U.S. Department of the Interior
U.S. Geological Survey

Report of
The River Master
Of the Delaware River

For the period
December 1,1995 - November 30, 1996

By Bruce E. Krejmas, William E. Harkness, And William J. Carswell, Jr.

With a section on Water Quality

By Charles R. Wood

Open-File Report 98 - 382

Reston, Virginia

1998

U.S. Department of the Interior
Bruce Babbitt, Secretary

U.S. Geological Survey
Thomas J. Casadevall, Acting Director

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Box 25286
Denver, CO 80225-0286

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CONVERSION FACTORS AND VERTICAL DATUM

Multiply	By	To obtain
Length		
inch (in.)	25.4	millimeter
foot (ft)	0.3048	meter
mile (mi)	1.609	kilometer
Area		
square mile (mi^2)	2.590	square kilometer
Volume		
million gallons (Mgal)	3,785	cubic meter
million gallons (Mgal)	1.547	cubic feet per second-day
billion gallons (Bgal)	3.785	cubic hectometer
cubic foot per second-day ($ft^3/s \cdot d$)	0.002447	cubic hectometer
Flow rate		
million gallons per day (Mgal/d)	1.547	cubic feet per second
million gallons per day (Mgal/d)	0.04381	cubic meter per second
billion gallons per day (Bgal/d)	43.81	cubic meter per second
cubic foot per second (ft^3/s)	0.02832	cubic meter per second

Vertical datum: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

SECTION I

RIVER MASTER LETTER OF TRANSMITTAL

and

SPECIAL REPORT

OFFICE OF THE DELAWARE RIVER MASTER
United States Geological Survey
433 National Center, Reston, Virginia 20192

July 8, 1998

The Honorable
William H. Rehnquist
Chief Justice of the United States

The Honorable
Thomas R. Carper
Governor of Delaware

The Honorable
Christine Todd Whitman
Governor of New Jersey

The Honorable
George E. Pataki
Governor of New York

The Honorable
Thomas J. Ridge
Governor of Pennsylvania

The Honorable
Rudolph W. Giuliani
Mayor of the City of New York

New Jersey v. New York et al
No. 5 Original, October Term 1950

Dear Sirs and Madam:

For the record and in compliance with the provisions of the Amended Decree of the Supreme Court of the United States entered June 7, 1954, I am transmitting herewith the forty-third annual report of the River Master of the Delaware River for the year December 1, 1995, to November 30, 1996.

Monthly precipitation in the upper Delaware River basin during the 1996 River Master report year ranged from 55 percent of the long-term average during December to 233 percent during January. Total precipitation during the year was 9.60 inches above average. Precipitation during the December to May period, when reservoirs typically refill, was 116 percent of the 55-year average.

On December 1, 1995, when this report year began, combined storage in the New York City reservoirs in the upper Delaware River Basin was 166.770 billion gallons (Bgal), 61.6 percent of the combined storage capacity. Median storage on December 1, based on 28 years of data, is 169.270 Bgal. Operations on December 1, 1995, were being conducted as prescribed in the Decree. Storage increased slightly during early-December, 1995, then declined slowly from mid-December until mid-January, 1996. Storage increased very rapidly from mid-January to the end of the month in response to runoff from a record storm event January 18-20, 1996. Storage continued to increase steadily until mid-April, when all the reservoirs were spilling. Storage remained uncharacteristically high for the rest of the report year. On November 30, 1996, the combined storage in the New York City reservoirs was 268.531 Bgal, 99.1 percent of capacity and was the highest recorded storage for the end of the report year in the period of record. The operations in the basin continued to be conducted as prescribed in the Decree.

During the report year, the River Master and staff participated in meetings of the Delaware River Basin Commission to assess water-supply conditions. Upon invitation of the representatives of the Parties to the Decree, the Deputy Delaware River Master met periodically with those representatives as a member of the Flow Management Technical Advisory Committee. Discussions centered primarily on proposals for the management of releases from reservoirs in the basin and other measures designed to cope with streamflow deficiencies whenever they occur.

The U.S. Geological Survey continued the operation of its field office of the Delaware River Master at Milford, Pennsylvania. William E. Harkness, Deputy Delaware River Master, continued in charge of the office, assisted by Bruce E. Krejmas and Joanne Koch.

During the report year, the Milford office continued the weekly distribution of summary river data. These weekly reports contained preliminary data on releases from the New York City reservoirs to the Delaware River, diversions to the New York City water-supply system, reservoir contents, daily segregation of flow of the Delaware River at Montague, New Jersey gaging station, and diversions by New Jersey. The reports were made available to the State and City representatives on the Delaware River Master Advisory Committee and to other parties interested in the Delaware River operations. A special monthly summary of past hydrologic conditions, supplemented by an "outlook" of the river flow for the forthcoming month, was made available to the representatives on the Advisory Committee.

Section II of this report describes in detail Delaware River operations during the report year. The City of New York diverted a total of 243.792 Bgal from the basin during the report year ending November 30, 1996, and released 60.216 Bgal from Pepacton, Cannonsville, and Neversink Reservoirs to the Delaware River during the same period. The River Master directed releases to the Delaware River from these reservoirs totaling 15.955 Bgal.

Section III of this report describes water quality at various sites in the Delaware River Estuary. It was prepared by Charles R. Wood, U.S. Geological Survey, Malvern, Pennsylvania and contains data showing the extent of salinity encroachment and other water-quality characteristics in the estuary.

During the report year, the following individuals served as members of the River Master Advisory Committee:

Delaware	Dr. Robert R. Jordan
New Jersey	Steven Nieswand Robert C. Shinn, Jr.
New York	N.G. Kaul
New York City	Marilyn Gelber Joel A. Miele, Sr.
Pennsylvania	Irene B. Brooks

Throughout the year, diversions to supply water for New York City and releases designed to maintain the flow of the Delaware River at Montague were made as directed by this office. Diversions by New York City from the Delaware River basin reservoirs did not exceed the limit specified by the Decree.

The appreciation of the Delaware River Master and staff is expressed for the continued excellent cooperation of all the representatives of the Parties to the Decree. Also, appreciation is extended to the Pennsylvania Power & Light Company and the Orange and Rockland Utilities, Inc. for keeping us informed of their plans for power generation and resulting releases.

A draft of this report was furnished to the Advisory Committee members for comment.

Sincerely yours,

William J. Carswell, Jr., Ph.D.
Delaware River Master

SECTION II

REPORT OF DELAWARE RIVER OPERATIONS

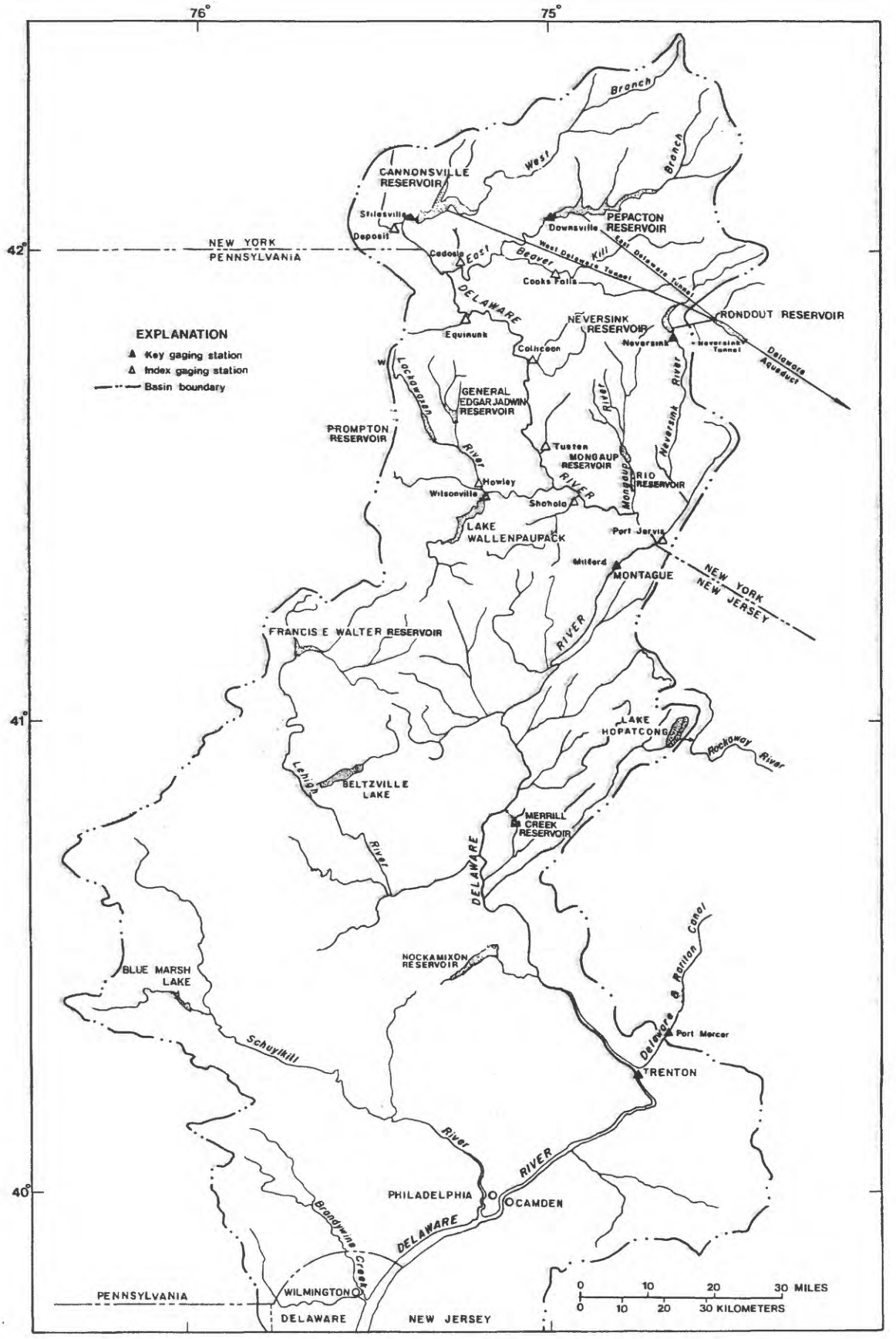

Figure 1.- Delaware River Basin upstream from Wilmington, Delaware

Section II

REPORT OF DELAWARE RIVER OPERATIONS

by Bruce E. Krejmas and William E. Harkness

ABSTRACT

A Decree of the Supreme Court of the United States in 1954 established the position of Delaware River Master. The Decree authorizes diversions of water from the Delaware River Basin (fig. 1) and requires compensating releases from certain New York City owned reservoirs to be made under the supervision and direction of the River Master. Reports to the Court, not less frequently than annually, were stipulated.

During the 1996 report year, December 1, 1995, to November 30, 1996, the monthly precipitation ranged from above to below long-term monthly averages and monthly runoff ranged from normal to excessive (above the 75^{th} percentile) in the Delaware River Basin. For the report year, precipitation was 9.60 inches above average. Reservoir storage increased rapidly during the latter half of January as a result of runoff from heavy rain and melting of the snowpack. Combined storage continued to increase until mid-April, when all the New York City Delaware River Basin reservoirs filled to capacity and spilled. Operations were conducted as prescribed by the Decree throughout the report year.

Diversions from the Delaware River Basin by New York City and New Jersey did not exceed those authorized by the terms of the Decree. Releases were made as directed by the River Master at rates designed to meet the Montague flow objective on 41 days during the year. On days when releases were not directed, releases were made at the experimental augmented conservation rates, or at rates designed to relieve thermal stress and protect the fishery in the streams downstream from the reservoirs. The excess-release quantity, as defined by the Decree, was expended on September 17, 1996, and the Montague design rate was reduced from 1,860 cubic feet per second (ft^3/s) to 1,750 ft^3/s, as prescribed in the Decree.

New York City and New Jersey complied fully with the terms of the Decree and with the directives of the River Master throughout the year.

INTRODUCTION

The Amended Decree of the United States Supreme Court entered June 7, 1954, authorized diversions of water from the Delaware River Basin and provided for releases of water from certain New York City reservoirs to the Delaware River to be made under the supervision and direction of the River Master. The Decree also stipulated that reports be made to the Court not less frequently than annually. This report describes the River Master operations from December 1, 1995, to November 30, 1996.

Part of the hydrologic data presented are records of flow and water quality at U.S. Geological Survey gaging stations. These records were collected, computed, and furnished by the offices of the U.S. Geological Survey in New York, Pennsylvania, and New Jersey, in cooperation with the States of New York and New Jersey, the Commonwealth of Pennsylvania, and the City of New York.

Definition of Terms and Procedures

The following definitions apply to various terms and procedures used in the operations described in this report. A table for converting inch-pound units to International System of Units (SI) is given on page *v*. The map of the Delaware River Basin (fig. 1) indicates the location of pertinent streams, reservoirs, and gaging stations.

Capacity. - Total usable volume between the point of maximum depletion and the elevation of the lowest crest of the spillway.

Conservation releases. - Controlled releases from reservoirs designed to maintain flow in the channels downstream from the reservoirs.

Daily excess-release credits. - Daily credits and deficits during the seasonal period are equal to the algebraic difference between the daily mean discharge at Montague and 1,750 ft^3/s; however, the daily credit cannot exceed the 24-hour period releases from Pepacton, Cannonsville, and Neversink Reservoirs routed to Montague and made in accordance with direction, with the following exception. During the seasonal period, credits are also made for part or all of other releases from these reservoirs contributing to daily mean discharge at Montague between the excess-release rate and 1,750 ft^3/s.

Directed releases. - Controlled releases from the New York City reservoirs in the upper Delaware River Basin designed by the Delaware River Master to meet the Montague flow objective.

Diversions. - The transfer of water by New York City from Pepacton, Cannonsville, and Neversink Reservoirs in the upper Delaware River Basin through the East Delaware, West Delaware, and Neversink Tunnels, respectively, to its water-supply system. Also, the transfer of water by New Jersey from the Delaware River through the Delaware and Raritan Canal.

Excess quantity and seasonal period for its release. - As defined in the Decree, the excess quantity of water equals 83 percent of the amount by which the estimated consumption in New York City during the year is less than the City's estimate of continuous safe yield (1,665 Mgal/d stipulated by 1954 Decree) from all its sources of supply obtainable without pumping, except that the excess quantity should not exceed 70 billion gallons. Each year the "seasonal period" for

release of the excess quantity begins on June 15. The design rate for that period becomes effective at Montague on that date and continues in effect until the following March 15, or until the cumulative total of excess-release credits becomes equal to the seasonal quantity, whichever occurs first.

Point of maximum reservoir depletion. - Elevation at the top of the highest outlet, sometimes referred to as minimum full-operation level.

Rate of flow. - Mean discharge for any stated 24-hour period, in cubic feet per second (ft^3/s) or million gallons per day (Mgal/d).

Rate of flow at Montague. - Daily mean discharge of the Delaware River at Montague, N.J., on a calendar-day basis.

Reservoir-controlled releases. - Controlled releases from reservoirs passed through outlet valves in the dams or through turbines in powerplants. This does not include spillway overflow at the reservoirs.

Storage or contents. - Usable volume of water in a reservoir. Unless otherwise indicated, volume is computed on the basis of level pool and above the point of maximum depletion.

Time of day. - Time of day is expressed in 24-hour eastern standard time, which included a 23-hour day April 7 and a 25-hour day October 27.

Uncontrolled runoff at Montague. - Runoff from the drainage area upstream from Montague, exclusive of the drainage area upstream from the Downsville, Cannonsville, Neversink, Wallenpaupack, and Rio dams, but including spillway overflow at these dams.

Precipitation

Precipitation measured in the basin above Montague totaled 52.70 inches for the 1996 report year and was 9.60 inches above the long-term (55-year) average. Monthly precipitation ranged from 55 percent of the long-term average in December, 1995, to 233 percent of the average in January, 1996. Table 1[1] compares the monthly precipitation during the report year with the long-term average.

These data were computed from records collected by the National Weather Service, New York City Department of Environmental Protection, Bureau of Water Supply, Quality, and Protection, and the River Master, at 10 stations distributed over the basin area upstream from Montague.

December to May is generally considered the normal time of year when surface-water reservoirs and ground-water aquifers fill. During this period in 1995-96, average precipitation at the 10 stations was 23.34 inches, which was 116 percent of the long-term average. During June to November, average precipitation at the 10 stations was 29.36 inches, which was 128 percent of the long-term average. The maximum monthly precipitation measured at any of the 10 stations was 8.93 inches in July at Milford, Pennsylvania; the minimum monthly precipitation was 1.01 inches in August also at Milford, Pennsylvania.

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1. All numbered tables in Section II are grouped at the end of this section, beginning on page 30.

Acknowledgments

The River Master daily-operation records were prepared by the Milford Office of the Delaware River Master from hydrologic data collected principally on a day-to-day basis. Data for these records were collected and computed by the Milford office or were furnished by agencies as follows: Data from Pepacton, Cannonsville, and Neversink Reservoirs by the New York City Department of Environmental Protection, Bureau of Water Supply, Quality, and Protection; from Delaware and Raritan Canal by the New Jersey Water Supply Authority; from Lake Wallenpaupack by the Pennsylvania Power & Light Company; and from Rio Reservoir by Orange and Rockland Utilities, Inc. Precipitation data and quantitative precipitation forecasts were provided by the National Oceanic and Atmospheric Administration, National Weather Service. The River Master and staff extends appreciation to George Soller, who resigned at the end of the year after 19 years of dedicated service as an observer at the Tenmile River gaging station. Mr. Soller collected and reported valuable stream gage and precipitation data for the station.

OPERATIONS

December through May

Operations on December 1, 1995, were being conducted as prescribed in the Decree. The Montague flow objective was 1,750 ft^3/s and the allowable diversions to New York City and New Jersey were 800 Mgal/d and 100 Mgal/d, respectively. Conservation releases from the New York City reservoirs were being made at the experimental levels shown in table 2.

During the first half of the report year, total precipitation was 3.20 inches above average and monthly precipitation ranged from 55 percent of the long-term average in December to 233 percent in January (table 1). Runoff in the upper basin was in the normal range during December, March, and April, and was above normal during January, February, and May.

On December 1, 1995, Pepacton Reservoir contained 83.794 Bgal of water in storage above the point of maximum depletion, or 59.8 percent of the reservoir's storage capacity of 140.190 Bgal. Cannonsville Reservoir contained 60.805 Bgal, or 63.5 percent of the reservoir's storage capacity of 95.706 Bgal and Neversink Reservoir contained 22.171 Bgal, or 63.5 percent of the reservoir's storage capacity of 34.941 Bgal. The combined storage in the three reservoirs as of December 1 was 166.770 Bgal, or 61.6 percent of their combined capacity. Daily storages in Pepacton, Cannonsville, and Neversink Reservoirs are shown in tables 3, 4, and 5 respectively, and the combined storage is shown graphically in figure 2.

Inflow to the City's reservoirs during the December through May period generally exceeds draft rates and therefore increases storage. The average inflow to Pepacton, Cannonsville, and Neversink Reservoirs for these six months during the 55-year period, December 1940 to May 1995, was 299.9 Bgal. During the corresponding six months of the current report year, inflow to the three reservoirs totaled 387.2 Bgal. Evaporation loss was not included in the computation.

Combined storage increased slightly during early-December, 1995, then declined slowly from mid-December to mid-January, 1996. During January 18-20, 1996, a significant storm occurred over much of the Delaware River Basin. In some areas more than three inches of rain

occurred causing the rapid melting of most of the moderately heavy snowpack that was on the ground. The resulting runoff caused near record to record flooding on many streams in the basin and caused storage in the New York City Delaware River Basin reservoirs to increase very rapidly from mid-January to the end of the month. Storage continued to increase gradually during February, March, and April until April 16, 1996, when all three reservoirs were spilling. The reservoirs remained near full capacity through May.

