, depending on the incubation period. (See also “Primary productivity”)

**Radioisotopes** are isotopic forms of elements that exhibit radioactivity. Isotopes are varieties of a chemical element that differ in atomic weight but are very nearly alike in chemical properties. The difference arises because the atoms of the isotopic forms of an element differ in the number of neutrons in the nucleus; for example, ordinary chlorine is a mixture of isotopes having atomic weights of 35 and 37, and the natural mixture has an atomic weight of about 35.453. Many of the elements similarly exist as mixtures of isotopes, and a great many new isotopes have been produced in the operation of nuclear devices such as the cyclotron. There are 275 isotopes of the 81 stable elements, in addition to more than 800 radioactive isotopes.

**Reach**, as used in this report, is a length of stream that is chosen to represent a uniform set of physical, chemical, and biological conditions within a segment. It is the principal sampling unit for collecting physical, chemical, and biological data.

**Recoverable** is the amount of a given constituent that is in solution after a representative water sample has been extracted or digested. Complete recovery is not achieved by the extraction or digestion and thus the determination represents something less than 95 percent of the constituent present in the sample. To achieve comparability of analytical data, equivalent extraction or digestion procedures are required of all laboratories performing such analyses because different procedures are likely to produce different analytical results. (See also “Bed material”)

**Recurrence interval**, also referred to as return period, is the average time, usually expressed in years, between occurrences of hydrologic events of a specified type (such as exceedances of a specified high flow or nonexceedance of a specified low flow). The terms “return period” and “recurrence interval” do not imply regular cyclic occurrence. The actual times between occurrences vary randomly, with most of the times being less than the average and a few being substantially greater than the average. For example, the 100-year flood is the flow rate that is exceeded by the annual maximum peak flow at intervals whose average length is 100 years (that is, once in 100 years, on average); almost two-thirds of all exceedances of the 100-year flood occur less than 100 years after the previous exceedance, half occur less than 70 years after the previous exceedance, and about one-eighth occur more than 200 years after the previous exceedance. Similarly, the 7-day, 10-year low flow ( $7Q_{10}$ ) is the flow rate below which the annual minimum 7-day-mean flow dips at intervals whose average length is 10 years (that is, once in 10 years, on average); almost two-thirds of the nonexceedances of the  $7Q_{10}$  occur less than 10 years after the previous nonexceedance, half occur less than 7 years after, and about one-eighth occur more than 20 years after the previous nonexceedance. The recurrence interval for annual events is the reciprocal of the annual probability of occurrence. Thus, the 100-year flood has a 1-percent chance of being exceeded by the maximum peak flow in any year, and there is a 10-percent chance in any year that the annual minimum 7-day-mean flow will be less than the  $7Q_{10}$ .

**Replicate samples** are a group of samples collected in a manner such that the samples are thought to be essentially identical in composition.

**Return period** (See “Recurrence interval”)

**Riffle**, as used in this report, is a shallow part of the stream where water flows swiftly over completely or partially submerged obstructions to produce surface agitation.

**River mileage** is the curvilinear distance, in miles, measured upstream from the mouth along the meandering path of a stream channel in accordance with Bulletin No. 14 (October 1968) of the Water Resources Council and typically is used to denote location along a river.

**Run**, as used in this report, is a relatively shallow part of a stream with moderate velocity and little or no surface turbulence.

**Runoff** is the quantity of water that is discharged (“runs off”) from a drainage basin during a given time period. Run-off data may be presented as volumes in acre-feet, as mean discharges per unit of drainage area in cubic feet per second per square mile, or as depths of water on the drainage basin in inches. (See also “Annual runoff”)

**Salinity** is the total quantity of dissolved salts, measured by weight in parts per thousand. Values in this report are calculated from specific conductance and temperature. Seawater has an average salinity of about 35 parts per thousand (for additional information, refer to: Miller, R.L., Bradford, W.L., and Peters, N.E., 1988, Specific conductance: theoretical considerations and application to analytical quality control: U.S. Geological Survey Water-Supply Paper 2311, 16 p.)

**Sea level**, as used in this report, refers to one of the two commonly used national vertical datums (NGVD 1929 or NAVD 1988). See separate entries for definitions of these datums.

**Sediment** is solid material that originates mostly from disintegrated rocks; when transported by, suspended in, or deposited from water, it is referred to as “fluvial sediment.” Sediment includes chemical and biochemical precipitates and decomposed organic material, such as humus. The quantity, characteristics, and cause of the occurrence of sediment in streams are affected by environmental and land-use factors. Some major factors are topography, soil characteristics, land cover, and depth and intensity of precipitation.

**Sensible heat flux** (often used interchangeably with latent sensible heat-flux density) is the amount of heat energy that moves by turbulent transport through the air across a specified cross-sectional area per unit time and goes to heating (cooling) the air. Usually expressed in watts per square meter.

**Seven-day, 10-year low flow** ( $7Q_{10}$ ) is the discharge below which the annual 7-day minimum flow falls in 1 year out of 10 on the long-term average. The recurrence interval of the  $7Q_{10}$  is 10 years; the chance that the annual 7-day minimum flow will be less than the  $7Q_{10}$  is 10 percent in any given year. (See also “Annual 7-day minimum” and “Recurrence interval”)

**Shelves**, as used in this report, are streambank features extending nearly horizontally from the flood plain to the lower limit of persistent woody vegetation.

**Sodium adsorption ratio** (SAR) is the expression of relative activity of sodium ions in exchange reactions within soil and is an index of sodium or alkali hazard to the soil. Sodium hazard in water is an index that can be used to evaluate the suitability of water for irrigating crops.

**Soil heat flux** (often used interchangeably with soil heat-flux density) is the amount of heat energy that moves by conduction across a specified cross-sectional area of soil per unit time and goes to heating (or cooling) the soil. Usually expressed in watts per square meter.