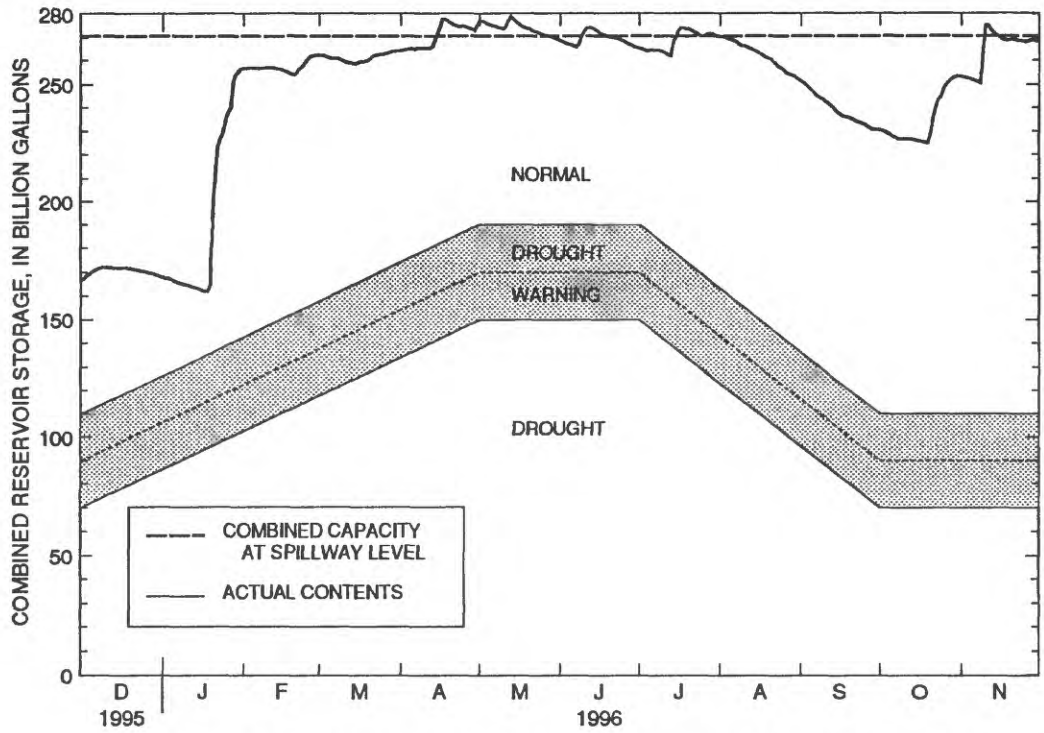

Figure 2.- Operating curves for New York City reservoirs in the Delaware River basin compared with the actual contents of the reservoirs, December 1, 1995, to November 30, 1996. (Sources: Operating curves from Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree of 1954, reservoir contents from New York City Bureau of Water Supply data.)

Total storage in the three New York City reservoirs was 165.726 Bgal on November 30, 1995, and 269.136 Bgal on May 31, 1996, an increase of 103.4 Bgal, 38.2 percent of capacity. The maximum combined storage was 278.957 Bgal on May 13 (fig. 2), when all three reservoirs were spilling. Normally, maximum storage in the individual reservoirs occurs on different days. The maximum storage in Pepacton Reservoir, during the December to May period, was 143.182 Bgal on April 17, 1996, the maximum storage in Cannonsville Reservoir was 101.355 Bgal on May 13, 1996, and the maximum storage in Neversink Reservoir was 35.568 Bgal on May 1, 1996. During the December to May period, diversions to Rondout Reservoir by New York City totaled 119.851 Bgal (655 Mgal/d). Neither the forecast discharge at Montague, exclusive of water released from the City reservoirs, nor the observed discharge at Montague fell below the

design rate, and no releases were directed. New York City released a total of 14.05 Bgal of water for conservation purposes at the experimental conservation rates shown in table 2 during the period.

June through November

During the June through November period, monthly precipitation was below average in August and was above average in all the other months. Total precipitation during the period was 29.36 inches, or 6.40 inches more than the 55-year average of 22.96 inches (table 1).

The New York City Department of Environmental Protection, Bureau of Water Supply, furnished the River Master with the following advance data for the 1996 calendar year:

1. The estimated continuous safe yield from all the City's sources, obtainable without pumping, is 1,665 Mgal/d, or a total during the calendar year 1996 of 1.665 Bgal/d x 366 days = 609.390 Bgal.

2. The estimated consumption that the City must provide from all its sources of supply during calendar year 1996 is 591.582 + 7.250 = 598.832 Bgal.

On the basis of the provisions of the Decree and the above data, the aggregate quantity of excess-release water was 83 percent of (609.390 - 598.832) or 8.763 Bgal. The Montague design rate during the excess release period beginning June 15, 1996, was computed as:

$$1{,}750\ ft^3/s + \frac{8.763\ Bgal \times 1{,}547\ (ft^3/s)/(Bgal/d)}{120\ days} = 1{,}860\ ft^3/s$$

Data on consumption of water by the City of New York for each calendar year, since 1950, are shown in table 6.

Releases were directed to satisfy the Montague design rate on 41 days between June 1 and November 30, 1996, when the forecasted discharge at Montague, exclusive of water released from the New York City reservoirs, fell below the applicable design rate (table 7). Releases at the experimental conservation rates, or at rates designed to protect the fishery, were made at other times from each reservoir from June 1 to November 30. A total of 3,001 $(ft^3/s)\cdot d$ (1.940 Bgal) was released for the relief of thermal stress from June 1 through September 30.

From June 1 to June 14, the level of flow required to be maintained in the Delaware River at Montague was 1,750 ft^3/s. The forecasted flow, exclusive of releases from Pepacton, Cannonsville, and Neversink Reservoirs, was less than the design rate on two days during the period and releases were directed.

On June 15, 1996 the seasonal period for the release of the excess quantity began and the Montague design rate was increased to 1,860 ft^3/s. The release of the excess quantity, 13,556 $(ft^3/s)\cdot d$, was completed on September 17, 1996. Consequently, the Montague design rate was reduced to 1,750 ft^3/s effective September 21, 1996. Between June 15, when release of the excess-quantity began, and November 30, 1996, the forecasted flow at Montague, exclusive of releases from the New York City reservoirs was below the design rate on 39 days and releases were directed.

On 5 days between June 15 and September 20, the observed flow fell below the design rate. Of those 5 days, only 2 days were more than 10 percent below the design rate.

The total discharge at Montague; the portion derived from uncontrolled runoff downstream from the reservoirs; the portion contributed by the power reservoirs; and the portion contributed by Pepacton, Cannonsville, and Neversink Reservoirs are shown by the hydrographs in figure 3. In analyzing the water budget at Montague, the uncontrolled runoff downstream from the reservoirs was computed as the residual of observed flow less releases from all reservoirs and therefore was subject to all the errors in observations, transit times, and routing of the several components of flow. All of these uncertainties are contained in the computed hydrograph of uncontrolled runoff.

Diversions to Rondout Reservoir from June 1 to November 30 totaled 123.941 Bgal.

Summary of Operations

From December 1, 1995, to November 30, 1996, diversions to Rondout Reservoir totaled 243.792 Bgal, and all releases from the New York City reservoirs to the Delaware River totaled 60.217 Bgal. Directed releases to the Delaware River from these reservoirs totaled 15.955 Bgal.

During the year, maximum storage in Pepacton Reservoir was 143.182 Bgal, on April 17, 1996. Maximum storage in Cannonsville Reservoir was 103.463 Bgal, on November 10. Maximum storage in Neversink Reservoir was 35.568 Bgal, on May 1. The maximum combined storage in the three reservoirs during the year was 278.957 Bgal, on May 13, when all three reservoirs were spilling.

Minimum combined storage in the reservoirs during the year was 161.848 Bgal on January 18, 1996. The minimum storage in Pepacton Reservoir was 80.671 Bgal (57.5 percent of capacity) on January 17 and 18, 1996. The minimum storage in Cannonsville Reservoir was 60.805 Bgal (63.5 percent of capacity) on December 1, 1995, and the minimum storage in Neversink Reservoir was 18.736 Bgal (53.6 percent of capacity) on January 18, 1996.

On November 30, 1996, combined storage in the three reservoirs was 268.531 Bgal, or 99.1 percent of their combined capacity, which was a new maximum storage for the end of the report year. During the year, combined storage increased 102.805 Bgal, or 38.0 percent of capacity. The combined storage of the three reservoirs on the first day of the month from June 1967, to November 1996, is shown in figure 4. Storage was below the median in December, January and June and was above the median during all other months. Storage was above the 75th percentile in February, March, May, and August through November. A new monthly maximum combined storage was established for August 1.

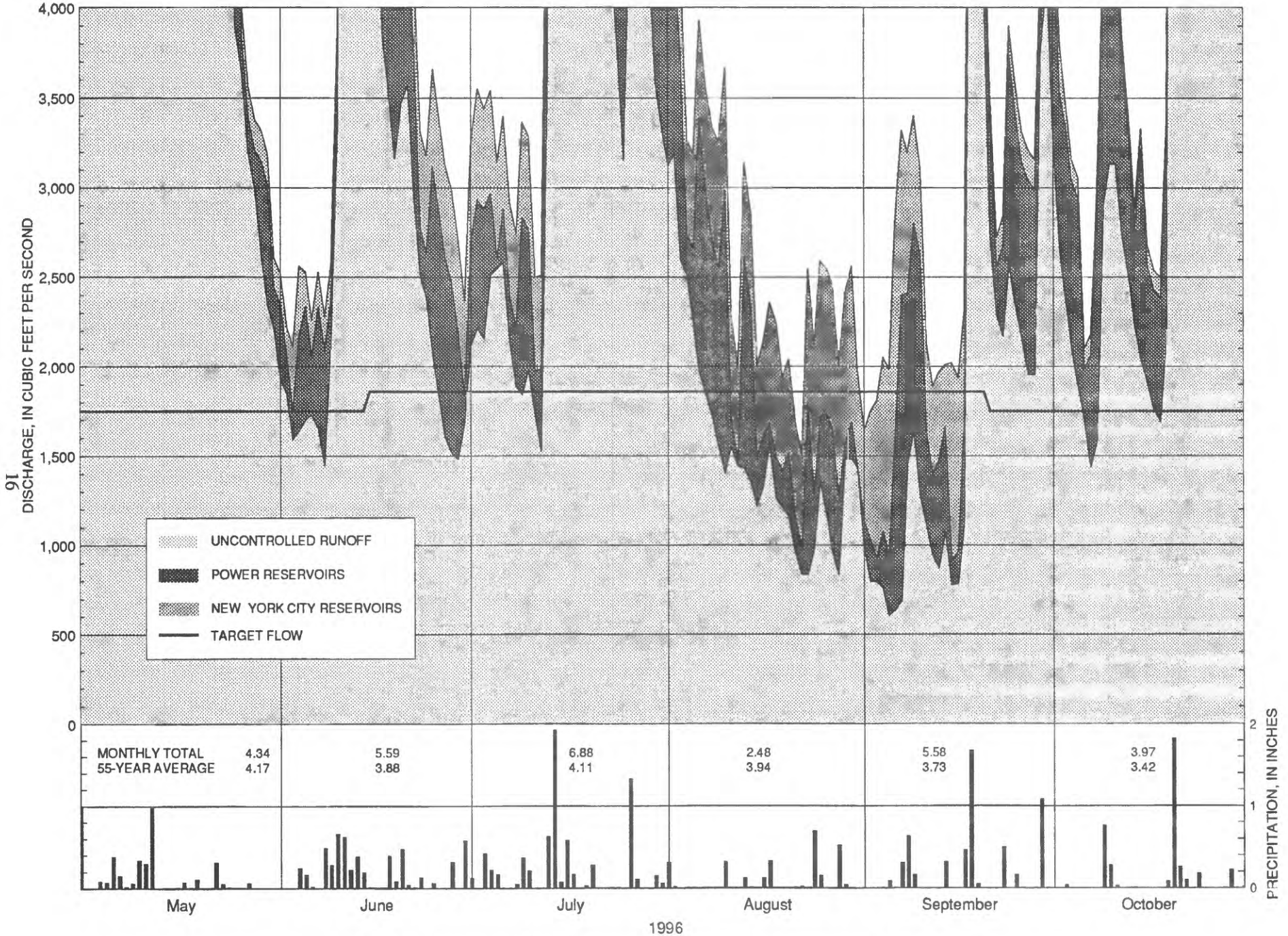

Figure 3.-Components of flow, Delaware River at Montague, N.J., May 1 to October 31, 1996.

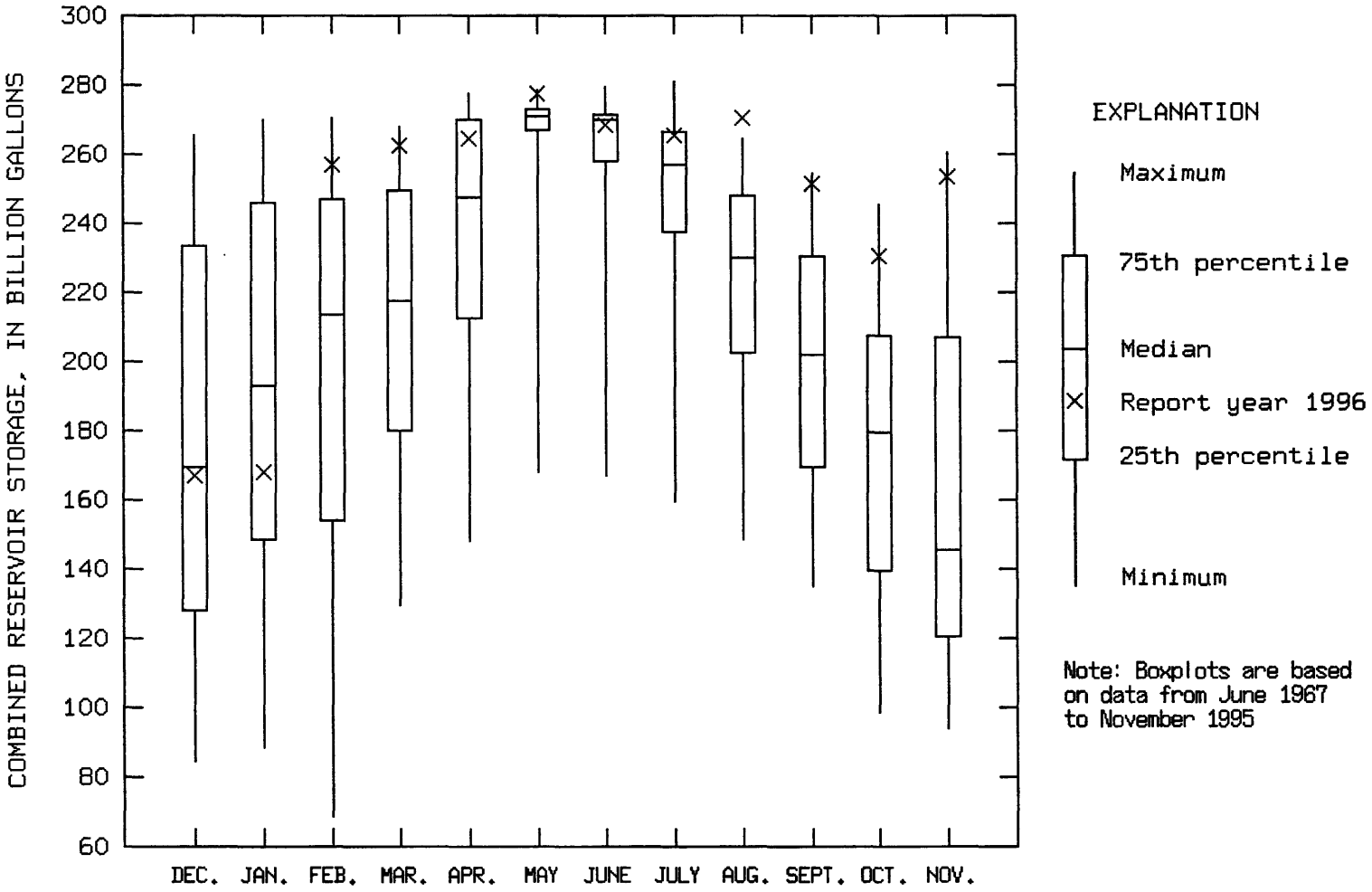

Figure 4.- Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs on the first day of the month, December 1995 to November 1996 (this report year), compared to values for the period of record, June 1967 to November 1995.

SUPPLEMENTARY RELEASE FROM WALLENPAUPACK POWERPLANT

An agreement between Pennsylvania Power & Light Company and New York City provides for supplementary releases from Wallenpaupack hydroelectric powerplant if the Delaware River Basin Commission requests compensation for water consumed at the company's Martins Creek steam-electric generating station. Releases may be requested if the flow of the Delaware River at Trenton, N.J. is expected to be less than 3,000 ft^3/s for more than three consecutive days. No supplementary releases were requested during the year.

COMPONENTS OF FLOW, DELAWARE RIVER AT MONTAGUE, N.J.

The data and computations of the various components of flow formed the basic operational records required to carry out the River Master's specific responsibilities with respect to the Montague Formula during the report year. The operational record has two parts: the forecasted flow at Montague, exclusive of controlled releases from New York City's reservoirs (table 8) and the segregation of the daily average flow at Montague among its various source components (table 9).

Discharge of the Delaware River at Montague was composed of the following source components:

1. Controlled releases from Lake Wallenpaupack on Wallenpaupack Creek in the production of hydroelectric power.
2. Controlled releases from Rio Reservoir on the Mongaup River in the production of hydroelectric power.
3. Runoff from the uncontrolled area upstream from Montague.
4. Controlled releases from Pepacton, Cannonsville, and Neversink Reservoirs of New York City.

The releases from the City's reservoirs necessary to maintain the applicable rate of flow at Montague was computed from the forecasted flow at Montague, exclusive of controlled releases from the City's reservoirs.

TIME OF TRANSIT

The average times for the effective transit of water from the various sources of controlled supply to Montague used for discharge routing during the 1996 report year are as follows:

Source	Hours
Pepacton Reservoir	60
Cannonsville Reservoir	48
Neversink Reservoir	33
Lake Wallenpaupack	16
Rio Reservoir	8

This schedule was developed from reservoir and powerplant operations and gaging-station records of prior years and was found to be generally suitable. At times, noticeable exceptions occur, for example, when a large release from Cannonsville Reservoir follows a small one, a large part of the release is expended in filling the channel en route, and the remainder may appear at Montague as much as 18 hours late. During the winter, ice cover, together with the low streamflow, gradually increases the resistance to streamflow and lengthens the time of transit. However, because the increased travel time generally occurs gradually over several days and releases were not being directed to meet the Montague flow objective during that time, no adjustments were made to compensate for the increased travel time under ice cover.

SEGREGATION OF FLOW AT MONTAGUE

The River Master daily-operation record of reservoir releases and daily segregation of flow among the various source components contributing to the flow of the Delaware River at Montague is shown in table 9. The arrangement of data conforms with the downstream movement of water from the various sources to Montague. A horizontal summation of data in the table is equivalent to routing the various contributions to Montague, using the schedule for travel time of water discussed previously. The uncontrolled runoff was computed by subtracting the contributions of the several other sources from the observed discharge at Montague.

COMPUTATION OF DIRECTED RELEASES

In the daily operations, it was necessary to utilize: (1) discharges computed from recorded or reported stream-gage heights for various 24-hour periods without current information about changes in stage-discharge relations that might have occurred, (2) daily discharge from New York City's three reservoirs obtained from venturi meters, (3) rainfall reports for the previous 24 hours, (4) actual powerplant releases converted to daily discharge, (5) advance estimates of power demand converted to daily discharge, (6) advance estimates of uncontrolled runoff at Montague, and (7) average times for routing of water from the several sources. Variable errors of estimate occur in projecting data, but these data must be used in the daily design and direction of releases from the reservoirs.

The time of transit of water from Pepacton Reservoir to Montague (60 hours) was greater than the transit time of water from any other reservoir. Releases from Cannonsville and Neversink Reservoirs were timed to arrive at Montague concurrently with releases from Pepacton Reservoir. To allow for the actual differences in transit times, daily directed releases from Pepacton were scheduled to begin at 1200 hours, releases from Cannonsville were scheduled to begin at 2400 hours, and releases from Neversink were scheduled to begin at 1500 hours the following day.

Releases from the City's reservoirs required to maintain the specified flow at Montague were calculated after estimates of releases from Lake Wallenpaupack and Rio Reservoir were obtained and after a forecast was made of the uncontrolled runoff at Montague. Taking into account the time of transit from these sources to Montague, the calculation required that estimates of the following components be made two or more days in advance: (1) release of water from Lake Wallenpaupack, (2) release of water from Rio Reservoir, and (3) uncontrolled runoff at Montague. The River Master daily operation record for computing daily directed release from the City's reservoirs during the periods of low flow is shown in table 8.

The electric power companies cooperated fully in furnishing advance estimates of power-plant releases. As the hydroelectric plants were used chiefly for meeting peak-power demands of the system, advance estimates were subject to many modifying factors such as the influence of the vagaries of weather upon peak-power demand. In addition, the power companies are members of wide-area power pools which may present unforeseen demands for power generation. As a result, the actual use of water for power generation was at times at considerable variance from the advance estimates that were used in the design computations.

For computation purposes during periods of low flow, the estimate of uncontrolled runoff at Montague was treated as two items: (1) current runoff and (2) estimated increase in runoff from precipitation. Estimated quantities for these items are shown in table 8.

During the winter period, the advance estimate of the uncontrolled runoff (current conditions) was based on flows at nearby gaging stations and on the recession curve of the computed uncontrolled flow at Montague.

During ice-free conditions, the current runoff was calculated using a routing and recession procedure based on discharges as of 0800 hours at the gaging stations listed below:

Station	Drainage area (square miles)
Beaver Kill at Cooks Falls, N.Y.	241
Cadosia Creek at Cadosia, N.Y.	17.9
Oquaga Creek at Deposit, N.Y.	67.6
Equinunk Creek at Equinunk, Pa.	56.3
Callicoon Creek at Callicoon, N.Y.	110
Tenmile River at Tusten, N.Y.	45.6
Lackawaxen River at Hawley, Pa.	290
Shohola Creek near Shohola, Pa.	83.6
Neversink River at Port Jervis, N.Y.	336

The forecasted increase in runoff from precipitation is shown in table 8 under the heading of "Weather Adjustment." Throughout the low-flow periods, the National Weather Service Office, Mt. Holly, N.J., furnished quantitative forecasts of average precipitation over the drainage area above Montague and air temperatures for each day of the three-day design period. During the winter, runoff was estimated from the current state of snow and ice and from forecasted temperature and precipitation. During other periods, the forecasted precipitation was used to calculate runoff.

The forecasted flow at Montague, exclusive of releases from the City's reservoirs (table 8), was the sum of the forecasted releases from the power reservoirs, the estimated uncontrolled runoff under then current conditions, and the weather adjustment. If the computed flow was less than the desired flow at Montague, the expected deficiency was made up by corresponding releases from New York City reservoirs.

When revised forecasts of precipitation or powerplant releases became available, the releases required from the reservoirs were recomputed. Usually this procedure resulted in a reduced-release requirement from New York City reservoirs for that day and therefore conserved water. Only the final figures are shown in table 8.

ANALYSIS OF FORECASTS

Forecasts of the flow at Montague based on the anticipated flow of the several components (exclusive of the release from New York City's reservoirs) varied somewhat from the observed flow on most days. At times, variations in the several components are partially compensating and the resulting observed flows were fairly close to the estimated flows.

The forecasted flow of the Delaware River at Montague, exclusive of the releases from the New York City reservoirs, was less than the applicable design rate on 41 days from June 9 to October 7, 1996. The tabulation below compares the advance estimates of the various contributions to the flow at Montague to the observed operations during the period, August 17 to September 20, 1996, when releases were being directed daily.

	Advance estimates [$(ft^3/s)\cdot d$]	Observed operations [$(ft^3/s)\cdot d$]
Directed releases from New York City reservoirs	[a] 22,726	[b] 22,670
Power releases		
Lake Wallenpaupack	4,030	8,124
Rio Reservoir	3,537	8,640
Runoff from uncontrolled area	31,157	49,911
	[c] 27,682	[c] 32,757

[a] Directed release as designed.
[b] Actual release in response to direction.
[c] August 17 to September 16, 1996.

During these periods, New York City released 0.2 percent less water than was directed, the power companies released 102 percent more water from Lake Wallenpaupack and 144 percent more water from Rio Reservoir than was forecast, and the observed runoff from the uncontrolled area was 60.2 percent more than the forecasted runoff. However, if the last four days of the period are removed from the comparison, the observed uncontrolled runoff is 18.3 percent more than the forecasted runoff. Those four days were a period of high runoff from rainfall that was not forecast (2.18 inches, observed versus 0.4 inches, forecast).

On the basis of the observed discharges at Montague, exact forecasting of releases required from the City's reservoirs during the report year would have totaled 14,390 $(ft^3/s)\cdot d$. Directed releases totaled 24,683 $(ft^3/s)\cdot d$, or 72 percent more than for exact forecasting.

A comparison of the hydrographs of the forecasted runoff and the actual runoff from the uncontrolled area (fig. 5), indicates that the forecasting procedures tended to underestimate runoff during high precipitation events. Adjustments were made periodically to compensate for errors in the forecast, but because of the travel time, the effect of the adjustments at Montague are not seen for several days.

Analysis of the precipitation forecasts indicates that the total precipitation forecasted for the three-day design period is often fairly accurate, but the storm may occur either earlier or later in the period. The accuracy of the runoff forecasts is significantly affected by the timing of the precipitation events. In addition, if the storm track is somewhat different than was anticipated, the amount and timing of the runoff is significantly affected.

DIVERSIONS TO NEW YORK CITY WATER SUPPLY

The 1954 Amended Decree allows New York City to divert water from the Delaware River Basin at a rate not to exceed 800 Mgal/d. The Decree also specifies that the rate of diversions will be computed as the aggregate total diversion beginning on June 1 of each year divided by the number of days elapsed since the previous May 31.

Diversions from Pepacton, Cannonsville, and Neversink Reservoirs to the New York City water-supply system (Rondout Reservoir) during the report year are shown in table 10. The table includes a running account of the average rates of the combined diversions from the reservoirs, computed as prescribed by the Decree. The tabulation below shows the allowable maximum diversion rates and the actual diversions during those periods.

Effective dates	Allowable diversions (Mgal/d)	Actual diversions (Mgal/d)
Nov. 12, 1995 to May 31, 1996	800	622
June 1 to Nov. 30, 1996	800	677

During the year, a total of 243.792 Bgal of water was diverted to the New York City water supply system. The allowable diversion during the year was 302.126 Bgal.

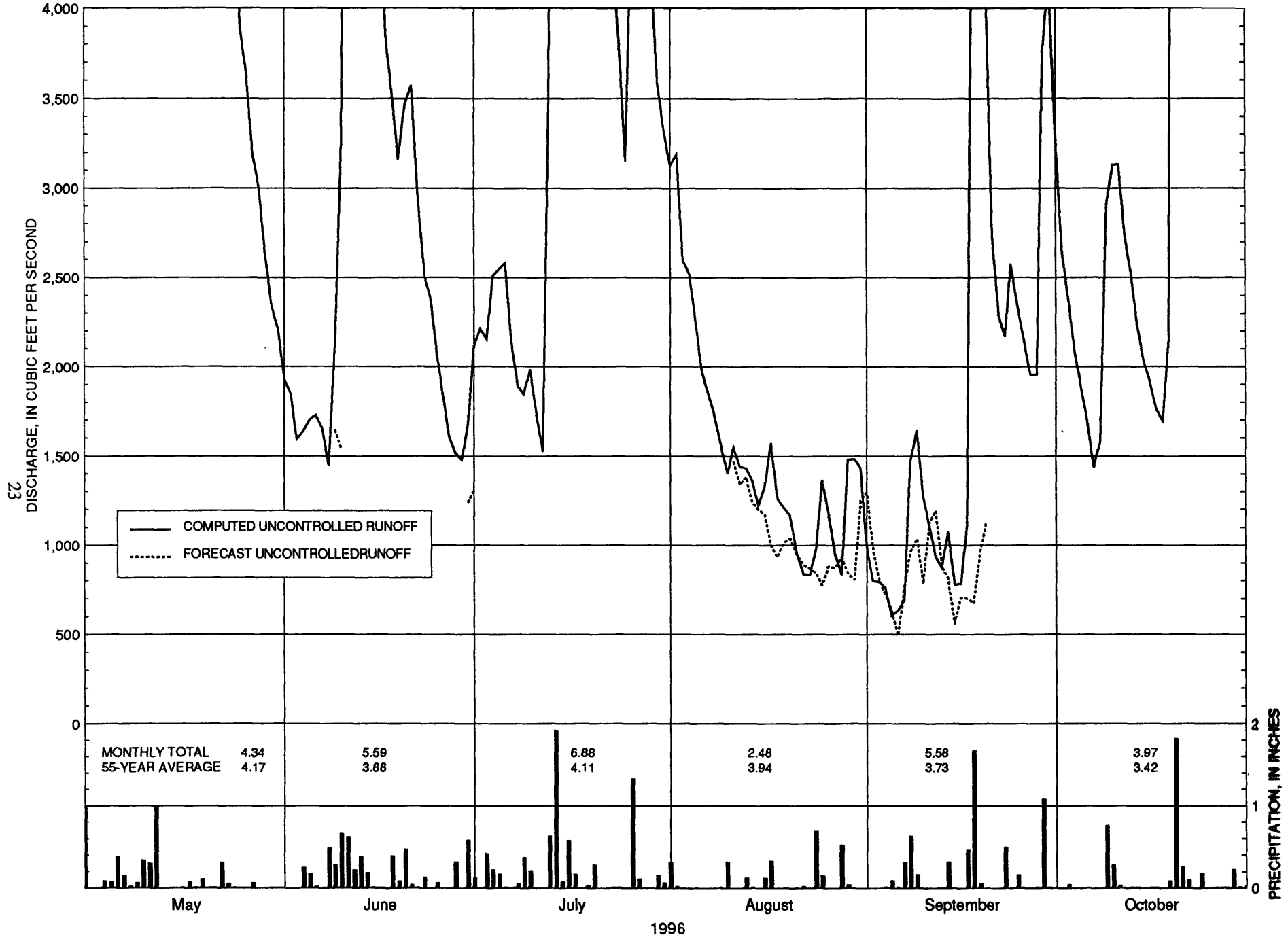

Figure 5.-Uncontrolled runoff component, Delaware River at Montague, N.J., May 1 to October 31, 1996.

STORAGE IN NEW YORK CITY RESERVOIRS

The New York City Board of Water Supply determined the "point of maximum depletion" and other pertinent reservoir levels and contents of Pepacton, Cannonsville, and Neversink Reservoirs to be as follows:

Level	Pepacton Reservoir		Cannonsville Reservoir		Neversink Reservoir	
	Elevation (ft.)	Contents (Bgal)	Elevation (ft.)	Contents (Bgal)	Elevation (ft.)	Contents (Bgal)
Full pool or spillway crest	1,280.00	*140.190	1,150.00	*95.706	1,440.00	*34.941
Point of maximum depletion	1,152.00	*3.511	1,040.00	*1.020	1,319.00	*0.525
Sill of diversion tunnel	1,143.00	*4.200	+1,035.00	*1.564	1,314.00	
Sill of river outlet tunnel	1,126.50		1,020.5		1,314.00	
Dead storage		1.800		0.328		1.680

*Contents shown are quantities stored between listed elevations.
+Elevation of mouth of inlet channel of diversion works.

Tables 3, 4, and 5 show storage in Pepacton, Cannonsville, and Neversink Reservoirs, respectively, above the "point of maximum depletion" or minimum full-operating level.

On December 1, 1995, combined storage in the three reservoirs was 166.770 Bgal. As discussed earlier, storage increased slightly in early-December, then declined slowly from mid-December to mid-January, reaching the minimum combined storage for the report year on January 18, 1996. Storage increased very rapidly during the latter half of January, then increased gradually during February, March, and April until reaching the maximum for the report year on May 13, when all three reservoirs were spilling (fig. 2).

Combined storage remained uncharacteristically level during June and July, and established a new record high storage for August 1. The belated seasonal decline in storage began in early August and continued until mid-October when it began increasing again. Combined storage reached 275.331 Bgal on November 10, 1996 with Pepacton and Cannonsville Reservoirs spilling. The combined storage was 268.531 Bgal on November 30, 1996, which was a new maximum for the end of the report year.

COMPARISON OF RIVER MASTER OPERATION DATA AND OTHER STREAMFLOW RECORDS

It has been explained that the River Master operations are, in effect, day-to-day operations, for which it is necessary to use preliminary records of streamflow. The following summaries show comparison of records used in the River Master operations and U.S. Geological Survey records. In the comparison of releases, the data used were reported in units of million gallons per day (Mgal/d) and converted to cubic feet per second (ft^3/s) in the summaries.

Releases from New York City Reservoirs

The River Master operations data on the controlled releases from Pepacton, Cannonsville, and Neversink Reservoirs, to the Delaware River were obtained from calibrated instruments connected to venturi meters installed in the outlet conduits.

The U.S. Geological Survey gaging station on the East Branch Delaware River at Downsville, N.Y., is 0.5 mile downstream from Pepacton Reservoir dam (fig. 1). The discharge for this station (table 11) includes releases from Pepacton Reservoir and also includes a small amount of seepage and any runoff that enters the channel between the dam and the gage site. The drainage area at the dam is 371 mi^2 and at the gaging station is 372 mi^2.

The tabulation below compares the releases from Pepacton Reservoir reported by New York City to the final records for the USGS gaging station on the East Branch Delaware River at Downsville, N.Y. (table 11) for the target rate of flow shown.

Target rate of flow (ft^3/s)	45	70	95
USGS flow (ft^3/s)	42.9	65.8	92.0
NYC flow (ft^3/s)	45.7	70.0	93.8
Percent difference NYC flow is from USGS flow	+6.5	+6.4	+2.0

The target flows are the experimental conservation release rates as shown in table 2. The differences are similar to the differences observed in previous years. The calibration of the instruments attached to the venturi meters was adjusted periodically by New York City to improve the accuracy of the readings.

The U.S. Geological Survey gaging station on the West Branch Delaware River at Stilesville, N.Y. is 1.4 miles downstream from Cannonsville Dam (fig. 1). The discharge for this station (table 12) includes releases from Cannonsville Reservoir and the runoff from 2 mi^2 of drainage area between the dam and the gage site. The drainage area at the dam is 454 mi^2, and at the gaging station is 456 mi^2.

The following tabulation compares the releases from Cannonsville Reservoir reported by New York City to the final records for the USGS gaging station on the West Branch Delaware River at Stilesville, N.Y. (table 12) for the target rate of flow shown.

Target rate of flow (ft^3/s)	33	45	a/ 330-380	500-800	b/ 800-1100
USGS flow (ft^3/s)	37.7	48.3	336	625	914
NYC flow (ft^3/s)	34.0	44.8	376	660	919
Percent difference NYC flow is from USGS flow	-9.8	-7.2	+11.9	+5.6	+0.5

a/ Release at summer, June 15 to August 15, conservation rate (table 2).
b/ Highest releases of summer made in response to direction.

The gaging-station records are considered good at flows above 100 ft^3/s and fair below. The gaging-station records include the runoff from precipitation on the area between the dam and the gaging station and include seepage that occurs near the base of the dam. On January 29, 1992, the seepage near the base of the dam was measured and found to be 2.4 ft^3/s, which agrees with estimates made in previous years. If the gaging-station record is adjusted for seepage, the agreement at 33 ft^3/s and 45 ft^3/s from the above table becomes -3.7 and -2.8 percent, respectively. We are continuing to monitor the differences in cooperation with New York City and the USGS field office at Troy, N.Y. In an effort to investigate the differences further, one discharge measurement was made just below the Cannonsville release outlet during the report year. Measurements at this location eliminate most of the runoff contribution from the intervening area between the outlet and the gaging station, but includes the seepage at the base of the dam. The measurement was adjusted for the seepage of 2.4 ft^3/s as discussed above. A comparison of the measurement to the New York City release records showed a difference of +3.6% at the summer, June 15 to August 15, conservation rate (table 2).

The U.S. Geological Survey gaging station on the Neversink River at Neversink, N.Y. is 1,650 feet downstream from Neversink Dam (fig. 1). The discharge for this station (table 13) includes releases from Neversink Reservoir and, during storms, a small amount of runoff that originates between the dam and the gage site. The drainage area at the dam is 92.5 mi^2 and that at the gaging station is 92.6 mi^2.

The following tabulation compares the releases from Neversink Reservoir reported by New York City to the final records for the USGS gaging station on the Neversink River at Neversink, N.Y. (table 13) for the target rate of flow shown.

Target rate of flow (ft^3/s)	25	53	80-90
USGS flow (ft^3/s)	23.8	50.8	81.3
NYC flow (ft^3/s)	24.7	51.6	86.1
Percent difference NYC flow is from USGS flow	+3.8	+1.6	+5.9

The target flows are the experimental conservation release rates except for the highest releases of 80 ft^3/s to 90 ft^3/s, which represented the maximum rates of release for thermal protection made during the report year.

Releases from Lake Wallenpaupack

Records of daily discharge through the Wallenpaupack powerplant were furnished by the Pennsylvania Power & Light Company and published by the U.S. Geological Survey as Wallenpaupack Creek at Wilsonville, Pa. These discharges (table 14) represent the flow through the turbines of the powerplant and were computed on a midnight-to-midnight basis. For River Master operations, flows were computed on an 0800 hour to 0800 hour basis to compensate for the travel time to Montague.

From December 1995, through November 1996, the River Master's record agrees with the published U.S. Geological Survey record except for a slight variation due to the difference in the time frame and the rounding of the computations.

Delaware River at Montague, N.J.

The River Master's operation record for the Delaware River at Montague, N.J. (table 9) indicated 0.19 percent more discharge for the year than did the published U.S. Geological Survey record for the gaging station at that site (table 15), and daily records were in good agreement.

Diversion Tunnels

Records of diversions through the East Delaware, West Delaware, and Neversink Tunnels (fig. 1) were furnished to the River Master's Office by the City of New York. These records were obtained from New York City's calibrated instruments connected to venturi meters installed in the tunnel conduits. The on-site venturi rates-of-flow were transmitted electronically to the New York City Department of Environmental Protection computer at the Rondout Effluent Chamber every 15 seconds. Every five minutes, the computer system calculated the release and diversion quantities for the preceding five-minute periods based on the latest instantaneous rates-of-flow. These five-minute quantities were added to calculate the daily total flows, which were reported to the River Master office daily. The diversion values were checked weekly against the flow-meter totalizer readings on-site and calibrated or corrected as necessary. When possible, current-meter measurements were made by the River Master's office to verify the reported diversions. The measurements were made in the outlet channels downstream from the tunnels.

The East Delaware Tunnel is used to divert water from Pepacton Reservoir to Rondout Reservoir. Conditions in the outlet channel of the East Delaware Tunnel were unfavorable for the measurement of flows throughout the year, except for two brief periods during January and February, because of high water levels in Rondout Reservoir. Consequently, no current-meter measurements were made during the report year. Comparison of the data provided by New York City with discharges obtained from recorded gage-heights and the rating curve for the weir on the outlet channel from the East Delaware Tunnel indicate that the data provided by New York City were within acceptable limits.