**Soil-water content** is the water lost from the soil upon drying to constant mass at 105 °C; expressed either as mass of water per unit mass of dry soil or as the volume of water per unit bulk volume of soil.

**Specific electrical conductance (conductivity)** is a measure of the capacity of water (or other media) to conduct an electrical current. It is expressed in microsiemens per centimeter at 25 °C. Specific electrical conductance is a function of the types and quantity of dissolved substances in water and can be used for approximating the dissolved-solids content of the water. Commonly, the concentration of dissolved solids (in milligrams per liter) is from 55 to 75 percent of the specific conductance (in microsiemens). This relation is not constant from stream to stream, and it may vary in the same source with changes in the composition of the water.

**Stable isotope ratio** (per MIL) is a unit expressing the ratio of the abundance of two radioactive isotopes. Isotope ratios are used in hydrologic studies to determine the age or source of specific water, to evaluate mixing of different water, as an aid in determining reaction rates, and other chemical or hydrologic processes.

**Stage** (See “Gage height”)

**Stage-discharge relation** is the relation between the water-surface elevation, termed stage (gage height), and the volume of water flowing in a channel per unit time.

**Streamflow** is the discharge that occurs in a natural channel. Although the term “discharge” can be applied to the flow of a canal, the word “streamflow” uniquely describes the discharge in a surface stream course. The term “streamflow” is more general than “runoff” as streamflow may be applied to discharge whether or not it is affected by diversion or regulation.

**Substrate** is the physical surface upon which an organism lives.

**Substrate embeddedness class** is a visual estimate of riffle streambed substrate larger than gravel that is surrounded or covered by fine sediment (<2 mm, sand or finer). Below are the class categories expressed as the percentage covered by fine sediment:

|   |                               |   |               |
|---|-------------------------------|---|---------------|
| 0 | no gravel or larger substrate | 3 | 26-50 percent |
| 1 | > 75 percent                  | 4 | 5-25 percent  |
| 2 | 51-75 percent                 | 5 | < 5 percent   |

**Surface area of a lake** is that area (acres) encompassed by the boundary of the lake as shown on USGS topographic maps, or other available maps or photographs. Because surface area changes with lake stage, surface areas listed in this report represent those determined for the stage at the time the maps or photographs were obtained.

**Surficial bed material** is the upper surface (0.1 to 0.2 foot) of the bed material that is sampled using U.S. Series Bed-Material Samplers.

**Surrogate** is an analyte that behaves similarly to a target analyte, but that is highly unlikely to occur in a sample. A surrogate is added to a sample in known amounts before extraction and is measured with the same laboratory procedures used to measure the target analyte. Its purpose is to monitor method performance for an individual sample.

**Suspended** is the amount (concentration) of undissolved material in a water-sediment mixture. Most commonly refers to that material retained on a 0.45-micrometer filter.

**Suspended, recoverable** is the amount of a given constituent that is in solution after the part of a representative water-suspended sediment sample that is retained on a 0.45-micrometer filter has been extracted or digested. Complete recovery is not achieved by the extraction or digestion procedures and thus the determination represents less than 95 percent of the constituent present in the sample. To achieve comparability of analytical data, equivalent extraction or digestion procedures are required of all laboratories performing such analyses because different procedures are likely to produce different analytical results. (See also “Suspended”)

**Suspended sediment** is sediment carried in suspension by the turbulent components of the fluid or by the Brownian movement (a law of physics). (See also “Sediment”)

**Suspended-sediment concentration** is the velocity-weighted concentration of suspended sediment in the sampled zone (from the water surface to a point approximately 0.3 foot above the bed) expressed as milligrams of dry sediment per liter of water-sediment mixture (mg/L). The analytical technique uses the mass of all of the sediment and the net weight of the water-sediment mixture in a sample to compute the suspended-sediment concentration. (See also “Sediment” and “Suspended sediment”)

**Suspended-sediment discharge** (tons/d) is the rate of sediment transport, as measured by dry mass or volume, that passes a cross section in a given time. It is calculated in units of tons per day as follows: concentration (mg/L) x discharge (ft<sup>3</sup>/s) x 0.0027. (See also “Sediment,” “Suspended sediment,” and “Suspended-sediment concentration”)

**Suspended-sediment load** is a general term that refers to a given characteristic of the material in suspension that passes a point during a specified period of time. The term needs to be qualified, such as “annual suspended-sediment load” or “sand-size suspended-sediment load,” and so on. It is not synonymous with either suspended-sediment discharge or concentration. (See also “Sediment”)

**Suspended solids, total residue at 105 °C concentration** is the concentration of inorganic and organic material retained on a filter, expressed as milligrams of dry material per liter of water (mg/L). An aliquot of the sample is used for this analysis.

**Suspended, total** is the total amount of a given constituent in the part of a water-sediment sample that is retained on a 0.45-micrometer membrane filter. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. Knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to determine when the results should be reported as “suspended, total.” Determinations of “suspended, total” constituents are made either by directly analyzing portions of the suspended material collected on the filter or, more commonly, by difference, on the basis of determinations of (1) dissolved and (2) total concentrations of the constituent. (See also “Suspended”)

**Synoptic studies** are short-term investigations of specific water-quality conditions during selected seasonal or hydrologic periods to provide improved spatial resolution for critical water-quality conditions. For the period and conditions sampled, they assess the spatial distribution of selected water-quality conditions in relation to causative factors, such as land use and contaminant sources.

**Taxa (Species) richness** is the number of species (taxa) present in a defined area or sampling unit.

**Taxonomy** is the division of biology concerned with the classification and naming of organisms. The classification of organisms is based upon a hierarchical scheme beginning with Kingdom and ending with Species at the base. The higher the classification level, the fewer features the organisms have in common. For example, the taxonomy of a particular mayfly, *Hexagenia limbata*, is the following:

|          |                   |
|----------|-------------------|
| Kingdom: | Animal            |
| Phylum:  | Arthropoda        |
| Class:   | Insecta           |
| Order:   | Ephemeroptera     |
| Family:  | Ephemeridae       |
| Genus:   | Hexagenia         |
| Species: | Hexagenia limbata |

**Thalweg** is the line formed by connecting points of minimum streambed elevation (deepest part of the channel).

**Thermograph** is an instrument that continuously records variations of temperature on a chart. The more general term “temperature recorder” is used in the table descriptions and refers to any instrument that records temperature whether on a chart, a tape, or any other medium.