The hydroelectric plant at the downstream end of the East Delaware Tunnel operated most days of the year. When the powerplant was not in operation, a small amount of leakage through the wicket gates was not recorded on the totalizer. The results of current-meter measurements made in previous years and observations made in 1995 indicate that the leakage has not changed substantially with time and is approximately 8.0 Mgal/d. Because the powerplant was not in operation for the equivalent of 95 days during the 1996 report year, the unmeasured leakage was approximately 760 Mgal. Based upon the measurements obtained in previous years, the record of diversions through the East Delaware Tunnel was substantially correct.

The West Delaware Tunnel is used to divert water from Cannonsville Reservoir into Rondout Reservoir. Two current-meter measurements of flow in the West Delaware Tunnel outlet channel were made during the report year. Those measurements and two additional measurements, one made just before and one just after the end of the report year, indicated that on the average the venturi instruments gave higher results, 3.6 percent for the totalizer and 3.0 percent

for the rate-of-flow indicator. Inspections of the channel downstream from the outlet, when valves were closed, showed negligible leakage.

A hydroelectric plant uses water diverted through the West Delaware Tunnel. However, it operates only when diversions are less than 300 Mgal/d. When the powerplant is not operating, the valves on the pipelines to the powerplant are closed, and there is no leakage through the system. The results of the measurements and inspections made this year and during past years indicate that the reported record of the quantity of water diverted through the West Delaware Tunnel was substantially correct.

The Neversink Tunnel is used to divert water from Neversink Reservoir into Rondout Reservoir. Two measurements of flow from the Neversink Tunnel were made during the report year. Those measurements showed that on average, the venturi instruments were 5.2 percent higher for the totalizer and 3.0 percent higher for the rate-of-flow indicator.

A hydroelectric plant uses water diverted through the Neversink Tunnel. When the powerplant is not operating and the main valve on the diversion tunnel is open, leakage occurs that is not recorded on the venturi instruments. Based on measurements made during previous years, the average rate of leakage was 14.0 ft^3/s (9.0 Mgal/d). When the powerplant was operating, the leakage was included in the recorded flow. When the main valve on the tunnel is closed, there is no leakage.

During the 1996 report year, the power plant did not operate for part of the day most of the time and was not operated the equivalent of 190 days. However, on 7 of those days, the tunnel was dewatered and there was no leakage. Based on the above rate, records of power plant operation, and tunnel dewatering, approximately 1.6 Bgal of water was diverted, but was unrecorded.

DIVERSIONS BY NEW JERSEY

The Decree allows New Jersey to divert water from the Delaware River (or its tributaries in New Jersey) to areas outside the Delaware River Basin without compensating releases. These diversions may not exceed 100 Mgal/d (154.7 ft^3/s) as a monthly average, with the diversion on any day not to exceed 120 Mgal/d (185.6 ft^3/s). The U.S. Geological Survey gaging station, Delaware and Raritan Canal at Port Mercer, New Jersey (fig. 1) is used as the official location for measuring the diversions by New Jersey (table 16). Because of the very low gradient in the canal near the gaging station, negative or reverse flow occasionally occurs during high runoff events.

The 30-day average diversion was computed weekly throughout the year to monitor compliance with the terms of the Decree. The maximum monthly diversion was 92.5 Mgal/d during December, 1995. The maximum daily diversion was 103 Mgal on December 22, 1995. These computations show that the diversions by New Jersey did not exceed the limits allowed by the Decree.

CONFORMANCE OF OPERATIONS AS PROVIDED UNDER AMENDED DECREE OF THE U.S. SUPREME COURT DATED JUNE 7, 1954

Operations were conducted as prescribed in the Decree throughout the report year. Diversions from the Delaware River Basin to the New York City water-supply system, during the report year, were less than those authorized by the Decree.

Under Compensating Releases of the Montague Formula, New York City released water from its reservoirs at rates designed by the River Master to maintain the applicable Montague flow objectives and complied fully with the directives of the River Master during the year.

Diversions from the Delaware River Basin by New Jersey were also within the limits prescribed by the Decree.

Table 1. Precipitation in the Delaware River basin upstream from Montague, N.J.
[All values given in inches.]

Month	December 1940 to November 1995 Monthly Average	December 1995 to November 1996			
		Amount	Percentage of average	Excess (+) or deficit (-) Month	Cumulative
December	3.36	1.86	55	-1.50	-1.50
January	2.89	6.74	233	+3.85	+2.35
February	2.68	2.03	76	-.65	+1.70
March	3.29	2.52	77	-.77	+.93
April	3.75	5.85	156	+2.10	+3.03
May	4.17	4.34	104	+.17	+3.20
June	3.88	5.59	144	+1.71	+4.91
July	4.11	6.88	167	+2.77	+7.68
August	3.94	2.48	63	-1.46	+6.22
September	3.73	5.58	150	+1.85	+8.07
October	3.42	3.97	116	+.55	+8.62
November	3.88	4.86	125	+.98	+9.60
12 months	43.10	52.70	122	+9.60	

Table 2. Conservation release rates for New York City reservoirs in the Delaware River Basin.
[ft^3/s, cubic feet per second]

Reservoir	Operative dates	Conservation release rates		
		Basic (ft^3/s)	Augmented (ft^3/s)	Experimental (ft^3/s)
Neversink	January 1 to March 31	5	25	25
	April 1-7	5	45	25
	April 8-30	15	45	25
	May 1 to September 30	15	45	53
	October 1-31	15	45	25
	November 1 to December 31	5	25	25
Pepacton	January 1 to March 31	6	50	45
	April 1-7	6	70	45
	April 8-30	19	70	45
	May 1-31	19	70	70
	June 1 to August 31	19	70	95
	September 1-30	19	70	70
	October 1-31	19	70	45
	November 1 to December 31	6	50	45
Cannonsville	January 1 to March 31	8	33	45
	April 1-15	8	45	45
	April 16 to June 14	23	45	45
	June 15 to August 15	23	325	325
	August 16 to October 31	23	45	45
	November 1-30	23	33	33
	December 1-31	8	33	33

Table 3. Storage in Pepacton Reservoir, N.Y. for year ending November 30, 1996.
(Storage in millions of gallons above elevation 1,152.00 ft. Add 7,711 million gallons for total contents above sill of outlet tunnel, elevation 1,126.50 ft.) Storage at spillway level is 140,190 million gallons
(River Master daily operations record; gage reading at 0800)

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	83,794	83,304	127,758	132,665	136,181	142,864	139,308	137,346	140,338	131,327	119,648	128,989
2	83,948	83,053	128,251	132,897	136,308	142,640	138,995	137,036	140,375	130,848	119,376	128,954
3	84,313	83,011	128,514	132,970	136,345	142,378	138,664	136,781	140,079	130,404	119,104	128,866
4	84,580	82,802	128,725	132,934	136,326	142,062	138,332	136,472	139,951	129,908	118,613	128,778
5	84,763	82,552	128,761	132,970	136,381	141,949	138,131	136,490	139,638	129,660	118,192	128,585
6	84,834	82,329	128,866	133,222	136,381	141,802	137,802	136,309	139,418	129,060	117,804	128,532
7	84,960	82,176	128,849	133,329	136,690	141,709	137,455	136,055	139,142	128,655	117,400	128,286
8	85,087	82,051	128,849	133,383	136,781	141,486	138,535	135,747	138,811	128,269	117,031	128,075
9	85,257	81,926	128,919	133,258	136,854	141,486	140,153	135,566	138,516	127,934	116,830	135,783
10	85,243	81,719	128,813	133,132	136,945	141,375	140,950	135,149	138,314	127,460	116,713	141,709
11	85,229	81,650	128,673	133,006	137,090	141,820	141,839	134,714	138,040	127,023	116,412	142,696
12	85,201	81,415	128,602	132,897	137,328	142,472	141,802	134,372	137,748	126,568	116,127	142,155
13	85,172	81,292	128,339	132,862	137,601	142,547	141,561	134,156	137,383	126,114	115,842	141,672
14	85,215	81,168	128,128	132,773	138,700	142,136	141,338	136,454	137,072	125,679	115,559	141,357
15	85,257	80,975	127,934	132,880	140,338	141,876	141,042	137,802	136,726	125,245	115,193	141,079
16	85,201	80,795	127,477	133,060	141,802	141,709	140,820	139,730	136,326	124,880	114,878	140,746
17	85,144	80,671	127,390	133,132	143,182	141,486	140,616	140,950	136,000	124,481	114,628	140,616
18	85,045	80,671	127,181	133,222	142,864	141,449	140,486	141,357	135,584	124,343	114,495	140,634
19	84,904	82,023	126,831	133,419	142,435	141,431	140,264	141,338	135,203	123,756	114,163	140,690
20	84,834	100,838	126,743	133,707	142,024	141,468	140,209	141,301	135,022	123,411	116,295	140,838
21	84,665	105,383	127,093	134,390	141,876	141,246	140,246	141,061	134,372	122,946	120,378	140,690
22	84,580	107,589	127,846	134,678	141,764	141,172	140,006	140,857	134,066	122,550	122,705	140,560
23	84,467	109,056	128,532	134,823	141,654	141,135	139,767	140,857	133,581	122,292	124,343	140,579
24	84,355	110,290	129,218	135,076	141,876	141,042	139,472	140,486	133,240	121,951	124,430	140,505
25	84,201	112,662	130,191	135,185	141,839	140,857	139,216	140,394	132,880	121,643	126,517	140,486
26	84,159	114,180	131,238	135,385	141,802	140,671	138,829	140,579	132,416	121,231	127,285	140,653
27	83,948	115,559	131,737	135,493	141,691	140,616	138,480	140,876	132,434	120,872	127,934	140,765
28	83,990	121,317	132,058	135,693	141,672	140,505	138,351	141,023	132,487	120,463	128,549	140,708
29	83,682	123,911	132,398	135,874	141,486	140,171	138,003	141,023	132,505	120,293	128,849	140,560
30	83,541	125,592		136,018	142,099	139,822	137,693	140,671	132,147	120,055	129,042	140,634
31	83,304	126,901		136,073		139,564		140,431	131,737		129,042	
Change	-167	+43,597	+5,497	+3,675	+6,026	-2,535	-1,871	+2,738	-8,694	-11,682	+8,987	+11,592
Equiv. Mgal/d	-5.4	+1,406	+189.6	+118.5	+200.9	-81.8	-62.4	+88.3	-280.5	-389.4	+289.9	+386.4
Equiv. ft^3/s	-8.3	+2,176	+293	+183	+311	-127	-96.5	+137	-434	-602	+448	+598
Change for year +57,163 Mgal					Equiv. for year +156.2 Mgal/d						Equiv. for year +242 ft^3/s	

Table 4. Storage in Cannonsville Reservoir, N.Y. for year ending November 30, 1996.
(Storage in millions of gallons above elevation 1,040.00 ft. Add 2,584 million gallons for total contents above sill outlet tunnel, elevation 1,020.50 ft.) Storage at spillway level is 95,706 million gallons.
(River Master daily operations record; gage reading at 0800)

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	60,805	64,580	98,571	97,460	96,736	98,925	95,569	94,337	95,787	92,725	87,161	97,090
2	61,536	64,326	98,120	97,363	96,639	99,263	95,234	94,368	95,867	92,329	87,175	97,058
3	62,212	64,364	97,878	97,202	96,671	99,102	95,022	94,139	95,835	91,812	87,089	96,945
4	62,874	64,377	97,573	96,977	96,639	98,780	94,839	93,957	95,770	91,279	86,973	96,945
5	63,600	64,071	97,251	96,768	96,607	98,683	94,733	94,155	95,787	90,716	86,814	96,704
6	64,275	63,893	97,106	96,768	96,478	98,378	94,535	94,459	95,787	90,412	86,698	96,543
7	64,746	63,740	96,897	96,832	96,462	98,442	94,398	94,763	95,738	89,986	86,583	96,317
8	65,166	63,549	96,929	96,784	96,446	98,474	94,717	94,915	95,432	89,834	86,308	96,205
9	65,434	63,396	96,832	96,639	96,446	98,249	96,301	95,037	95,067	89,773	86,496	99,311
10	65,586	63,281	96,913	96,446	96,237	98,120	97,090	95,113	95,463	89,606	86,771	103,463
11	65,663	63,243	96,816	96,350	96,012	98,265	97,396	94,961	95,600	89,499	87,002	102,257
12	65,599	63,090	96,768	96,334	95,899	100,067	97,557	94,657	95,539	89,271	87,219	101,001
13	65,574	63,014	96,704	96,317	95,947	101,355	97,573	94,504	95,645	89,119	87,435	100,051
14	65,663	62,963	96,575	96,317	97,122	100,808	97,540	96,559	95,615	88,602	87,594	99,359
15	65,675	62,785	96,511	96,543	98,136	100,132	97,347	97,492	95,600	88,222	87,710	98,683
16	65,764	62,594	96,446	96,848	98,989	99,440	96,591	97,991	95,463	87,984	87,883	98,152
17	65,790	62,390	96,350	96,977	99,987	98,909	96,527	98,104	95,356	87,782	87,956	97,766
18	65,764	62,441	96,301	96,961	99,939	98,490	96,205	97,798	95,280	87,739	87,999	97,621
19	65,726	63,459	96,221	96,977	99,649	98,362	95,883	97,460	95,250	87,768	88,130	97,621
20	65,688	65,815	96,189	97,283	99,134	98,184	95,867	97,589	95,417	87,681	88,663	97,911
21	65,650	81,813	96,527	97,669	98,651	97,766	95,508	97,444	95,326	87,652	90,594	98,088
22	65,574	91,248	97,267	97,782	98,410	97,508	95,584	97,218	94,991	87,594	92,147	97,943
23	65,446	93,059	97,363	97,621	98,152	97,283	95,478	96,704	94,687	87,565	93,272	97,862
24	65,484	94,185	97,685	97,524	98,039	96,977	95,432	96,269	94,504	87,594	94,215	97,895
25	65,408	96,655	97,975	97,218	98,136	96,687	95,250	96,060	94,337	87,551	95,143	97,782
26	65,243	97,750	98,104	97,138	97,830	96,430	95,082	95,835	93,987	87,248	95,835	97,846
27	65,217	98,072	97,895	97,122	97,653	96,317	94,809	96,076	93,820	87,060	96,317	98,394
28	65,115	100,598	97,605	97,218	97,363	96,028	94,672	96,124	93,561	86,872	96,623	98,458
29	64,950	100,389	97,637	97,138	97,170	95,980	94,444	96,044	93,288	86,958	96,945	98,265
30	64,835	99,601		97,025	97,830	95,803	94,368	95,947	93,120	87,089	97,106	98,313
31	64,670	99,070		96,929		95,691		95,660	93,044		97,170	
Change	+4,659	+34,400	-1,433	-708	+901	-2,139	-1,323	+1,292	-2,616	-5,955	+10,081	+1,143
Equiv. Mgal/d	+150.3	+1,110	-49.4	-22.8	+30.0	-69.0	-44.1	+41.7	-84.4	-198.5	+325.2	+38.1
Equiv. ft^3/s	+232	+1,717	-76.4	-35.3	+46.5	-107	-68.2	+64.5	-131	-307	+503	+58.9
Change for year +38,302 Mgal					Equiv. for year +104.7 Mgal/d						Equiv. for year +162 ft^3/s	

Table 5. Storage in Neversink Reservoir, N.Y. for year ending November 30, 1996.
(Storage in Millions of gallons above elevation 1,319.00 ft. Add 525 million gallons for total contents above sill of outlet tunnel, elevation 1,314.00 ft.) Storage at spillway level is 34,941 million gallons.
(River Master daily operations record; gage reading at 0800)

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	22,171	20,201	30,661	32,326	31,461	35,568	33,799	33,775	34,379	27,485	23,661	27,378
2	22,101	20,139	30,588	32,150	31,648	35,324	33,838	33,693	34,219	27,507	23,621	27,227
3	22,000	20,113	30,670	31,939	31,832	35,264	33,881	33,688	34,062	27,494	23,557	27,073
4	21,923	20,053	30,808	31,663	31,995	35,036	33,974	33,765	33,848	27,279	23,469	26,910
5	21,826	19,972	30,947	31,434	32,042	34,936	34,052	33,891	33,741	27,000	23,382	26,782
6	21,764	19,902	31,058	31,252	32,071	34,833	34,023	33,891	33,563	26,749	23,298	26,736
7	21,626	19,799	31,165	31,067	32,141	34,725	34,072	33,891	33,355	26,473	23,234	26,587
8	21,535	19,774	31,299	30,891	32,174	34,552	34,155	33,858	33,134	26,287	23,135	26,469
9	21,386	19,715	31,438	30,602	32,213	34,414	34,508	33,848	32,909	26,068	23,107	29,106
10	21,272	19,613	31,565	30,273	32,321	34,214	34,684	33,799	32,723	25,825	23,139	30,159
11	21,131	19,496	31,672	29,995	32,330	34,438	35,031	33,698	32,481	25,587	23,147	30,350
12	21,063	19,376	31,794	29,905	32,326	34,720	34,931	33,611	32,250	25,250	23,175	30,447
13	21,010	19,260	31,868	29,742	32,477	35,055	34,868	33,563	32,019	25,002	23,115	30,487
14	21,006	19,195	32,929	29,598	32,871	34,976	34,700	34,941	31,813	24,731	23,099	30,483
15	20,972	19,061	32,005	29,482	33,331	34,837	34,547	35,239	31,560	24,453	23,036	30,612
16	20,968	18,964	32,080	29,518	33,819	34,739	34,487	35,434	31,313	24,177	22,925	30,501
17	20,938	18,815	31,972	29,392	35,055	34,616	34,478	35,304	31,062	24,035	22,862	30,506
18	20,934	18,736	31,733	29,491	35,150	34,523	34,458	35,070	30,868	24,112	22,733	30,506
19	20,938	19,122	31,522	29,437	35,060	34,311	34,243	34,863	30,575	24,319	22,698	30,487
20	20,908	23,068	31,285	29,571	35,041	34,379	34,257	34,916	30,314	24,230	23,809	30,429
21	20,837	23,813	31,202	29,765	35,085	34,106	34,253	34,734	30,046	24,100	25,291	30,359
22	20,773	24,193	31,397	29,878	34,996	34,062	34,204	34,591	29,769	23,951	25,858	30,222
23	20,735	24,490	31,587	30,059	34,941	34,047	34,194	34,508	29,527	23,850	26,127	30,095
24	20,660	24,699	31,620	30,191	34,971	33,979	34,140	34,399	29,279	23,773	26,303	29,982
25	20,633	25,620	31,878	30,314	34,956	34,003	34,052	34,281	29,008	23,705	26,646	29,869
26	20,563	26,064	32,174	30,465	34,868	34,042	33,934	34,453	28,743	23,641	26,842	29,774
27	20,495	26,435	32,472	30,726	34,739	34,042	33,833	34,695	28,447	23,525	27,026	29,819
28	20,432	29,240	32,562	30,891	34,616	34,096	33,736	34,725	28,176	23,417	27,172	29,737
29	20,376	29,955	32,449	31,044	34,468	34,042	33,669	34,689	28,014	23,533	27,344	29,665
30	20,320	30,364		31,183	35,194	33,959	33,679	34,645	27,762	23,677	27,460	29,584
31	20,261	30,703		31,341		33,881		34,492	27,485		27,451	
Change	-1,983	+10,442	+1,746	-1,108	+3,853	-1,313	-202	+813	-7,007	-3,808	+3,774	+2,133
Equiv. Mgal/d	-64.0	+336.8	+60.2	-35.7	+128.4	-42.4	-6.7	+26.2	-226.0	-126.9	+121.7	+71.1
Equiv. ft^3/s	-99.0	+521	+93.1	-55.3	+199	-65.5	-10.4	+40.6	-350	-196	+188	+110
Change for year +7,340 Mgal					Equiv. for year +20.1Mgal/d						Equiv. for year +31.0 ft^3/s	