**Time-weighted average** is computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water resulting from the mixing of flow proportionally to the duration of the concentration.

**Tons per acre-foot (T/acre-ft)** is the dry mass (tons) of a constituent per unit volume (acre-foot) of water. It is computed by multiplying the concentration of the constituent, in milligrams per liter, by 0.00136.

**Tons per day (T/DAY, tons/d)** is a common chemical or sediment discharge unit. It is the quantity of a substance in solution, in suspension, or as bedload that passes a stream section during a 24-hour period. It is equivalent to 2,000 pounds per day, or 0.9072 metric ton per day.

**Total** is the amount of a given constituent in a representative whole-water (unfiltered) sample, regardless of the constituent’s physical or chemical form. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent present in both the dissolved and suspended phases of the sample. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as “total.” (Note that the word “total” does double duty here, indicating both that the sample consists of a water-suspended sediment mixture and that the analytical method determined at least 95 percent of the constituent in the sample.)

**Total coliform bacteria** are a particular group of bacteria that are used as indicators of possible sewage pollution. This group includes coliforms that inhabit the intestine of warmblooded animals and those that inhabit soils. They are characterized as aerobic or facultative anaerobic, gram-negative, nonspore-forming, rod-shaped bacteria that ferment lactose with gas formation within 48 hours at 35 °C. In the laboratory, these bacteria are defined as all the organisms that produce colonies with a golden-green metallic sheen within 24 hours when incubated at 35 °C plus or minus 1.0 °C on M-Endo medium (nutrient medium for bacterial growth). Their concentrations are expressed as number of colonies per 100 milliliters of sample. (See also “Bacteria”)

**Total discharge** is the quantity of a given constituent, measured as dry mass or volume, that passes a stream cross section per unit of time. When referring to constituents other than water, this term needs to be qualified, such as “total sediment discharge,” “total chloride discharge,” and so on.

**Total in bottom material** is the amount of a given constituent in a representative sample of bottom material. This term is used only when the analytical procedure assures measurement of at least 95 percent of the constituent determined. A knowledge of the expected form of the constituent in the sample, as well as the analytical methodology used, is required to judge when the results should be reported as “total in bottom material.”

**Total length** (fish) is the straight-line distance from the anterior point of a fish specimen’s snout, with the mouth closed, to the posterior end of the caudal (tail) fin, with the lobes of the caudal fin squeezed together.

**Total load** refers to all of a constituent in transport. When referring to sediment, it includes suspended load plus bed load.

**Total organism count** is the number of organisms collected and enumerated in any particular sample. (See also “Organism count/volume”)

**Total recoverable** is the amount of a given constituent in a whole-water sample after a sample has been digested by a method (usually using a dilute acid solution) that results in dissolution of only readily soluble substances. Complete dissolution of all particulate matter is not achieved by the digestion treatment, and thus the determination represents something less than the “total” amount (that is, less than 95 percent) of the constituent present in the dissolved and suspended phases of the sample. To achieve comparability of analytical data for whole-water samples, equivalent digestion procedures are required of all laboratories performing such analyses because different digestion procedures may produce different analytical results.

**Total sediment discharge** is the mass of suspended-sediment plus bed-load transport, measured as dry weight, that passes a cross section in a given time. It is a rate and is reported as tons per day. (See also “Bedload,” “Bedload discharge,” “Sediment,” “Suspended sediment,” and “Suspended-sediment concentration”)

**Total sediment load** or **total load** is the sediment in transport as bedload and suspended-sediment load. The term may be qualified, such as “annual suspended-sediment load” or “sand-size suspended-sediment load,” and so on. It differs from total sediment discharge in that load refers to the material, whereas discharge refers to the quantity of material, expressed in units of mass per unit time. (See also “Sediment,” “Suspended-sediment load,” and “Total load”)

**Transect**, as used in this report, is a line across a stream perpendicular to the flow and along which measurements are taken, so that morphological and flow characteristics along the line are described from bank to bank. Unlike a cross section, no attempt is made to determine known elevation points along the line.

**Turbidity** is an expression of the optical properties of a liquid that causes light rays to be scattered and absorbed rather than transmitted in straight lines through water. Turbidity, which can make water appear cloudy or muddy, is caused by the presence of suspended and dissolved matter, such as clay, silt, finely divided organic matter, plankton and other microscopic organisms, organic acids, and dyes (ASTM International, 2003, D1889–00 Standard test method for turbidity of water, *in* ASTM International, Annual Book of ASTM Standards, Water and Environmental Technology, v. 11.01: West Conshohocken, Pennsylvania, 6 p.). The color of water, whether resulting from dissolved compounds or suspended particles, can affect a turbidity measurement. To ensure that USGS turbidity data can be understood and interpreted properly within the context of the instrument used and site conditions encountered, data from each instrument type are stored and reported in the National Water Information System (NWIS) using parameter codes and measurement reporting units that are specific to the instrument type, with specific instruments designated by the method code. The respective measurement units, many of which also are in use internationally, fall into two categories: (1) the designations NTU, NTRU, BU, AU, and NTMU signify the use of a broad spectrum incident light in the wavelength range of 400-680 nanometers (nm), but having different light detection configurations; (2) The designations FNU, FNRU, FBU, FAU, and FNMU generally signify an incident light in the range between 780-900 nm, also with varying light detection configurations. These reporting units are equivalent when measuring a calibration solution (for example, formazin or polymer beads), but their respective instruments may not produce equivalent results for environmental samples. Specific reporting units are as follows:

**NTU** (Nephelometric Turbidity Units): white or broadband [400-680 nm] light source, 90 degree detection angle, one detector.