Table 6. Consumption of Water by New York City - 1950 to 1996
Data furnished by New York City, Department of Environmental Protection
Bureau of Water Supply, Quality and Protection
[Mgal/d, million gallons per day; Bgal, billion gallons]

Year	Average daily consumption			Annual consumption (Bgal)
	City proper (Mgal/d)	Outside communities (Mgal/d)	Total (Mgal/d)	
1950	953.3	29.1	982.4	358.576
51	1,041.9	28.1	1,070.0	390.550
52	1,087.0	32.7	1,119.7	409.810
53	1,093.9	44.6	1,138.5	415.552
54	1,063.4	46.3	1,109.7	405.040
1955	1,109.9	45.3	1,155.2	421.648
56	1,111.3	48.9	1,160.2	424.633
57	1,169.0	57.2	1,226.2	447.563
58	1,152.9	49.6	1,202.5	438.912
59	1,204.3	60.3	1,264.6	461.579
1960	1,199.4	58.9	1,258.3	460.529
61	1,221.0	64.0	1,285.0	469.022
62	1,207.6	68.8	1,276.4	465.896
63	1,218.0	76.7	1,294.7	472.582
64	1,189.2	79.4	1,268.6	464.295
1965	1,052.1	71.2	1,123.3	409.995
66	1,044.9	73.2	1,118.1	408.128
67	1,135.3	71.0	1,206.3	440.302
68	1,242.0	78.2	1,320.2	483.175
69	1,328.7	80.1	1,408.8	514.229
1970	1,400.3	90.4	1,490.7	544.116
71	1,423.6	87.9	1,511.5	551.695
72	1,412.4	83.0	1,495.4	547.340
73	1,448.9	95.4	1,544.3	563.681
74	1,441.8	96.3	1,538.1	561.409
1975	1,415.0	92.1	1,507.1	550.093
76	1,435.0	95.8	1,530.8	560.264
77	1,483.0	104.7	1,587.7	579.510
78	1,479.4	103.0	1,582.4	577.566
79	1,513.0	104.6	1,617.6	590.426
1980	1,506.3	110.1	1,616.3	591.582
81	1,309.5	100.0	1,409.5	514.475
82	1,383.0	104.8	1,487.8	543.060
83	1,424.2	112.6	1,536.8	561.010
84	1,465.2	113.9	1,579.1	577.963
1985	1,325.4	106.5	1,431.9	522.656
86	1,351.1	115.2	1,466.3	535.200
87	1,447.1	119.8	1,566.9	571.885
88	1,484.3	125.6	1,609.9	589.090
89	1,402.0	113.4	1,515.4	553.158
1990	1,424.4	122.4	1,546.8	564.577
91	1,469.9	123.6	1,593.5	581.628
92	1,368.7	113.9	1,482.6	542.632
93	1,368.9	118.8	1,487.7	543.011
94	1,357.8	119.2	1,477.0	539.105
1995	1,326.1	123.1	1,449.2	528.958
96	1,283.5	120.2	1,403.7	512.351

Table 7. Design rates for the Delaware River at Montague, N.J. gaging station December 1, 1995 to November 30, 1996
[ft^3/s, cubic feet per second]

Effective dates	Montague Design Rate (ft^3/s)
December 1, 1995 to June 14, 1996	1,750
June 15 to September 20, 1996	1,860
September 21 to November 30, 1996	1,750

Table 8. New York City Reservoir release design data
(River Master daily operation record)
[ft^3/s, cubic feet per second; $(ft^3/s)\cdot d$, cubic feet per second days]

Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases							Indicated	Balancing	Directed	Computation of the balancing adjustment					
	Powerplant release forecasts		Uncontrolled runoff							Adjusted directed release		Actutal deficiency		Cumulative	Balancing
Date of advance estimate	Lake Wallenpaupack	Rio Reservoir	Current conditions	Weather adjustment	Date	Discharge	deficiency	adjustment	release	Daily	Cumulative	Daily	Cumulative	difference	adjustment
	ft^3/s	ft^3/s	ft^3/s	ft^3/s		ft^3/s	ft^3/s	ft^3/s	ft^3/s	ft^3/s	$(ft^3/s)\cdot d$	ft^3/s	$(ft^3/s)\cdot d$	$(ft^3/s)\cdot d$	ft^3/s
1996	1	2	3	4		5	6	7	8	9	10	11	12	13	14
MONTAGUE DESIGN RATE = 1,750 ft^3/s DECEMBER 1, 1995 TO JUNE 14, 1996															
The estimated Montague discharge was greater than the Montague design rate Dec. 1, 1995 to June 8, 1996															
June 6	0	0	1,353	292	June 9	1,645	105		105						
June 7	0	113	1,230	310	10	1,653	97		97						
MONTAGUE DESIGN RATE = 1,860 ft^3/s JUNE 15, 1996 TO SEPTEMBER 20, 1996															
The estimated Montague discharge was greater than the Montague design rate June 11-29, 1996															
June 27	0	99	1,217	22	June 30	1,338	522	0	522	522	522	24	24	498	-50
28	0	270	1,291	16	July 1	1,577	283	0	283	283	805	0	24	781	-78
The estimated Montague discharge was greater than the Montague design rate July 2-10, 1996															
July 8	288	106	1,303	103	July 11	1,800	60	-78	0	0	805	0	24	781	-78
9	288	106	1,579	113	12	2,086	0	-78	0	0	805	0	24	781	-78
10	288	71	1,496	0	13	1,855	5	-78	0	0	805	0	24	781	-78
11	0	0	1,279	182	14	1,461	399	-78	321	321	1,126	0	24	1,102	-110
The estimated Montague discharge was greater than the Montague design rate July 15, 1996 to August 10, 1996															
Aug. 8	0	0	1,300	170	Aug. 11	1,470	390	-110	280	280	1,406	143	167	1,239	-110
Aug. 9	0	113	1,243	96	12	1,452	408	-110	298	298	1,704	393	560	1,144	-110
The estimated Montague discharge was greater than the Montague design rate August 13-14, 1996															
Aug.12	821	113	1,116	82	Aug. 15	2,132	0	-110	0	0	1,704	381	941	763	-76
13	821	113	1,093	82	16	2,109	0	-110	0	0	1,704	242	1,183	521	-52
14	0	71	990	8	17	1,069	791	-110	681	682	2,386	182	1,365	1,021	-102
15	0	71	922	12	18	1,005	855	-110	745	744	3,130	364	1,729	1,401	-110
16	0	259	973	40	19	1,272	588	-76	512	512	3,642	444	2,173	1,469	-110
17	0	355	1,038	0	20	1,393	467	-52	415	415	4,057	344	2,517	1,540	-110
18	0	355	953	0	21	1,308	552	-102	450	450	4,507	693	3,210	1,297	-110
19	0	355	894	0	22	1,249	611	-110	501	501	5,008	874	4,084	924	-92
20	0	142	857	13	23	1,012	848	-110	738	739	5,747	49	4,133	1,614	-110
21	0	71	822	24	24	917	943	-110	833	838	6,585	578	4,711	1,874	-110
22	0	106	756	19	25	881	979	-110	869	871	7,456	141	4,852	2,604	-110
23	0	71	686	197	26	954	906	-92	814	812	8,268	122	4,974	3,294	-110
24	0	71	816	56	27	943	917	-110	807	807	9,075	207	5,181	3,894	-110
25	0	71	905	29	28	1,005	855	-110	745	723	9,798	583	5,764	4,034	-110
26	0	71	825	14	29	910	950	-110	840	839	10,637	289	6,053	4,584	-110
27	0	71	757	50	30	878	982	-110	872	868	11,505	168	6,221	5,284	-110
28	0	35	1,215	32	31	1,282	578	-110	468	465	11,970	426	6,647	5,323	-110

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on weather forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = Design rate - Col. 5, when positive; otherwise Co. 6 = 0.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = Design rate - Col. 5 + Col. 7, when positive; otherwise Col. 8 = 0.
Col. 9 = Col. 7, from Table 16.
Col. 10 = Summation of Col. 9.
Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 16), when positive; otherwise Col. 11 = 0.
Col. 12 = Summation of Col. 11.
Col. 13 = Col. 10 - Col. 12.
Col. 14 = Col. 13 divided by minus 10, limited to ±110.

Note:--Cols. 9-14 are used only for the computation of the balancing adjustment June 15, 1996 to Sept. 20, 1996.

Table 8. New York City Reservoir release design data - Continued
(River Master daily operation record)
[ft^3/s, cubic feet per second; $(ft^3/s)\cdot d$, cubic feet per second days]

Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases							Indicated	Balancing	Directed	Computation of the balancing adjustment					
	Powerplant release forecasts		Uncontrolled runoff							Adjusted directed release		Actutal deficiency		Cumulative	Balancing
Date of advance estimate	Lake Wallenpaupack	Rio Reservoir	Current conditions	Weather adjustment	Date	Discharge	deficiency	adjustment	release	Daily	Cumulative	Daily	Cumulative	difference	adjustment
	ft^3/s	ft^3/s	ft^3/s	ft^3/s		ft^3/s	ft^3/s	ft^3/s	ft^3/s	ft^3/s	$(ft^3/s)\cdot d$	ft^3/s	$(ft^3/s)\cdot d$	$(ft^3/s)\cdot d$	ft^3/s
1996	1	2	3	4		5	6	7	8	9	10	11	12	13	14
Aug. 29	0	35	1,295	0	Sept. 1	1,330	530	-110	420	420	12,390	727	7,374	5,016	-110
30	0	35	990	0	2	1,025	835	-110	725	722	13,112	832	8,206	4,906	-110
31	0	53	799	6	3	858	1,002	-110	892	884	13,996	934	9,140	4,896	-110
Sept. 1	0	53	725	0	4	778	1,082	-110	972	970	14,966	780	9,920	5,046	-110
2	0	53	636	3	5	692	1,168	-110	1,058	1,052	16,018	922	10,842	5,176	-110
3	0	35	494	3	6	532	1,328	-110	1,218	1,213	17,231	253	11,095	6,136	-110
4	0	71	534	221	7	826	1,034	-110	924	924	18,155	0	11,095	7,060	-110
5	0	0	599	365	8	964	896	-110	786	786	18,941	0	11,095	7,846	-110
6	0	106	551	488	9	1,145	715	-110	605	599	19,540	0	11,095	8,445	-110
7	526	106	628	159	10	1,419	441	-110	331	331	19,871	0	11,095	8,776	-110
8	526	106	1,001	123	11	1,756	104	-110	0	0	19,871	234	11,329	8,542	-110
9	526	106	882	312	12	1,826	34	-110	0	0	19,871	464	11,793	8,078	-110
10	526	106	835	49	13	1,516	344	-110	234	234	20,105	383	12,176	7,929	-110
11	526	71	753	60	14	1,410	450	-110	340	343	20,448	193	12,369	8,079	-110
12	0	71	521	41	15	633	1,227	-110	1,117	1,106	21,554	946	13,315	8,239	-110
13	0	71	541	165	16	777	1,083	-110	973	975	22,529	895	14,210	8,319	-110
14	350	71	688	14	17	1,123	737	-110	627						
15	350	71	649	26	18	1,096	764	-110	654						
16	350	71	643	324	19	1,388	472	-110	362						
17	350	71	726	405	20	1,552	308	-110	198						

MONTAGUE DESIGN RATE = 1,750 ft^3/s SEPTEMBER 21, 1996 TO NOVEMBER 30, 1996

The estimated Montague discharge was greater than the Montague design rate September 21, 1996 to October 6, 1996

Oct. 4	0	213	1,486	0	Oct. 7	1,699	51	-	51						

The estimated Montague discharge was greater than the Montague design rate October 8, 1996 to November 30, 1996

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on weather forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = Design rate - Col. 5, when positive; otherwise Co. 6 = 0.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = Design rate - Col. 5 + Col. 7, when positive; otherwise Col. 8 = 0.
Col. 9 = Col. 7, from Table 16.
Col. 10 = Summation of Col. 9.
Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 16), when positive; otherwise Col. 11 = 0.
Col. 12 = Summation of Col. 11.
Col. 13 = Col. 10 - Col. 12.
Col. 14 = Col. 13 divided by minus 10, limited to ±110.

Note:--Cols. 9-14 are used only for the computation of the balancing adjustment June 15, 1996 to Sept. 20, 1996.

Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J.
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
									Controlled releases			Computed		Excess Release Credits	
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-	Rio		N.Y.C. reservoirs		Power-	uncon-			
Date	Amount				Date	paupack	Reservoir	Date	Directed	Other	plants	trolled	Total	Daily	Cumul.
1995	1	2	3	4		5	6		7	8	9	10	11	12	13
Nov. 28		45	34	25	Nov. 30	926	670	Dec. 1		104	1,596	4,090	5,790		
29		45	34	25	Dec. 1	862	312	2		104	1,174	4,032	5,310		
30		45	34	25	2	0	323	3		104	323	4,263	4,690		
Dec. 1		46	34	25	3	118	294	4		105	412	4,193	4,710		
2		46	34	25	4	931	394	5		105	1,325	4,140	5,570		
3		46	34	25	5	920	415	6		105	1,335	4,080	5.520		
4		46	34	25	6	927	528	7		105	1,455	3,750	5,310		
5		46	34	25	7	998	571	8		105	1,569	3,276	4,950		
6		48	34	25	8	813	408	9		107	1,221	2,802	4,130		
7		46	34	25	9	332	344	10		105	676	2,719	3,500		
8		46	34	25	10	453	386	11		105	839	2,656	3,600		
9		46	34	25	11	994	468	12		105	1,462	2,933	4,500		
10		46	34	25	12	995	514	13		105	1,509	2,686	4,300		
11		46	34	25	13	1,009	379	14		105	1,388	2,207	3,700		
12		46	34	25	14	991	319	15		105	1,310	2,185	3,600		
13		46	34	25	15	881	663	16		105	1,544	2,451	4,100		
14		45	34	25	16	0	518	17		104	518	2,778	3,400		
15		45	34	25	17	131	376	18		104	507	2,589	3,200		
16		45	34	23	18	985	472	19		102	1,457	2,341	3,900		
17		45	34	25	19	1,011	408	20		104	1,419	2,077	3,600		
18		46	34	25	20	1,001	447	21		105	1,448	2,147	3,700		
19		46	34	25	21	892	606	22		105	1,498	1,997	3,600		
20		46	34	25	22	0	0	23		105	0	2,095	2,200		
21		46	34	25	23	0	0	24		105	0	2,195	2,300		
22		46	34	25	24	0	145	25		105	145	2,150	2,400		
23		46	34	25	25	110	415	26		105	525	1,970	2,600		
24		46	34	25	26	994	447	27		105	1,441	2,254	3,800		
25		46	34	25	27	943	578	28		105	1,521	1,674	3,300		
26		46	34	25	28	918	365	29		105	1,283	1,612	3,000		
27		46	34	25	29	819	87	30		105	906	1,789	2,800		
28		46	34	25	30	0	156	31		105	156	1,539	1,800		
Total	0	1,421	1,054	773		19,954	12,008		0	3,248	31,962	83,670	118,880		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1995/96	1	2	3	4		5	6		7	8	9	10	11	12	13
Dec. 29		46	34	25	Dec. 31	0	128	Jan. 1		105	128	1,567	1,800		
30		46	34	25	Jan. 1	89	252	2		105	341	1,754	2,200		
31		46	34	25	2	915	397	3		105	1,312	1,783	3,200		
Jan. 1		46	34	25	3	542	482	4		105	1,024	1,571	2,700		
2		46	34	25	4	435	507	5		105	942	1,553	2,600		
3		45	34	25	5	831	426	6		104	1,257	1,539	2,900		
4		45	34	25	6	701	0	7		104	701	1,595	2,400		
5		45	34	25	7	669	103	8		104	772	1,624	2,500		
6		45	34	25	8	928	99	9		104	1,027	1,669	2,800		
7		45	34	25	9	946	21	10		104	967	1,829	2,900		
8		45	34	25	10	936	0	11		104	936	1,660	2,700		
9		46	34	25	11	895	121	12		105	1,016	1,779	2,900		
10		45	34	25	12	827	0	13		104	827	1,869	2,800		
11		46	34	25	13	0	0	14		105	0	1,795	1,900		
12		45	34	25	14	104	262	15		104	366	1,730	2,200		
13		45	34	25	15	942	423	16		104	1,365	1,931	3,400		
14		45	34	25	16	936	365	17		104	1,301	1,895	3,300		
15		45	34	25	17	813	450	18		104	1,263	1,833	3,200		
16		45	34	25	18	457	681	19		104	1,138	15,758	17,000		
17		45	34	25	19	739	699	20		104	1,438	118,458	120,000		
18		45	34	25	20	146	886	21		104	1,032	41,364	42,500		
19		46	36	25	21	114	890	22		107	1,004	24,289	25,400		
20		45	37	25	22	934	851	23		107	1,785	16,708	18,600		
21		46	37	25	23	923	843	24		108	1,766	12,926	14,800		
22		46	37	25	24	1,404	833	25		108	2,237	17,955	20,300		
23		46	37	25	25	1,464	858	26		108	2,322	14,170	16,600		
24		48	37	25	26	1,319	805	27		110	2,124	21,966	24,200		
25		48	37	25	27	1,749	872	28		110	2,621	55,269	58,000		
26		46	37	25	28	1,807	851	29		108	2,658	33,434	36,200		
27		48	37	25	29	1,801	844	30		110	2,645	23,045	25,800		
28		48	37	25	30	1,821	816	31		110	2,637	14,853	17,600		
Total	0	1,419	1,083	775		26,187	14,765		0	3,277	40,952	441,171	485,400		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
									Controlled releases					Excess Release Credits	
Directed		Pepacton	Cannonsville	Neversink		Lake Wallenpaupack	Rio Reservoir		N.Y.C. reservoirs		Powerplants	Computed uncontrolled	Total		
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
Jan. 29		46	37	25	Jan. 31	1,831	794	Feb. 1		108	2,625	11,167	13,900		
30		46	37	25	Feb. 1	1,831	826	2		108	2,657	9,435	12,200		
31		46	37	26	2	1,672	833	3		109	2,505	7,686	10,300		
Feb. 1		46	37	2	3	1,534	649	4		85	2,183	6,432	8,700		
2		46	37	2	4	1,609	716	5		85	2,325	5,090	7,500		
3		46	37	6	5	1,643	716	6		89	2,359	4,652	7,100		
4		46	37	26	6	1,477	564	7		109	2,041	4,250	6,400		
5		46	37	25	7	1,416	532	8		108	1,948	4,144	6,200		
6		46	37	25	8	1,400	418	9		108	1,818	4,474	6,400		
7		46	37	25	9	883	560	10		108	1,443	4,749	6,300		
8		46	37	25	10	822	525	11		108	1,347	4,545	6,000		
9		46	37	25	11	522	663	12		108	1,185	4,907	6,200		
10		45	37	25	12	920	681	13		107	1,601	4,102	5,810		
11		45	37	25	13	955	500	14		107	1,455	3,388	4,950		
12		45	37	25	14	769	436	15		107	1,205	3,268	4,580		
13		45	37	25	15	951	245	16		107	1,196	3,227	4,530		
14		45	37	25	16	741	681	17		107	1,422	3,871	4,400		
15		45	37	25	17	0	518	18		107	518	3,065	3,690		
16		45	37	25	18	112	514	19		107	626	3,127	3,860		
17		45	37	25	19	948	355	20		107	1,303	2,800	4,210		
18		45	37	25	20	1,450	798	21		107	2,248	6,265	8,620		
19		45	37	25	21	957	674	22		107	1,631	12,862	14,600		
20		45	37	25	22	927	680	23		107	1,607	14,486	16,200		
21		43	37	25	23	824	716	24		105	1,540	15,255	16,900		
22		45	37	25	24	820	660	25		107	1,480	17,613	19,200		
23		45	37	25	25	513	702	26		107	1,215	15,078	16,400		
24		45	37	25	26	937	702	27		107	1,639	12,054	13,800		
25		45	37	25	27	936	706	28		107	1,642	10,551	12,300		
26		43	37	25	28	946	642	29		105	1,588	10,707	12,400		
Total	0	1,313	1,073	662		30,346	18,006		0	3,048	48,352	212,250	263,650		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
Feb. 27		45	37	25	Feb. 29	948	681	Mar. 1		107	1,629	9,064	10,800		
28		45	37	25	Mar. 1	817	582	2		107	1,399	7,774	9,280		
29		46	37	25	2	816	684	3		108	1,500	6,592	8,200		
Mar. 1		54	37	25	3	528	635	4		116	1,163	6,051	7,330		
2		48	37	25	4	925	386	5		110	1,311	5,269	6,690		
3		48	37	25	5	916	397	6		110	1,313	5,177	6,600		
4		46	37	25	6	923	638	7		108	1,561	5,901	7,570		
5		46	37	25	7	748	486	8		108	1,234	5,758	7,100		
6		46	37	25	8	934	645	9		108	1,579	4,453	6,140		
7		46	37	25	9	680	358	10		108	1,038	3,884	5,030		
8		46	37	25	10	343	766	11		108	1,109	4,153	5,370		
9		46	37	25	11	819	468	12		108	1,287	3,845	5,240		
10		46	37	25	12	580	461	13		108	1,041	4,301	5,450		
11		48	37	25	13	845	528	14		110	1,373	4,717	6,200		
12		46	37	25	14	950	621	15		108	1,571	5,741	7,420		
13		46	37	25	15	637	415	16		108	1,052	8,730	9,890		
14		46	37	25	16	0	369	17		108	369	8,103	8,580		
15		46	37	25	17	103	330	18		108	433	7,589	8,130		
16		46	37	25	18	955	628	19		108	1,583	6,989	8,680		
17		46	37	25	19	946	702	20		108	1,648	9,544	11,300		
18		46	37	25	20	931	702	21		108	1,633	12,759	14,500		
19		46	37	25	21	942	702	22		108	1,644	11,048	12,800		
20		46	37	25	22	809	670	23		108	1,479	9,113	10,700		
21		46	37	25	23	0	680	24		108	680	8,072	8,860		
22		45	37	25	24	123	507	25		107	630	7,353	8,090		
23		45	37	25	25	919	603	26		107	1,522	6,681	8,310		
24		45	37	25	26	918	674	27		107	1,592	6,811	8,510		
25		45	37	25	27	949	433	28		107	1,382	6,411	7,900		
26		45	37	25	28	943	635	29		107	1,578	5,885	7,570		
27		46	37	25	29	808	457	30		108	1,265	5,437	6,810		
28		46	37	25	30	0	184	31		108	184	5,828	6,120		
Total	0	1,433	1,147	775		21,755	17,027		0	3,355	38,782	209,033	251,170		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-	Rio		Controlled releases			Computed uncon-		Excess Release Credits	
									N.Y.C. reservoirs		Power-				
Date	Amount				Date	paupack	Reservoir	Date	Directed	Other	plants	trolled	Total	Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
Mar. 29		46	37	25	Mar. 31	111	333	Apr. 1		108	444	5,448	6,000		
30		46	37	25	Apr. 1	814	649	2		108	1,463	5,669	7,240		
31		46	43	25	2	907	723	3		114	1,630	5,796	7,540		
Apr. 1		46	45	25	3	936	156	4		116	1,092	5,272	6,480		
2		46	45	25	4	831	103	5		116	934	4,870	5,920		
3		45	45	25	5	0	212	6		115	212	4,683	5,010		
4		46	45	25	6	0	0	7		116	0	4,654	4,770		
5		46	40	25	7	0	397	8		111	397	5,262	5,770		
6		45	48	25	8	0	461	9		118	461	5,701	6,280		
7		46	45	25	9	105	546	10		116	651	5,073	5,840		
8		46	45	25	10	0	486	11		116	486	4,858	5,460		
9		46	73	25	11	0	266	12		114	266	4,460	4,870		
10		46	45	25	12	0	149	13		116	1,419	5,465	5,730		
11		46	45	25	13	0	284	14		116	284	12,000	12,400		
12		46	45	25	14	0	606	15		116	606	15,978	16,700		
13		46	45	25	15	875	741	16		116	1,616	24,268	26,000		
14		46	45	25	16	1,316	716	17		116	2,032	35,752	37,900		
15		46	45	25	17	525	904	18		116	1,429	26,355	27,900		
16		48	45	25	18	624	848	19		118	1,472	19,710	21,300		
17		48	45	25	19	534	770	20		118	1,304	15,378	16,800		
18		48	45	25	20	0	660	21		118	660	12,622	13,400		
19		48	45	25	21	57	809	22		118	866	10,816	11,800		
20		46	45	25	22	975	844	23		116	1,819	9,265	11,200		
21		46	45	25	23	977	606	24		116	1,583	10,101	11,800		
22		46	45	25	24	932	720	25		116	1,652	10,032	11,800		
23		46	45	25	25	925	688	26		116	1,613	9,371	11,100		
24		46	45	25	26	826	685	27		116	1,511	8,263	9,890		
25		46	45	25	27	0	688	28		116	688	7,856	8,660		
26		46	45	23	28	125	411	29		114	536	7,750	8,400		
27		46	45	25	29	978	39	30		116	1,017	15,167	16,300		
Total	0	1,386	1,358	748		13,373	15,500		0	3,492	28,823	317,895	350,260		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
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Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
Apr. 29		46	45	26	Apr. 30	1,406	862	May 1		117	2,268	29,415	31,800		
30		46	45	32	May 1	944	801	2		123	1,745	26,132	28,000		
May 1		51	48	50	2	1,409	837	3		149	2,246	19,405	21,800		
2		71	45	54	3	1,401	791	4		170	2,192	15,938	18,300		
3		73	50	54	4	1,398	847	5		177	2,245	13,678	16,100		
4		71	45	53	5	1,398	855	6		169	2,253	12,078	14,500		
5		71	45	53	6	984	823	7		169	1,807	12,524	14,500		
6		73	45	51	7	948	805	8		169	1,753	10,978	12,900		
7		73	45	53	8	950	794	9		171	1,744	9,585	11,500		
8		73	45	53	9	943	787	10		171	1,730	9,699	11,600		
9		73	45	54	10	934	472	11		172	1,406	10,822	12,400		
10		73	45	54	11	394	589	12		172	983	21,345	22,500		
11		73	45	54	12	109	872	13		172	981	24,947	26,100		
12		73	45	54	13	1,405	847	14		172	2,252	19,876	22,300		
13		73	45	54	14	1,008	844	15		172	1,852	15,676	17,700		
14		73	45	54	15	928	840	16		172	1,768	12,760	14,700		
15		73	45	50	16	923	755	17		168	1,678	10,854	12,700		
16		73	45	50	17	839	699	18		168	1,538	9,194	10,900		
17		73	45	50	18	0	681	19		168	681	8,801	9,650		
18		79	45	50	19	132	759	20		174	891	8,075	9,140		
19		73	45	51	20	1,184	691	21		169	1,875	6,806	8,850		
20		73	45	51	21	1,126	472	22		169	1,598	6,683	8,450		
21		73	45	51	22	917	628	23		169	1,545	5,896	7,610		
22		74	45	51	23	940	780	24		170	1,720	4,800	6,690		
23		74	45	51	24	852	734	25		170	1,586	3,894	5,650		
24		74	45	51	25	0	188	26		170	188	3,642	4,000		
25		74	45	51	26	0	195	27		170	195	3,195	3,560		
26		74	45	51	27	0	213	28		170	213	2,997	3,380		
27		74	45	51	28	0	528	29		170	528	2,622	3,320		
28		74	45	51	29	0	677	30		170	677	2,343	3,190		
29		74	45	51	30	0	223	31		170	223	2,217	2,610		
Total	0	2,195	1,403	1,564		23,472	20,889		0	5,162	44,361	346,877	396,400		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
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Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
									Controlled releases			Computed		Excess Release Credits	
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		N.Y.C. reservoirs		Power-plants	uncon-trolled	Total		
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
May 30	0	74	45	51	May 31	0	418	June 1	0	170	418	1,932	2,520		
31	0	70	45	51	June 1	0	206	2	0	166	206	1,848	2,220		
June 1	0	74	234	51	2	0	156	3	0	359	156	1,595	2,110		
2	0	99	235	51	3	0	535	4	0	385	535	1,640	2,560		
3	0	99	45	51	4	0	631	5	0	195	631	1,704	2,530		
4	0	97	56	51	5	0	326	6	0	204	326	1,730	2,260		
5	0	96	46	51	6	320	362	7	0	193	682	1,655	2,530		
6	0	94	45	51	7	318	323	8	0	190	641	1,449	2,280		
7	105	94	45	51	8	0	245	9	105	85	245	2,145	2,580		
8	97	96	213	51	9	0	220	10	97	263	220	3,260	3,840		
9	0	96	213	51	10	345	291	11	0	360	636	7,364	8,360		
10	0	94	351	51	11	338	436	12	0	496	774	7,380	8,650		
11	0	94	384	51	12	1,101	507	13	0	529	1,608	8,963	11,100		
12	0	94	377	51	13	1,398	493	14	0	522	1,891	7,987	10,400		
13	0	96	379	51	14	894	507	15	0	526	1,401	5,813	7,740	0	0
14	0	96	377	51	15	0	407	16	0	524	407	4,789	5,720	0	0
15	0	96	377	51	16	0	234	17	0	524	234	3,852	4,610	0	0
16	0	96	377	51	17	631	287	18	0	524	918	3,518	4,960	0	0
17	0	96	370	67	18	629	525	19	0	533	1,154	3,163	4,850	0	0
18	0	96	377	51	19	712	745	20	0	524	1,457	3,469	5,450	0	0
19	0	96	377	51	20	634	330	21	0	524	964	3,572	5,060	0	0
20	0	94	377	51	21	634	135	22	0	522	769	2,939	4,230	0	0
21	0	94	377	62	22	0	270	23	0	533	270	2,507	3,310	0	0
22	0	101	377	68	23	0	245	24	0	546	245	2,389	3,180	0	0
23	0	105	377	56	24	648	404	25	0	538	1,052	2,070	3,660	0	0
24	0	97	377	51	25	628	404	26	0	525	1,032	1,823	3,380	0	0
25	0	91	377	51	26	625	383	27	0	519	1,008	1,603	3,130	0	0
26	0	96	376	51	27	621	330	28	0	523	951	1,516	2,990	0	0
27	0	97	376	51	28	339	368	29	0	524	707	1,479	2,710	0	0
28	522	96	376	62	29	0	156	30	522	12	156	1,680	2,370	522	522
Total	724	2,814	8,358	1,540		10,815	10,879		724	12,038	21,694	96,834	131,290		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
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Col. 11 = 24 hours of calendar day shown.

Col. 12 = Col. 11 - Col. 8 - 1,750 ft^3/s computed algebraically, but not greater than Col. 7; except that part of Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 15, 1996 = 13,556 (ft^3/s)·d.

Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
June 29	283	102	376	76	June 30	0	578	July 1	283	271	578	2,118	3,250	283	805
30	0	107	435	76	July 1	307	411	2	0	618	718	2,214	3,550	0	805
July 1	0	97	376	88	2	293	433	3	0	561	726	2,153	3,440	0	805
2	0	108	376	84	3	278	184	4	0	568	462	2,510	3,540	0	805
3	0	105	376	53	4	0	57	5	0	534	57	2,549	3,140	0	805
4	0	93	376	53	5	285	11	6	0	522	296	2,582	3,400	0	805
5	0	94	376	53	6	0	252	7	0	523	252	2,135	2,910	0	805
6	0	94	376	53	7	0	326	8	0	523	326	1,891	2,740	0	805
7	0	94	377	56	8	267	723	9	0	527	990	1,843	3,360	0	805
8	0	94	377	54	9	280	500	10	0	525	780	1,985	3,290	0	805
9	0	93	377	53	10	221	21	11	0	523	242	1,735	2,500	0	805
10	0	93	377	53	11	224	238	12	0	523	462	1,525	2,510	0	805
11	0	94	376	53	12	652	532	13	0	523	1,184	3,543	5,250	0	805
12	321	93	376	53	13	570	879	14	321	201	1,449	14,829	16,800	321	1,126
13	0	93	376	53	14	601	755	15	0	522	1,356	12,122	14,000	0	1,126
14	0	93	379	53	15	760	606	16	0	525	1,366	13,509	15,400	0	1,126
15	0	94	379	53	16	800	613	17	0	526	1,413	13,461	15,400	0	1,126
16	0	94	379	53	17	893	716	18	0	526	1,609	9,865	12,000	0	1,126
17	0	94	379	53	18	818	783	19	0	526	1,601	7,973	10,100	0	1,126
18	0	94	379	99	19	823	259	20	0	572	1,082	7,176	8,830	0	1,126
19	0	277	379	51	20	0	174	21	0	707	174	6,819	7,700	0	1,126
20	0	145	379	51	21	0	177	22	0	575	177	5,588	6,340	0	1,126
21	0	93	377	71	22	816	564	23	0	541	1,380	4,339	6,260	0	1,126
22	0	93	379	53	23	715	401	24	0	525	1,116	3,749	5,390	0	1,126
23	0	93	377	51	24	814	163	25	0	521	977	3,152	4,650	0	1,126
24	0	93	377	50	25	799	305	26	0	520	1,104	4,606	6,230	0	1,126
25	0	93	379	53	26	807	230	27	0	525	1,037	6,638	8,200	0	1,126
26	0	93	377	53	27	0	351	28	0	523	351	5,146	6,020	0	1,126
27	0	91	379	53	28	0	316	29	0	523	316	4,241	5,080	0	1,126
28	0	91	379	53	29	809	316	30	0	523	1,125	3,592	5,240	0	1,126
29	0	91	377	53	30	810	0	31	0	521	810	3,329	4,660	0	1,126
Total	604	3,176	11,757	1,814		13,642	11,874		604	16,143	25,516	158,917	201,180		

Col. 2 - 24 hours beginning 1200 of date shown.
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Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-	Rio		Controlled releases			Computed uncon-		Excess Release Credits	
									N.Y.C. reservoirs		Power-				
Date	Amount				Date	paupack	Reservoir	Date	Directed	Other	plants	trolled	Total	Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
July 30	0	91	377	53	July 31	814	138	Aug. 1	0	521	952	3,127	4,600	0	1,126
31	0	91	377	54	Aug. 1	809	319	2	0	522	1,128	3,190	4,840	0	1,126
Aug. 1	0	96	377	54	2	816	298	3	0	527	1,114	2,599	4,240	0	1,126
2	0	96	377	53	3	0	230	4	0	526	230	2,514	3,270	0	1,126
3	0	96	376	53	4	26	390	5	0	525	416	2,249	3,190	0	1,126
4	0	96	377	68	5	934	482	6	0	541	1,416	1,973	3,930	0	1,126
5	0	94	376	87	6	830	323	7	0	557	1,153	1,850	3,560	0	1,126
6	0	101	441	88	7	820	167	8	0	630	987	1,723	3,340	0	1,126
7	0	119	503	87	8	816	181	9	0	709	997	1,554	3,260	0	1,126
8	0	119	501	65	9	816	766	10	0	685	1,582	1,403	3,670	0	1,126
9	280	88	432	53	10	0	167	11	280	293	167	1,550	2,290	247	1,373
10	298	93	377	53	11	0	25	12	298	225	25	1,442	1,990	110	1,483
11	0	91	379	53	12	810	376	13	0	523	1,186	1,431	3,140	0	1,483
12	0	91	377	51	13	814	170	14	0	519	984	1,357	2,860	0	1,483
13	0	93	377	51	14	0	255	15	0	521	255	1,224	2,000	110	1,593
14	0	94	377	51	15	0	291	16	0	522	291	1,327	2,140	110	1,703
15	681	94	537	51	16	0	106	17	682	0	106	1,572	2,360	610	2,313
16	745	94	596	54	17	0	234	18	744	0	234	1,262	2,240	490	2,803
17	512	94	376	54	18	0	202	19	512	12	202	1,214	1,940	178	2,981
18	415	94	376	54	19	0	351	20	415	109	351	1,165	2,040	181	3,162
19	450	93	376	54	20	0	202	21	450	73	202	965	1,690	-60	3,102
20	501	93	377	54	21	0	149	22	501	23	149	837	1,510	-240	2,862
21	738	93	592	54	22	576	401	23	739	0	977	834	2,550	739	3,601
22	833	94	688	56	23	0	309	24	838	0	309	973	2,120	370	3,971
23	869	93	705	73	24	0	355	25	871	0	355	1,364	2,590	840	4,811
24	814	93	648	71	25	0	560	26	812	0	560	1,178	2,550	800	5,611
25	807	91	645	71	26	0	695	27	807	0	695	958	2,460	710	6,321
26	745	91	579	53	27	138	305	28	723	0	443	834	2,000	250	6,571
27	840	91	695	53	28	90	0	29	839	0	90	1,481	2,410	660	7,231
28	872	91	726	51	29	39	170	30	868	0	209	1,483	2,560	810	8,041
29	468	94	391	51	30	0	0	31	465	71	0	1,434	1,970	149	8,190
Total	10,868	2,942	14,708	1,828		9,148	8,617		10,844	8,634	17,765	48,067	85,310		

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Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
Aug. 30	420	94	362	51	Aug. 31	0	145	Sept. 1	420	87	145	988	1,640	-110	8,080
31	725	94	577	51	Sept. 1	0	230	2	722	0	230	798	1,750	0	8,080
Sept. 1	892	90	743	51	2	0	131	3	884	0	131	795	1,810	60	8,140
2	972	70	849	51	3	0	319	4	970	0	319	761	2,050	300	8,440
3	1,058	70	931	51	4	0	333	5	1,052	0	333	605	1,990	240	8,680
4	1,218	70	1,092	51	5	758	213	6	1,213	0	971	636	2,820	1,070	9,750
5	924	70	803	51	6	1,284	421	7	924	0	1,705	691	3,320	924	10,674
6	786	70	665	51	7	947	7	8	786	0	954	1,460	3,200	786	11,460
7	605	70	478	51	8	948	209	9	599	0	1,157	1,644	3,400	599	12,059
8	331	70	373	51	9	880	472	10	331	163	1,352	1,274	3,120	331	12,390
9	0	70	373	51	10	343	180	11	0	494	523	1,103	2,120	110	12,500
10	0	70	373	51	11	344	113	12	0	494	457	939	1,890	110	12,610
11	234	71	371	51	12	348	255	13	234	259	603	874	1,970	110	12,720
12	340	71	221	51	13	291	301	14	343	0	592	1,075	2,010	260	12,980
13	1,117	71	984	51	14	0	138	15	1,106	0	138	776	2,020	270	13,250
14	973	70	849	56	15	0	181	16	975	0	181	784	1,940	190	13,440
15	627	70	509	51	16	279	284	17	630	0	563	1,117	2,310	116	13,556
16	654	70	534	51	17	285	230	18	655	0	515	5,350	6,520		
17	362	71	240	51	18	289	294	19	362	0	583	6,575	7,520		
18	198	70	77	51	19	285	145	20	198	0	430	4,112	4,740		
19	0	70	45	51	20	287	337	21	0	166	624	2,730	3,520		
20	0	70	45	51	21	0	262	22	0	166	262	2,292	2,720		
21	0	70	45	51	22	0	504	23	0	166	504	2,170	2,840		
22	0	70	45	51	23	704	454	24	0	166	1,158	2,576	3,900		
23	0	71	45	51	24	701	365	25	0	167	1,066	2,347	3,580		
24	0	71	45	51	25	702	284	26	0	167	986	2,157	3,310		
25	0	71	45	51	26	709	379	27	0	167	1,088	1,955	3,210		
26	0	70	45	51	27	707	333	28	0	166	1,040	1,954	3,160		
27	0	70	48	50	28	0	287	29	0	168	287	3,755	4,210		
28	0	70	45	50	29	0	404	30	0	165	404	4,171	4,740		
Total	12,436	2,175	11,857	1,533		11,091	8,210		12,404	3,161	19,301	58,464	93,330		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4- Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Col. 12 = Col. 11 - Col. 8 - 1,750 ft^3/s computed algebraically, but not greater than Col. 7; except that part of Col. 8 contributing to the excess-release increment of Col. 11.
Col. 13 - Season limit of cumulative credit beginning June 15, 1996 = 13,556 $(ft^3/s)\cdot d$.

Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
Sept. 29	0	71	45	50	Sept. 30	696	521	Oct. 1	0	166	1,217	3,267	4,650		
30	0	71	167	42	Oct. 1	707	167	2	0	280	874	2,656	3,810		
Oct. 1	0	68	45	22	2	702	262	3	0	135	964	2,391	3,490		
2	0	46	43	25	3	705	238	4	0	114	943	2,103	3,160		
3	0	46	45	25	4	682	372	5	0	116	1,054	1,890	3,060		
4	0	46	45	25	5	0	273	6	0	116	273	1,711	2,100		
5	51	46	45	25	6	46	581	7	51	65	627	1,437	2,180		
6	0	48	45	25	7	873	397	8	0	118	1,270	1,582	2,970		
7	0	48	45	25	8	830	546	9	0	118	1,376	2,906	4,400		
8	0	46	45	25	9	813	401	10	0	116	1,214	3,130	4,460		
9	0	46	45	25	10	954	316	11	0	116	1,270	3,134	4,520		
10	0	46	42	25	11	769	234	12	0	113	1,003	2,734	3,850		
11	0	45	45	25	12	666	117	13	0	115	783	2,512	3,410		
12	0	42	45	25	13	113	429	14	0	112	542	2,226	2,880		
13	0	42	45	25	14	830	351	15	0	112	1,181	2,037	3,330		
14	0	42	45	25	15	289	365	16	0	112	654	1,914	2,680		
15	0	42	45	25	16	290	376	17	0	112	666	1,762	2,540		
16	0	42	45	25	17	290	401	18	0	112	691	1,697	2,500		
17	0	42	45	25	18	400	681	19	0	112	1,081	2,157	3,350		
18	0	42	45	25	19	434	681	20	0	112	1,115	10,573	11,800		
19	0	43	45	25	20	1,490	755	21	0	113	2,245	12,242	14,600		
20	0	43	45	25	21	1,026	773	22	0	113	1,799	10,888	12,800		
21	0	43	79	25	22	963	901	23	0	147	1,864	8,589	10,600		
22	0	43	45	25	23	1,604	695	24	0	113	2,299	7,688	10,100		
23	0	43	45	25	24	1,650	582	25	0	113	2,232	7,145	9,490		
24	0	43	45	25	25	1,025	741	26	0	113	1,766	5,601	7,480		
25	0	43	45	23	26	0	872	27	0	111	872	4,927	5,910		
26	0	45	45	25	27	8	745	28	0	115	753	4,722	5,590		
27	0	46	48	23	28	36	543	29	0	117	579	4,744	5,440		
28	0	45	45	23	29	0	624	30	0	113	624	4,713	5,450		
29	0	46	45	23	30	0	720	31	0	114	720	4,416	5,250		
Total	51	1,450	1,549	806		18,893	15,660		51	3,754	34,553	129,492	167,850		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of the Delaware River at Montague, N.J. - Continued
(River Master daily operation record)
[Mean discharge in cubic feet per second for 24 hours]

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Segregation of flow of the Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled	Total	Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1996	1	2	3	4		5	6		7	8	9	10	11	12	13
Oct. 30		46	45	23	Oct. 31	0	727	Nov. 1		114	727	4,119	4,960		
31		46	45	25	Nov. 1	0	723	2		116	723	3,771	4,610		
Nov. 1		46	39	25	2	0	323	3		110	323	3,577	4,010		
2		46	34	25	3	0	560	4		105	560	3,335	4.000		
3		46	34	25	4	0	14	5		105	14	3,181	3,300		
4		46	34	25	5	0	493	6		105	493	2,912	3,510		
5		46	34	25	6	0	596	7		105	596	2,649	3,350		
6		46	34	25	7	0	610	8		105	610	2,695	3,410		
7		46	34	25	8	0	723	9		105	723	38,172	39,000		
8		46	34	25	9	0	830	10		105	830	42,765	43,700		
9		46	34	25	10	0	823	11		105	823	29,272	30,200		
10		46	34	25	11	0	816	12		105	816	21,879	22,800		
11		46	36	25	12	0	809	13		107	809	16,484	17,400		
12		45	34	25	13	340	805	14		104	1,145	12,751	14,000		
13		45	34	25	14	754	755	15		104	1,509	10,387	12,000		
14		46	36	25	15	887	858	16		107	1,745	8,248	10,100		
15		46	36	25	16	167	681	17		107	848	7,125	8,080		
16		46	36	25	17	115	642	18		107	757	6,556	7,420		
17		46	36	25	18	282	780	19		107	1,062	6,361	7,530		
18		46	36	25	19	280	713	20		107	993	7,940	9,040		
19		46	34	25	20	287	752	21		105	1,039	7,456	8,600		
20		48	36	25	21	369	734	22		109	1,103	6,518	7,730		
21		48	36	25	22	163	596	23		109	759	6,102	6,970		
22		48	36	25	23	0	628	24		109	628	5,613	6,350		
23		48	36	25	24	42	521	25		109	563	5,248	5,920		
24		48	36	25	25	368	691	26		109	1,059	6,012	7,180		
25		48	36	25	26	650	766	27		109	1,416	8,975	10,500		
26		46	36	25	27	907	628	28		107	1,535	8,348	9,990		
27		46	36	25	28	403	652	29		107	1,055	7,118	8,280		
28		46	36	25	29	457	482	30		107	939	7,234	8,280		
Total	0	1,390	1,077	748		6,471	19,731		0	3,215	26,202	302,803	332,220		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in responce to Col. 1
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 10. Diversions to New York City water supply
Million gallons per day for 24 hour period beginning 0800 local time
(River Master daily operation record)

Date 1995	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Nov. 12, 1995 to date	Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Nov. 12, 1995 to date
Dec. 1	301	0	199	319	Jan. 1	299	298	130	531
2	292	0	200	327	2	300	298	78	534
3	300	0	192	334	3	300	298	98	537
4	302	0	215	342	4	301	298	96	540
5	451	0	178	354	5	300	298	98	543
6	302	0	200	360	6	299	298	109	545
7	284	128	201	370	7	300	298	100	548
8	164	161	216	376	8	297	298	102	551
9	276	252	225	390	9	300	298	152	554
10	298	250	187	402	10	300	298	152	557
11	303	293	105	412	11	301	298	152	561
12	299	298	98	421	12	301	298	197	564
13	303	298	101	430	13	301	298	106	567
14	301	298	105	438	14	294	298	154	569
15	300	298	102	446	15	293	298	152	572
16	295	298	119	453	16	300	298	164	575
17	300	298	97	460	17	301	298	149	578
18	300	298	111	467	18	300	298	155	580
19	300	298	93	473	19	157	162	35	577
20	299	299	107	479	20	0	0	0	569
21	299	298	103	484	21	0	0	0	561
22	301	297	99	489	22	0	0	0	553
23	302	297	105	494	23	0	0	0	545
24	300	298	104	499	24	0	0	0	538
25	290	298	103	504	25	0	0	0	531
26	298	298	101	508	26	0	0	0	524
27	297	297	110	512	27	0	0	0	517
28	302	298	101	516	28	0	0	0	510
29	300	298	97	520	29	0	0	0	504
30	294	298	108	524	30	0	0	0	498
31	290	298	110	527	31	0	0	306	495
Total	9,243	7,042	4,192			5,544	5,526	2,685	

Table 10. Diversions to New York City water supply - Continued
Million gallons per day for 24 hour period beginning 0800 local time
(River Master daily operation record)

Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Nov. 12, 1995 to date	Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Nov. 12, 1995 to date
Feb. 1	293	0	265	496	Mar. 1	452	298	400	545
2	300	0	88	495	2	452	298	406	551
3	300	0	0	492	3	452	298	410	556
4	299	0	0	490	4	451	298	401	561
5	351	0	0	488	5	452	299	416	566
6	451	0	0	488	6	451	299	393	571
7	451	0	0	488	7	451	299	388	576
8	451	0	0	487	8	451	299	406	581
9	451	0	0	487	9	451	299	432	586
10	451	0	0	486	10	451	299	416	591
11	452	0	0	486	11	451	218	194	593
12	451	0	0	486	12	451	203	293	596
13	451	0	0	485	13	451	203	304	599
14	451	0	0	485	14	451	203	279	602
15	451	13	0	485	15	452	203	196	604
16	451	0	166	486	16	452	204	323	607
17	451	0	319	489	17	452	203	63	608
18	450	0	289	491	18	451	203	197	610
19	450	0	292	494	19	451	203	106	611
20	451	180	321	498	20	381	202	125	612
21	451	300	304	504	21	451	202	78	612
22	452	299	315	509	22	451	202	0	613
23	451	299	435	516	23	451	202	0	613
24	451	299	449	522	24	452	202	0	613
25	119	60	83	520	25	452	296	5	614
26	336	316	1	521	26	452	297	0	615
27	591	494	209	528	27	423	297	0	616
28	395	306	445	534	28	451	297	0	617
29	452	298	408	540	29	451	297	0	618
					30	452	297	0	619
					31	452	297	0	620
Total	12,005	2,864	4,389			13,895	7,917	6,231	

Table 10. Diversions to New York City water supply - Continued
Million gallons per day for 24 hour period beginning 0800 local time
(River Master daily operation record)

Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Nov. 12, 1995 to date	Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Nov. 12, 1995 to date
Apr. 1	452	297	0	621	May 1	0	0	0	617
2	451	297	0	622	2	0	0	0	613
3	451	296	0	623	3	0	171	374	613
4	451	296	112	624	4	0	198	381	613
5	300	295	96	625	5	0	199	412	613
6	296	283	97	625	6	0	199	382	612
7	297	296	98	625	7	139	198	397	613
8	296	296	97	626	8	141	198	390	614
9	297	444	99	627	9	139	198	402	614
10	200	495	93	628	10	197	247	219	615
11	204	495	104	630	11	195	1	239	614
12	194	494	95	631	12	187	0	252	613
13	190	494	99	632	13	201	0	385	613
14	187	495	94	632	14	200	0	416	613
15	0	29	102	629	15	200	97	322	613
16	0	0	310	627	16	207	197	449	614
17	0	0	372	626	17	188	197	309	614
18	0	0	358	624	18	198	0	449	615
19	257	181	376	625	19	193	0	380	614
20	299	201	374	627	20	204	196	253	615
21	299	0	423	627	21	196	296	207	615
22	249	0	352	627	22	201	296	180	615
23	0	0	439	626	23	200	296	190	616
24	0	0	401	625	24	347	296	105	616
25	0	230	370	624	25	339	296	6	616
26	0	297	406	625	26	345	296	100	617
27	0	297	345	625	27	318	296	25	617
28	0	297	383	625	28	451	296	132	618
29	0	24	139	623	29	451	296	128	620
30	0	0	235	620	30	453	297	127	621
					31	451	296	145	622
Total	5,370	6,829	6,469			6,341	5,553	7,756	

Table 10. Diversions to New York City water supply - Continued
Million gallons per day for 24 hour period beginning 0800 local time
(River Master daily operation record)

Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date	Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date
June 1	450	295	0	745	July 1	452	0	118	755
2	451	295	0	746	2	452	273	100	757
3	451	295	0	746	3	452	295	127	761
4	451	295	0	746	4	452	295	34	761
5	451	295	0	746	5	451	100	101	758
6	452	295	0	746	6	452	0	100	752
7	452	295	0	746	7	453	0	99	747
8	452	295	0	746	8	453	0	101	742
9	454	296	0	747	9	465	0	148	739
10	339	296	379	773	10	453	283	142	742
11	38	0	360	739	11	452	296	134	745
12	403	0	355	741	12	301	55	145	740
13	301	0	355	734	13	0	0	0	722
14	216	0	315	720	14	0	0	0	706
15	392	295	148	727	15	0	0	0	690
16	439	296	116	735	16	0	0	0	675
17	452	296	140	744	17	0	0	287	667
18	398	296	303	758	18	0	0	432	662
19	415	295	130	763	19	339	0	165	659
20	305	296	161	763	20	353	0	293	659
21	452	199	155	765	21	346	0	299	658
22	419	199	155	765	22	127	265	193	657
23	449	199	161	767	23	565	296	197	665
24	452	198	158	769	24	453	296	240	671
25	453	199	193	772	25	455	297	194	676
26	452	198	170	774	26	20	12	221	668
27	451	199	156	775	27	0	0	156	659
28	452	199	117	774	28	0	0	237	652
29	451	198	45	772	29	452	0	204	652
30	451	0	0	761	30	452	281	320	659
					31	452	297	266	664
Total	12,244	6,514	4,072			9,302	3,341	5,053	

Table 10. Diversions to New York City water supply - Continued
Million gallons per day for 24 hour period beginning 0800 local time
(River Master daily operation record)

Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date	Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date
Aug. 1	452	297	291	670	Sept. 1	450	0	0	684
2	452	297	250	676	2	451	0	0	681
3	453	100	300	678	3	452	0	218	681
4	453	0	302	680	4	453	0	320	682
5	451	0	313	681	5	453	0	255	682
6	453	0	283	682	6	453	0	296	683
7	453	266	309	687	7	452	0	293	684
8	453	297	283	692	8	452	0	332	685
9	453	1	313	693	9	453	0	248	685
10	453	0	276	693	10	452	0	295	686
11	452	0	286	694	11	452	0	334	686
12	452	0	321	695	12	452	0	259	687
13	452	0	253	695	13	450	0	291	687
14	452	0	304	696	14	451	0	266	688
15	453	0	312	697	15	451	0	273	688
16	453	0	292	698	16	452	0	178	687
17	452	0	253	698	17	452	200	198	689
18	452	0	309	698	18	452	280	211	691
19	452	0	312	699	19	450	188	196	692
20	452	0	282	700	20	452	276	206	695
21	452	0	302	700	21	451	297	197	697
22	452	0	294	701	22	451	297	208	699
23	452	0	265	701	23	452	297	145	701
24	452	0	305	702	24	453	298	151	702
25	451	0	290	702	25	453	298	136	704
26	0	0	305	698	26	453	298	157	706
27	0	0	321	693	27	452	298	157	707
28	0	0	295	689	28	452	298	159	709
29	357	0	284	688	29	452	298	147	711
30	450	0	290	689	30	452	298	152	712
31	450	0	0	686					
Total	12,564	1,258	8,795			13,556	3,921	6,278	

Table 10. Diversions to New York City water supply - Continued
Million gallons per day for 24 hour period beginning 0800 local time
(River Master daily operation record)

Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date	Date 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date
Oct. 1	452	298	158	714	Nov. 1	452	0	280	670
2	451	298	169	716	2	452	0	254	671
3	451	298	172	717	3	453	0	267	671
4	452	298	146	719	4	453	245	226	673
5	453	298	149	720	5	451	296	101	674
6	452	298	166	722	6	452	296	253	676
7	452	298	151	723	7	452	296	255	678
8	452	1	154	722	8	452	296	309	680
9	452	0	141	721	9	142	91	227	679
10	452	0	149	720	10	0	0	320	677
11	452	0	106	719	11	0	0	267	674
12	452	0	140	718	12	253	0	183	673
13	452	0	118	717	13	357	0	231	672
14	452	0	153	716	14	442	151	180	673
15	451	0	177	715	15	451	199	169	674
16	454	0	152	715	16	448	199	198	675
17	449	0	169	714	17	431	199	189	675
18	297	0	161	712	18	431	198	200	676
19	0	0	122	708	19	451	0	254	676
20	0	0	150	704	20	452	0	241	677
21	0	0	158	700	21	451	0	236	677
22	0	0	152	696	22	451	0	207	677
23	0	0	155	693	23	451	0	244	677
24	0	0	0	688	24	451	0	253	677
25	0	0	0	683	25	451	0	255	677
26	0	0	0	679	26	437	0	233	677
27	0	0	0	674	27	450	0	244	677
28	376	0	0	672	28	450	0	234	677
29	451	0	0	671	29	451	0	251	677
30	451	0	165	670	30	450	0	242	677
31	439	0	191	670					
Total	9,695	2,087	3,824			11,968	2,466	7,003	

Table 11. Daily mean discharge, East Branch Delaware River at Downsville, N.Y., (01417000) for the year ending November 30, 1996.
(U.S. Geological Survey published record)
[All values, except total, in cubic feet per second, ft^3/s; total in cubic feet per second days, $(ft^3/s)\cdot d$]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	42	41	44	50	44	3510	83	103	105	77	51	43
2	42	42	43	43	47	3070	92	104	101	67	45	43
3	42	41	43	43	43	2510	93	98	98	67	45	43
4	42	41	43	43	43	2090	92	92	98	67	45	43
5	42	41	43	43	44	1800	92	92	98	67	45	43
6	42	41	43	43	44	1700	92	92	114	67	45	43
7	41	41	43	43	44	1570	92	92	122	67	45	43
8	43	41	43	43	44	1250	93	92	107	67	45	44
9	43	41	42	43	44	1130	102	92	91	67	45	123
10	42	41	42	43	44	1060	647	93	92	67	45	3140
11	42	41	42	46	44	1650	1440	93	92	66	45	3670
12	42	41	42	44	45	3110	1460	93	92	65	45	2730
13	41	41	42	43	46	3110	1020	96	94	65	44	1710
14	41	41	42	43	46	2500	832	95	92	65	44	1200
15	41	41	42	43	262	1910	641	96	90	65	44	789
16	41	41	42	43	2600	1520	369	103	90	65	44	513
17	41	41	42	43	4440	1270	186	655	90	66	43	354
18	41	42	42	43	3520	1110	106	1180	90	65	44	276
19	41	670	42	43	2650	965	100	1210	90	65	45	427
20	41	130	42	44	1810	797	93	884	90	65	46	497
21	41	48	43	44	1500	666	92	614	91	65	45	396
22	41	46	42	44	1300	565	103	470	92	66	44	313
23	41	46	42	44	1290	457	101	418	90	65	45	236
24	41	47	42	43	1610	356	87	163	90	65	45	178
25	41	46	42	44	1580	202	90	100	90	65	44	148
26	41	45	42	44	1430	111	94	291	90	65	43	316
27	41	57	42	43	1360	75	95	595	90	65	43	506
28	41	46	41	43	1210	71	95	636	92	66	43	476
29	41	45	41	43	1300	69	107	512	95	65	43	431
30	41	44	---	43	2170	67	98	247	95	65	43	374
31	41	44	---	43	---	65	---	129	95	---	43	---
Total	1284	2054	1226	1350	30654	40336	8687	9630	2946	1984	1381	19148
Mean	41.4	66.3	42.3	43.5	1022	1301	290	311	95.0	66.1	44.5	638