**NTRU** (Nephelometric Turbidity Ratio Units): white or broadband [400-680 nm] light source, 90 degree detection angle, multiple detectors with ratio compensation.

**BU** (Backscatter Units): white or broadband [400-680 nm] light source,  $30 \pm 15$  degree detection angle (backscatter).

**AU** (Attenuation Units): white or broadband [400-680 nm] light source, 180 degree detection angle (attenuation).

**NTMU** (Nephelometric Turbidity Multibeam Units): white or broadband [400-680 nm] light source, multiple light sources, detectors at 90 degrees and possibly other angles to each beam.

**FNU** (Formazin Nephelometric Units): near infrared [780-900 nm] or monochrome light source, 90 degree detection angle, one detector.

**FNRU** (Formazin Nephelometric Ratio Units): near infrared [780-900 nm] or monochrome light source, 90 degree detection angle, multiple detectors, ratio compensation.

**FBU** (Formazin Backscatter Units): near infrared [780-900 nm] or monochrome light source,  $30 \pm 15$  degree detection angle.

**FAU** (Formazin Attenuation Units): near infrared [780-900 nm] light source, 180 degree detection angle.

**FNMU** (Formazin Nephelometric Multibeam Units): near infrared [780-900 nm] or monochrome light source, multiple light sources, detectors at 90 degrees and possibly other angles to each beam.

For more information please see [http://water.usgs.gov/owq/FieldManual/Chapter6/6.7\\_contents.html](http://water.usgs.gov/owq/FieldManual/Chapter6/6.7_contents.html).

**Ultraviolet (UV) absorbance (absorption)** at 254 or 280 nanometers is a measure of the aggregate concentration of the mixture of UV absorbing organic materials dissolved in the analyzed water, such as lignin, tannin, humic substances, and various aromatic compounds. UV absorbance (absorption) at 254 or 280 nanometers is measured in UV absorption units per centimeter of path length of UV light through a sample.

**Unconfined aquifer** is an aquifer whose upper surface is a water table free to fluctuate under atmospheric pressure. (See "Water-table aquifer")

**Unfiltered** pertains to the constituents in an unfiltered, representative water-suspended sediment sample.

**Unfiltered, recoverable** is the amount of a given constituent in a representative water-suspended sediment sample that has been extracted or digested. Complete recovery is not achieved by the extraction or digestion treatment and thus the determination represents less than 95 percent of the constituent present in the sample. To achieve comparability of analytical data, equivalent extraction or digestion procedures are required of all laboratories performing such analyses because different procedures are likely to produce different analytical results.

**Vertical datum** (See "Datum")

**Volatile organic compounds (VOCs)** are organic compounds that can be isolated from the water phase of a sample by purging the water sample with inert gas, such as helium, and, subsequently, analyzed by gas chromatography. Many VOCs are human-made chemicals that are used and produced in the manufacture of paints, adhesives, petroleum products, pharmaceuticals, and refrigerants. They often are components of fuels, solvents, hydraulic fluids, paint thinners, and dry-cleaning agents commonly used in urban settings. VOC contamination of drinking-water supplies is a human-health concern because many are toxic and are known or suspected human carcinogens.

**Water table** is that surface in a ground-water body at which the water pressure is equal to the atmospheric pressure.

**Water-table aquifer** is an unconfined aquifer within which the water table is found.

**Water year** in USGS reports dealing with surface-water supply is the 12-month period October 1 through September 30. The water year is designated by the calendar year in which it ends and which includes 9 of the 12 months. Thus, the year ending September 30, 2002, is called the “2002 water year.”

**Watershed** (See “Drainage basin”)

**WDR** is used as an abbreviation for “Water-Data Report” in the REVISED RECORDS paragraph to refer to State annual hydrologic-data reports. (WRD was used as an abbreviation for “Water-Resources Data” in reports published prior to 1976.)

**Weighted average** is used in this report to indicate discharge-weighted average. It is computed by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharges. A discharge-weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

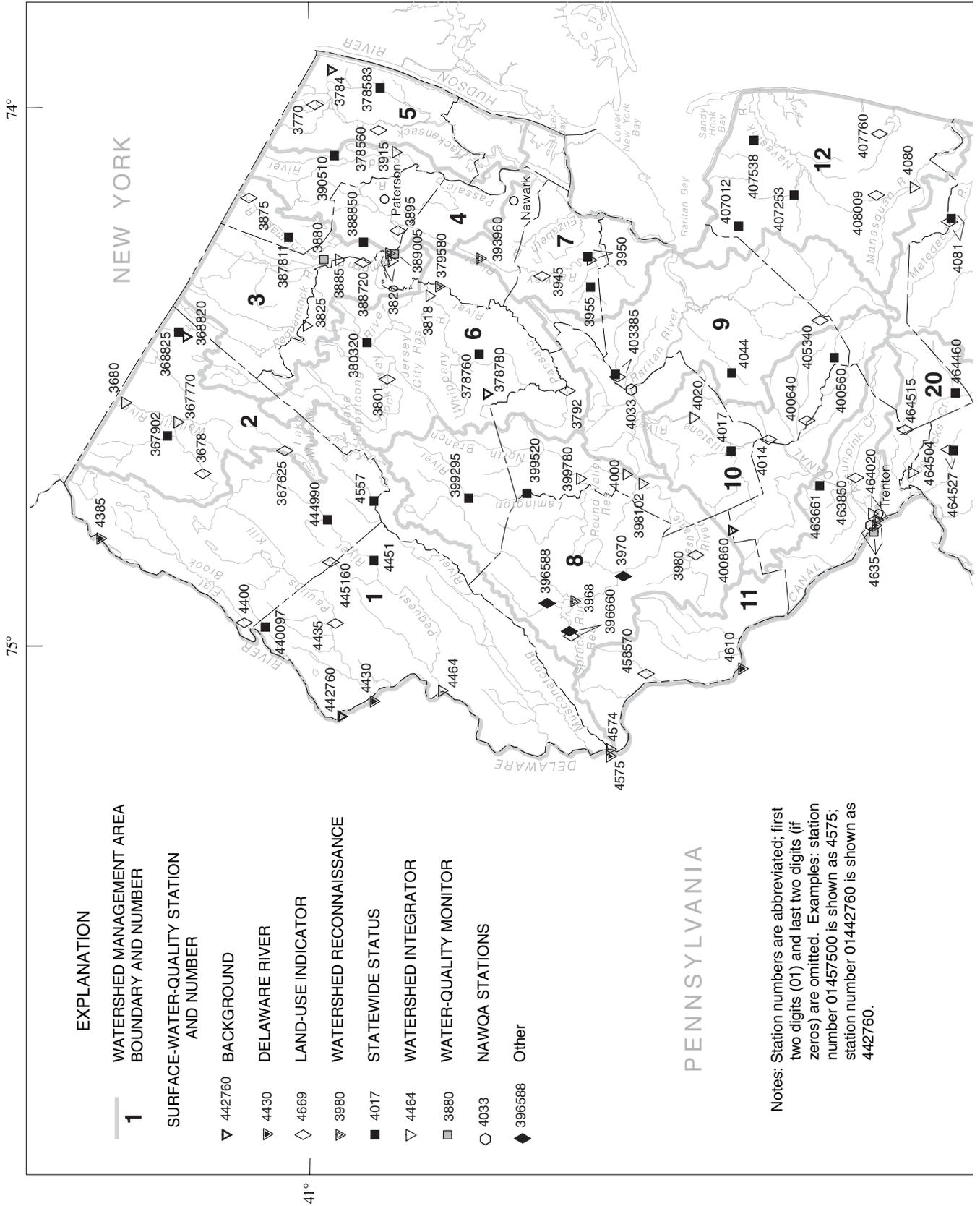
**Wet mass** is the mass of living matter plus contained water. (See also “Biomass” and “Dry mass”)

**Wet weight** refers to the weight of animal tissue or other substance including its contained water. (See also “Dry weight”)

**WSP** is used as an acronym for “Water-Supply Paper” in reference to previously published reports.

**Zooplankton** is the animal part of the plankton. Zooplankton are capable of extensive movements within the water column and often are large enough to be seen with the unaided eye. Zooplankton are secondary consumers feeding upon bacteria, phytoplankton, and detritus. Because they are the grazers in the aquatic environment, the zooplankton are a vital part of the aquatic food web. The zooplankton community is dominated by small crustaceans and rotifers. (See also “Plankton”)

WATER RESOURCES DATA-NEW JERSEY, 2005



EXPLANATION

- 1** WATERSHED MANAGEMENT AREA BOUNDARY AND NUMBER
- SURFACE-WATER-QUALITY STATION AND NUMBER
  - ▽ 442760 BACKGROUND
  - ▽ 4430 DELAWARE RIVER
  - ◇ 4669 LAND-USE INDICATOR
  - ▽ 3980 WATERSHED RECONNAISSANCE
  - 4017 STATEWIDE STATUS
  - ▽ 4464 WATERSHED INTEGRATOR
  - 3880 WATER-QUALITY MONITOR
  - 4033 NAWQA STATIONS
  - ◆ 396588 Other

PENNSYLVANIA

Notes: Station numbers are abbreviated: first two digits (01) and last two digits (if zeros) are omitted. Examples: station number 01457500 is shown as 4575; station number 01442760 is shown as 442760.

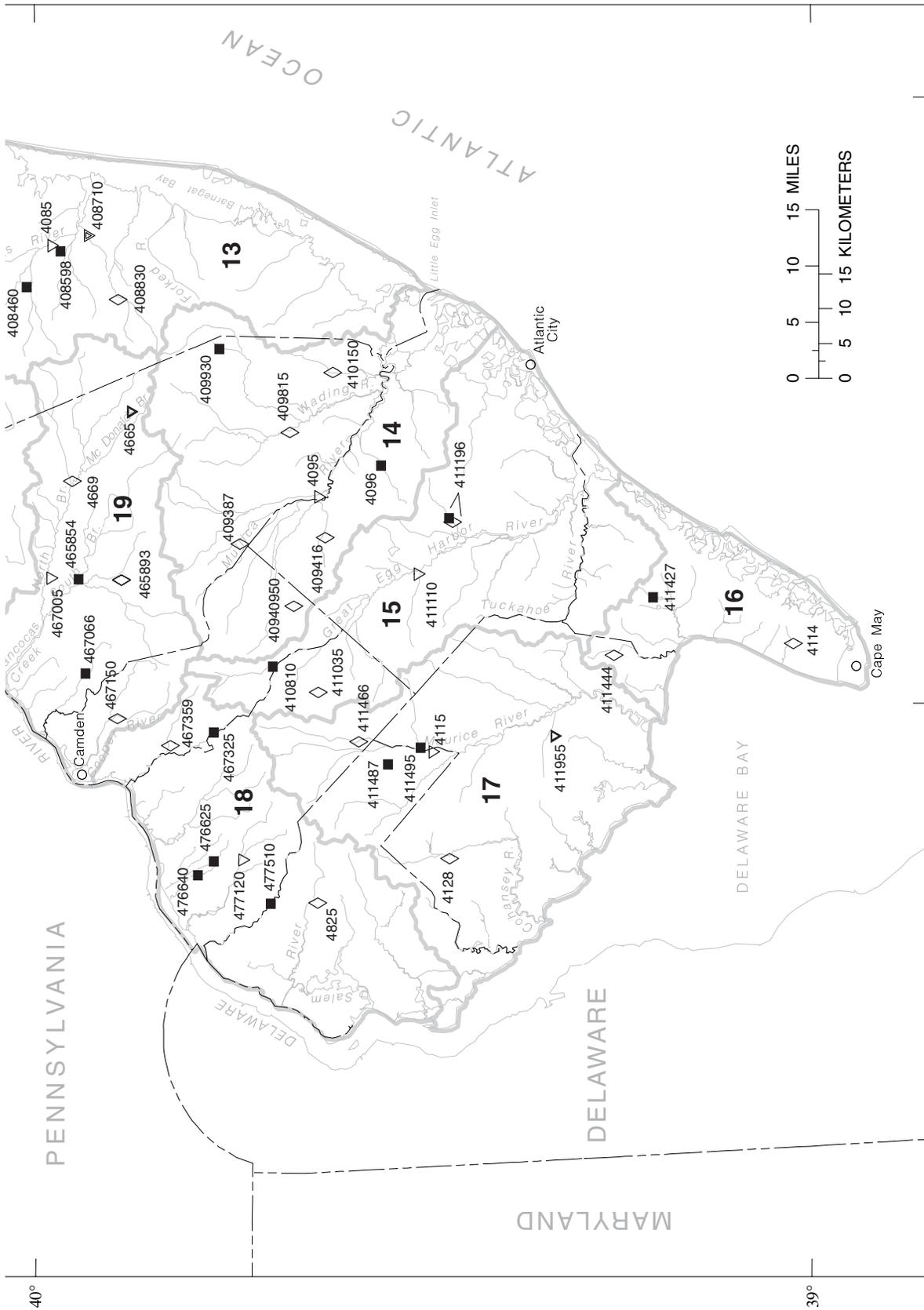
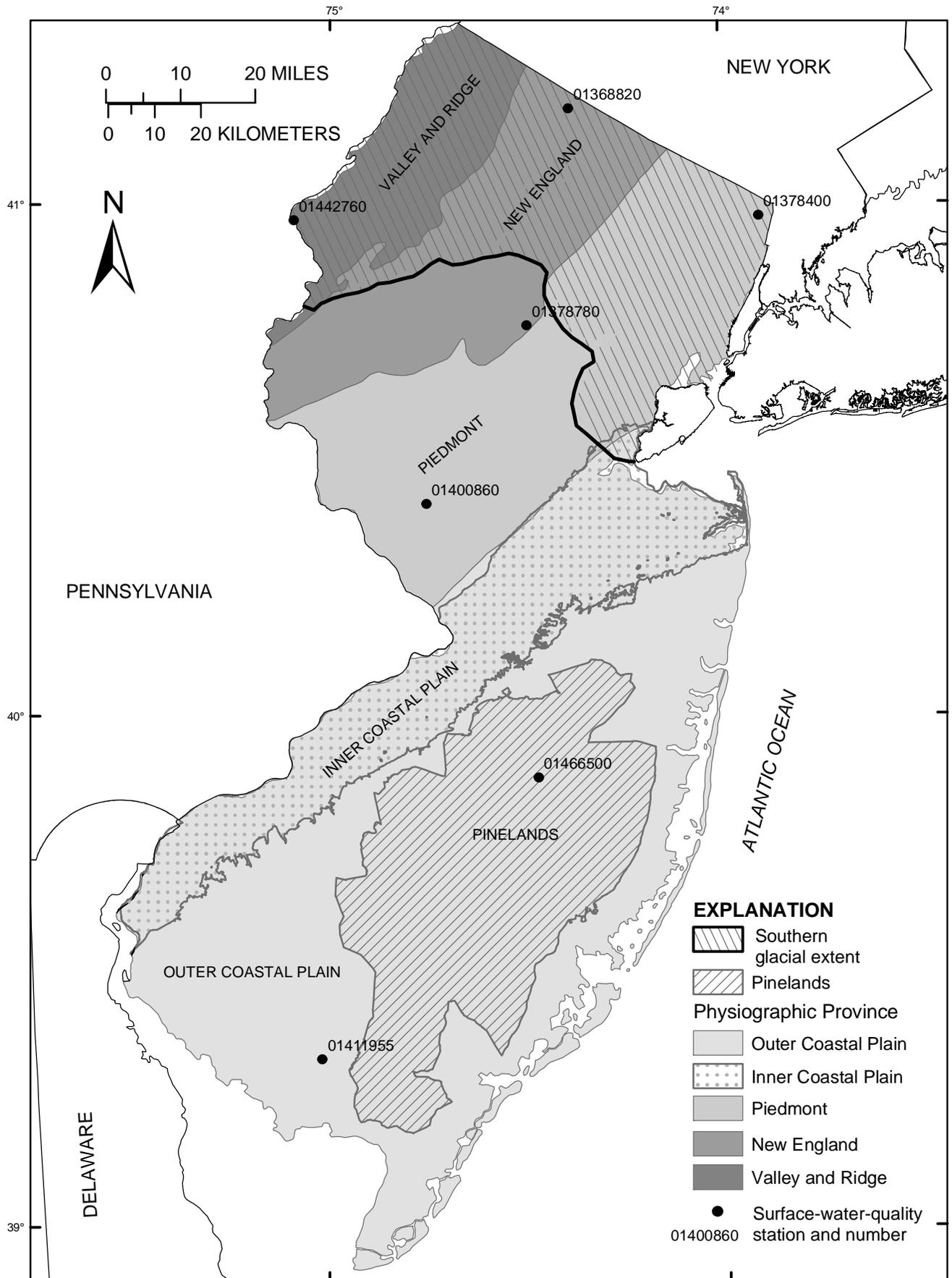
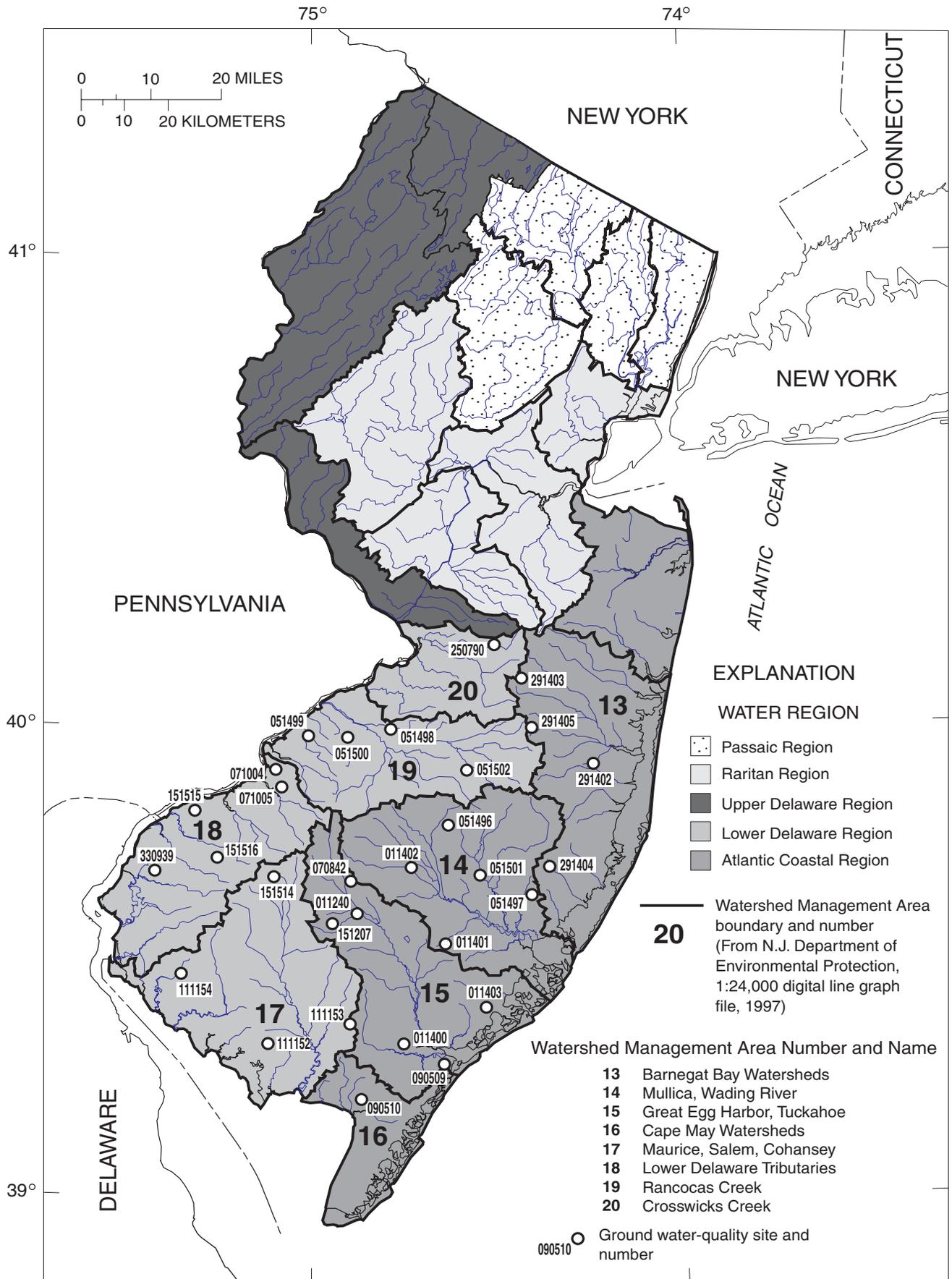


Figure 23. Location and type of surface-water-quality stations, water year 2005.



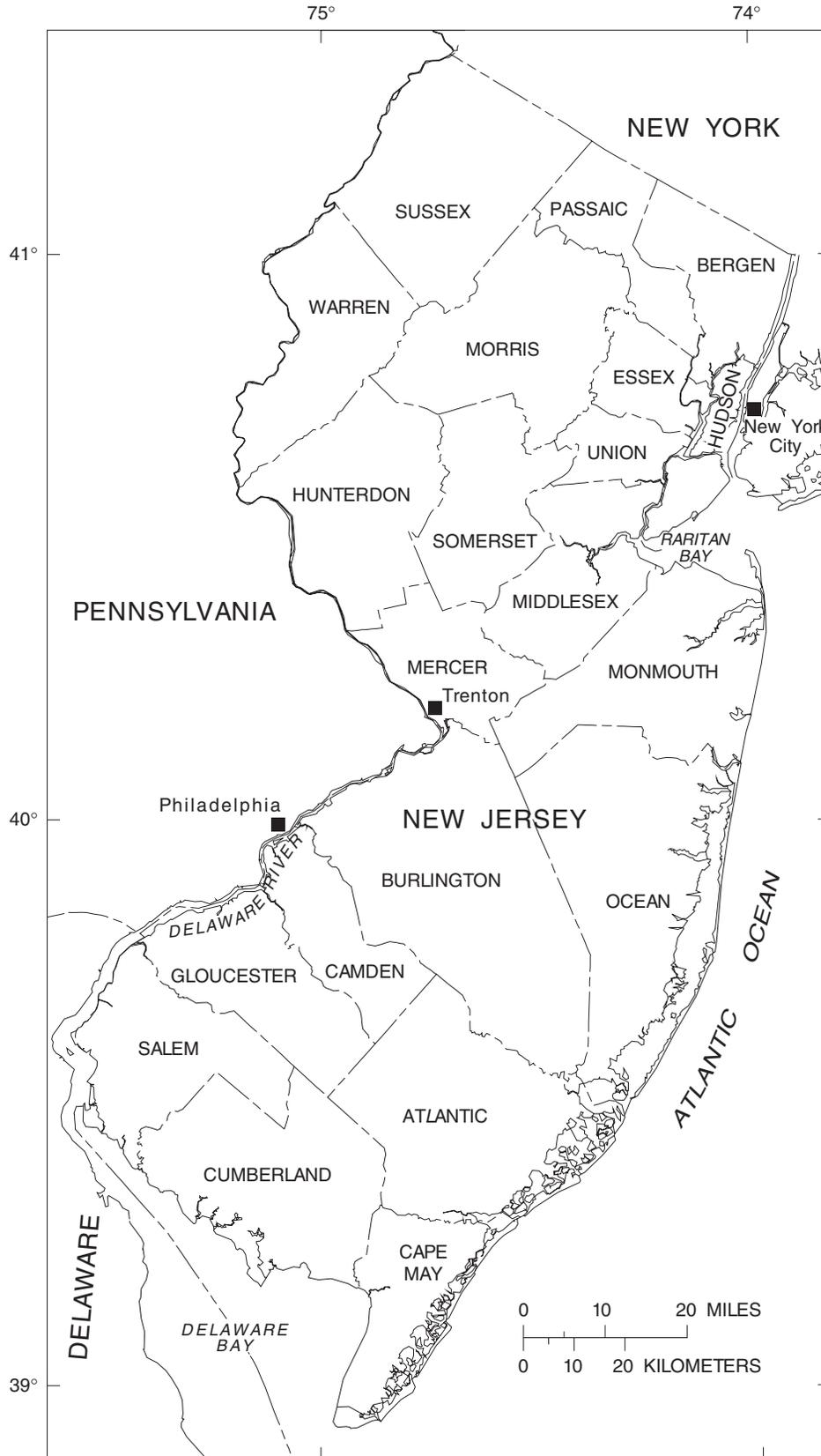
Base from U.S. Geological Survey digital line graph files, 1:24,000

**Figure 24.** Location of background stations in the Ambient Surface-Water-Quality Monitoring Network, water year 2005.



Base from U.S. Geological Survey digital line graph files, 1:24,000

**Figure 25.** Location of sites in the Ambient Ground-Water-Quality Monitoring Network, water year 2005.



**Figure 26.** Counties in New Jersey.

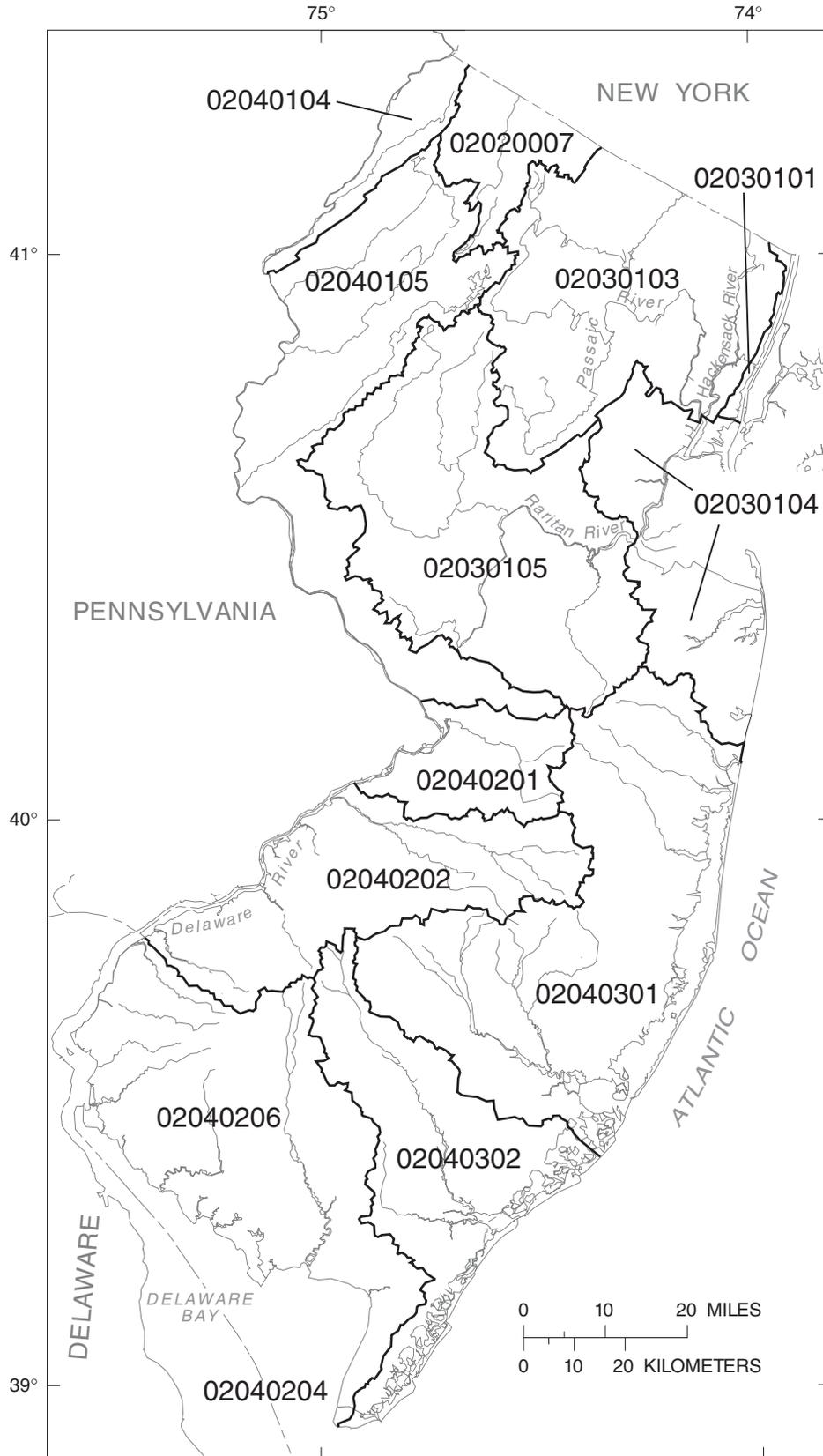


Figure 27. Cataloging units and codes in New Jersey. (Modified from Seaber and others, 1987)