Year total 120,680 $(ft^3/s)\cdot d$ Mean 330 ft^3/s

Table 12. Daily mean discharge, West Branch Delaware River at Stilesville, N.Y., (01425000) for the year ending November 30, 1996.
(U.S. Geological Survey published record)
[All values, except total, in cubic feet per second, ft^3/s; total in cubic feet per second days, $(ft^3/s)\cdot d$]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	38	38	2140	1020	594	2810	203	336	496	711	48	861
2	38	38	1720	894	587	3100	217	336	521	835	48	817
3	38	38	1440	790	566	2830	75	336	473	924	48	767
4	38	38	1180	623	536	2450	63	337	485	1080	48	699
5	38	38	969	521	492	2280	55	335	502	819	48	509
6	38	38	825	535	443	2120	53	336	558	614	48	378
7	37	38	734	559	410	2130	53	336	568	481	48	299
8	38	38	703	498	423	1930	185	336	470	340	48	354
9	38	38	741	384	393	1730	629	337	397	340	49	4770
10	37	38	769	311	329	1610	1250	336	371	340	50	9230
11	37	38	744	277	239	2010	1590	336	417	340	45	6800
12	37	39	723	280	195	4320	1680	336	427	237	48	4730
13	37	38	621	289	271	5430	1680	353	422	930	48	3470
14	37	39	531	313	1120	4610	1560	1040	411	844	48	2660
15	37	39	490	410	1960	3680	1330	1650	547	483	48	1980
16	37	39	450	576	2950	2830	997	2080	577	495	48	1520
17	37	39	410	648	3960	2230	736	2070	352	277	48	1220
18	37	40	383	676	3790	1860	568	1800	342	90	48	1040
19	37	74	349	741	3200	1740	466	1590	340	57	48	1130
20	37	85	341	955	2540	1540	423	1630	340	47	60	1400
21	37	55	623	1220	2100	1230	387	1450	540	47	90	1410
22	37	49	974	1280	1860	970	364	1220	659	50	52	1350
23	37	47	1060	1210	1680	761	348	901	692	49	48	1270
24	37	50	1230	1100	1760	582	336	669	619	48	48	1190
25	37	788	1500	965	1770	439	335	504	595	48	48	1140
26	37	1550	1620	914	1460	335	334	495	547	48	278	1350
27	37	2490	1320	918	1250	265	335	592	654	52	495	1780
28	37	4720	1140	852	1070	204	336	615	696	50	708	1770
29	38	4230	1160	802	1020	154	335	592	371	49	884	1680
30	38	3400	---	748	1670	118	392	539	330	147	920	1570
31	37	2750	---	663	---	89	---	441	524	---	902	---
Total	1157	20979	26890	21972	40638	58387	17315	24264	15243	10872	5445	59144
Mean	37.3	677	927	709	1355	1883	577	783	492	362	176	1971

Year total 302,306 $(ft^3/s)\cdot d$ Mean 826 ft^3/s

Table 13. Daily mean discharge, Neversink River at Neversink, N.Y., (0143600) for the year ending November 30, 1996.
(U.S. Geological Survey published record)
[All values, except total, in cubic feet per second, ft^3/s; total in cubic feet per second days, $(ft^3/s)\cdot d$]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	21	21	26	23	29	2040	58	77	49	45	31	24
2	21	21	20	22	28	1030	58	81	49	45	24	24
3	21	21	2.8	22	29	490	58	64	49	45	25	24
4	21	21	2.6	22	29	109	58	48	51	45	25	24
5	21	21	15	23	29	50	58	48	68	45	23	24
6	21	19	21	23	29	55	59	48	83	45	23	24
7	21	20	20	22	29	57	59	48	80	45	23	24
8	21	20	22	22	29	60	60	52	73	45	23	25
9	21	20	22	22	29	61	61	49	55	44	23	27
10	21	20	21	22	27	63	63	50	48	44	23	25
11	21	20	22	22	27	67	83	51	48	44	23	25
12	21	20	21	22	28	153	49	51	48	44	24	25
13	21	20	21	23	29	218	48	52	48	44	24	25
14	21	20	21	24	28	82	48	198	48	46	23	24
15	21	21	21	26	28	66	48	760	48	47	23	24
16	21	21	21	25	31	62	48	1540	49	45	23	24
17	21	21	22	25	214	62	55	703	51	45	24	24
18	21	22	22	25	199	61	59	151	51	45	24	24
19	21	25	21	26	87	60	51	66	51	44	25	24
20	21	27	22	26	33	60	51	76	51	44	26	24
21	21	26	22	27	55	60	50	51	51	44	26	24
22	21	26	23	29	27	60	69	51	51	44	26	24
23	21	26	23	29	29	60	66	41	60	44	26	24
24	21	27	23	29	84	60	52	40	68	44	25	24
25	21	26	22	29	28	59	52	45	68	44	27	24
26	21	27	22	29	28	59	52	51	60	44	28	24
27	21	28	22	28	28	59	54	49	44	44	28	23
28	21	26	22	29	29	59	50	49	45	44	27	24
29	21	26	22	29	28	58	64	49	44	44	27	23
30	21	26	---	29	733	58	70	49	44	44	27	24
31	21	26	---	29	---	58	---	49	44	---	26	---
Total	651	711	587.4	783	2060	5556	1711	4737	1677	1336	775	726
Mean	21.0	22.9	20.3	25.3	68.7	179	57.0	153	54.1	44.5	25.0	24.2

Year total 21,310.4 $(ft^3/s)\cdot d$ Mean 58.2 ft^3/s

Table 14. Daily mean discharge, Wallenpaupack Creek at Wilsonville, Pa., (01432000) for the year ending November 30, 1996.
(Record furnished by Pennsylvania Power & Light Company)
[All values, except total, in cubic feet per second, ft^3/s; total in cubic feet per second days, (ft^3/s)-d]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	862	0	1830	935	924	1310	0	307	809	0	707	0
2	0	895	1820	816	793	1050	0	293	816	0	702	0
3	0	658	1580	403	935	1400	0	278	0	0	705	0
4	931	381	1540	938	946	1400	0	0	0	0	682	0
5	926	802	1620	924	0	1400	0	285	847	722	0	0
6	925	783	1500	910	0	1330	320	0	943	838	0	0
7	947	572	1430	737	0	943	318	0	820	1380	866	0
8	928	914	1410	1060	0	955	0	267	816	950	830	0
9	332	946	1350	680	105	939	0	280	816	930	831	0
10	340	935	822	330	0	1050	345	221	0	343	871	0
11	991	891	408	833	0	301	338	224	0	344	887	0
12	1000	943	919	470	0	92	629	652	810	348	666	0
13	1000	0	957	931	0	1050	1410	570	814	291	0	287
14	995	0	769	863	o	1370	1360	573	0	0	830	692
15	991	928	848	749	400	928	0	788	0	0	285	887
16	0	939	857	0	1670	910	0	800	0	279	292	283
17	0	927	0	0	614	960	631	893	0	285	289	0
18	994	341	0	944	660	0	629	818	0	289	516	286
19	1020	842	948	947	534	0	712	823	0	285	315	277
20	1000	158	1080	927	0	1200	634	0	0	287	1110	253
21	1000	0	1320	942	0	1130	634	0	0	0	1330	345
22	0	925	935	925	923	917	0	816	576	0	1150	269
23	0	935	939	0	984	938	0	715	0	704	1040	0
24	0	1040	820	0	930	3730	648	814	0	701	1660	0
25	0	1470	398	933	925	9650	628	799	0	702	1570	356
26	992	1400	947	928	931	3730	625	807	0	709	0	644
27	944	1540	930	931	0	3730	621	0	5	707	0	853
28	926	1810	936	943	0	3730	329	0	133	0	44	515
29	921	1800	949	925	990	3730	0	809	129	0	0	344
30	0	1810	---	0	1040	3730	0	810	0	696	0	521
31	0	1800	---	0	---	3730	---	816	0	---	0	---
Total	18965	27385	29862	20924	14304	57333	10811	14458	8334	11790	18178	6812
Mean	612	883	1030	675	477	1849	360	466	269	393	586	227

Year total 239,156 (ft^3/s)-d Mean 653 ft^3/s

Table 15. Daily mean discharge, Delaware River at Montague, N.J., (01438500) for the year ending November 30, 1996.
(U.S. Geological Survey published record)
[All values, except total, in cubic feet per second, ft^3/s; total in cubic feet per second days, $(ft^3/s)\cdot d$]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	5770	1800	13900	10800	5950	31800	2510	3240	4590	1630	4650	4950
2	5290	2200	12200	9260	7210	27900	2210	3550	4840	1740	3810	4610
3	4670	3200	10300	8190	7550	21600	2100	3440	4240	1810	3490	4010
4	4690	2700	8700	7310	6500	18000	2590	3530	3270	2040	3150	4000
5	5550	2600	7500	6680	5960	15700	2520	3130	3180	1990	3060	3300
6	5500	2900	7100	6590	5030	14400	2250	3400	3930	2810	2100	3510
7	5310	2400	6400	7560	4770	14500	2530	2900	3560	3320	2170	3350
8	4950	2500	6200	7090	5770	12900	2280	2730	3340	3200	2970	3400
9	4070	2800	6400	6130	6280	11500	2570	3360	3260	3400	4390	38900
10	3500	2900	6300	5030	5830	11600	3830	3280	3670	3110	4460	43700
11	3600	2700	6000	5360	5460	12400	8340	2490	2280	2110	4520	30200
12	4500	2900	6200	5230	4870	22500	8640	2500	1990	1880	3840	22800
13	4300	2800	5800	5440	5730	26100	11100	5210	3140	1960	3410	17400
14	3700	1900	4930	6200	12300	22300	10400	16700	2860	2000	2870	14000
15	3600	2200	4580	7410	16700	17700	7740	14000	1990	2010	3330	12000
16	4100	3400	4530	9870	26000	14700	5720	15400	2140	1940	2680	10100
17	3400	3300	4390	8570	37900	12700	4610	15400	2350	2300	2530	8060
18	3200	3200	3700	8100	27900	10900	4960	12000	2240	6510	2500	7400
19	3900	17000	3860	8660	21300	9640	4850	10000	1930	7510	3350	7520
20	3600	118000	4200	11200	16800	9130	5440	8730	2030	4740	11800	9030
21	3700	42900	8610	14500	13400	8840	5060	7580	1680	3520	14600	8590
22	3600	25500	14600	12800	11800	8440	4230	6210	1500	2720	12800	7710
23	2200	18500	16200	10700	11200	7610	3310	6110	2550	2830	10600	6960
24	2300	14800	16900	8860	11800	6680	3180	5230	2110	3900	10100	6340
25	2400	20300	19200	8070	11800	5640	3650	4550	2580	3570	9480	5920
26	2600	16500	16400	8300	11100	4000	3380	6230	2550	3310	7470	7170
27	3800	24500	13800	8500	9890	3560	3130	8190	2460	3210	5910	10500
28	3300	57900	12300	7900	8660	3380	2990	6020	1990	3150	5590	9980
29	3000	36100	12400	7570	8380	3320	2700	5080	2400	4210	5430	8270
30	2800	25700	---	6830	16300	3190	2360	5240	2550	4740	5450	8260
31	1800	17500	---	6120	---	2600	---	4660	1960	---	5250	---
Total	118700	483600	263600	250830	350140	395230	131180	200090	85160	93170	167760	331940
Mean	3829	15600	9090	8091	11670	12750	4373	6455	2747	3106	5412	11060

Year total 2,871,400 $(ft^3/s)\cdot d$ Mean 7,845 ft^3/s

Table 16. Diversions by New Jersey; daily mean discharge, Delaware and Raritan Canal at Port Mercer, N.J. (01460440) for the year ending November 30, 1996.

[All data, except total in million gallons per day, Mgal/d; total in Million gallons, Mgal]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	74	100	81	81	68	90	90	83	63	74	93	73
2	73	98	83	83	46	89	89	89	81	75	94	72
3	76	94	85	81	58	92	89	90	86	74	92	76
4	83	91	92	81	63	94	92	83	87	72	92	79
5	90	94	92	80	65	94	92	87	85	76	96	83
6	89	96	92	76	65	90	90	87	83	74	98	87
7	89	93	92	52	67	90	90	89	79	77	98	75
8	89	94	93	69	64	89	91	89	72	72	86	71
9	91	90	91	73	63	91	89	85	60	77	77	79
10	88	87	87	76	52	91	90	83	71	76	92	85
11	89	87	86	77	57	89	90	79	81	72	94	85
12	93	87	83	77	63	80	101	72	81	71	93	86
13	96	87	83	79	70	88	36	32	68	73	97	85
14	90	87	84	81	69	91	69	65	63	74	97	85
15	94	90	83	83	70	90	72	59	69	73	94	83
16	102	90	85	83	32	92	85	68	69	74	96	81
17	98	90	87	82	58	96	69	77	69	45	98	79
18	96	90	90	83	87	98	66	74	74	68	89	79
19	98	-13	89	75	87	94	74	73	73	79	-63	85
20	90	-32	87	62	89	93	71	76	66	79	2.2	85
21	97	-13	70	65	90	91	78	80	71	78	83	91
22	103	97	76	67	88	90	68	87	76	72	89	92
23	100	94	77	67	87	90	43	92	78	79	90	91
24	100	87	76	69	85	87	78	90	65	79	90	92
25	99	84	75	67	86	87	69	90	69	82	89	92
26	98	94	78	67	87	89	65	90	71	81	83	72
27	96	81	85	66	89	92	67	89	72	81	83	78
28	94	78	84	67	89	90	75	91	72	81	81	92
29	95	94	81	70	92	93	77	91	73	74	78	92
30	97	-13	---	62	95	92	73	90	75	90	78	94
31	100	90	---	63	---	91	---	25	74	---	76	---
Total	2867	2373	2447	2264	2181	2813	2328	2455	2276	2252	2535.2	2499
Mean	92.5	76.5	84.4	73.0	72.7	90.7	77.6	79.2	73.4	75.1	81.8	83.3

Year total 29,290.2 Mgal

Mean 80.0 Mgal/d

SECTION III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

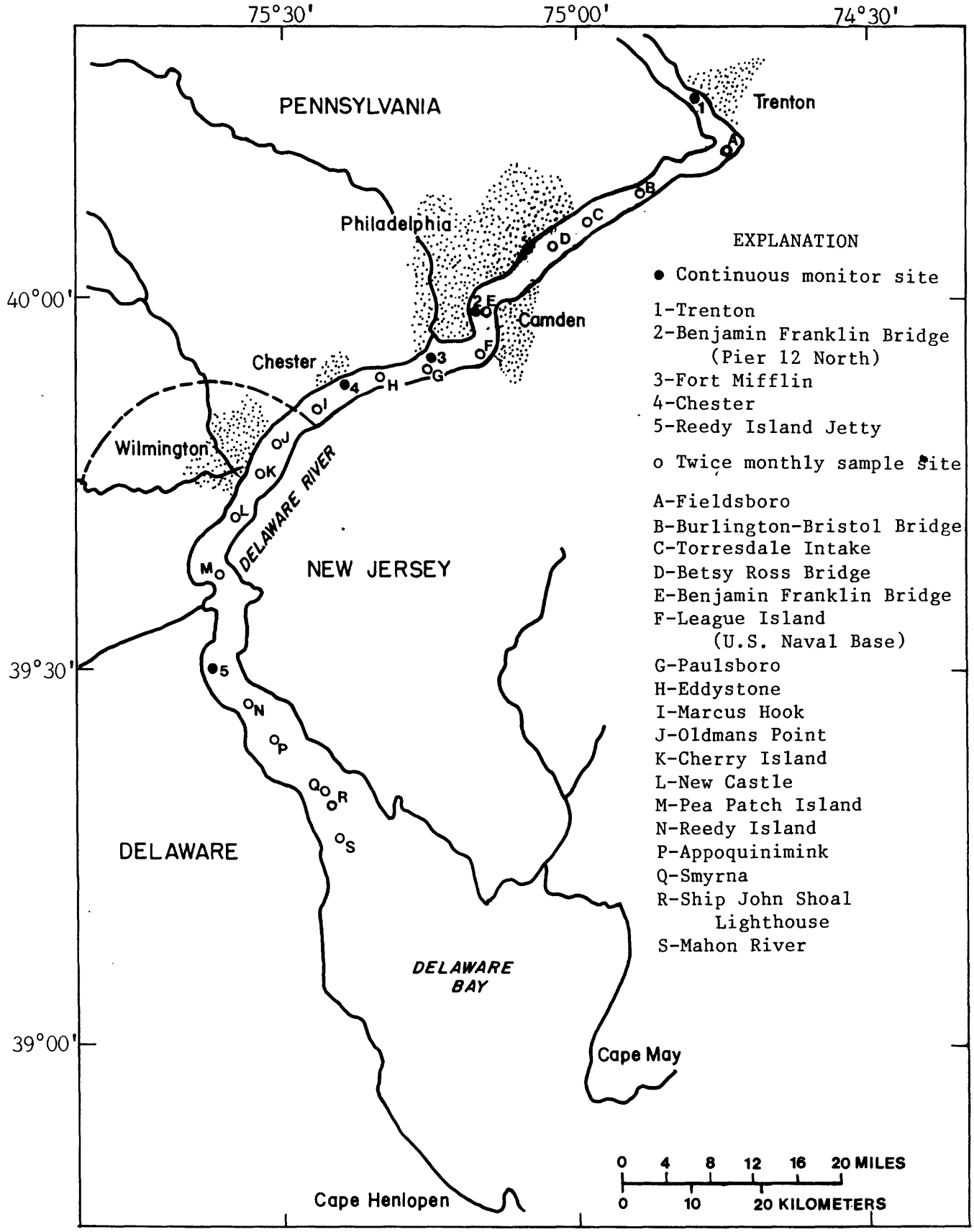

Figure 6.- Location of water-quality monitoring sites in the Delaware River Estuary.

Section III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

By Charles R. Wood

INTRODUCTION

This section describes the water-quality monitoring program conducted by the U.S. Geological Survey in the Delaware Estuary during the 1996 report year. Also presented here are some of the data that were obtained by this program and a brief discussion of the significance of the data.

WATER-QUALITY MONITORING PROGRAM

Water quality of the Delaware River and Estuary was monitored between Trenton, N.J., and Reedy Island Jetty, Del. Data were acquired continuously by electronic instruments at five monitor sites: one at Trenton just upstream of the head of tidewater and four in the estuary (fig. 6). At Fort Mifflin, the water was monitored for two parameters: temperature and specific conductance. At the remaining sites, the water was monitored for four parameters: temperature, specific conductance, dissolved oxygen, and pH.

Additional data were obtained twice a month from March to November at 18 sites between Fieldsboro, N.J., and the mouth of the Mahon River (fig. 6). At each of these sites, samples of water were collected at the center of the river channel. These samples were analyzed for 28 parameters including temperature, chloride, alkalinity, specific conductance, dissolved oxygen, and pH.

Data obtained from the continuous monitoring sites were processed by computer and stored for future reference by the U.S. Geological Survey. They were also distributed regularly to cooperators and published annually by the U.S. Geological Survey in "Water Resources Data for Pennsylvania, Volume 1, Delaware River Basin." Data from the twice-a-month sites were collected by the State of Delaware for the Delaware River Basin Commission (DRBC) at 18 sites. These data are available from the DRBC and from STORET, the U.S. Environmental Protection Agency's data storage system.

The above described programs were carried out in cooperation with the Delaware River Basin Commission, Delaware River Master, and other agencies of federal, state, and county governments.

ESTUARINE WATER-QUALITY DATA DURING 1996

The following is a summary and discussion of the data that were collected during the 1996 report year.

Streamflow

Streamflow is a vital factor that influences the water quality of the estuary. Increased streamflow usually results in better water quality by limiting salt-water intrusion and diluting the concentration of dissolved minerals, both of which contribute to a lower specific conductance and chloride level. Increased flow also aids in maintaining lower water temperature during warm weather and supporting higher dissolved-oxygen levels.

On the basis of streamflow records for the Delaware River at Trenton, mean monthly streamflow for the year was lowest during September (5,262 ft^3/s) and the highest during January (32,170 ft^3/s) (table 17).[2] The monthly mean streamflow was below the respective monthly mean for the period of record in December, March, June, and September and above the monthly mean for the remainder of the year.

Temperature

The significance of water temperature in regard to water quality in the estuary lies in its profound influence on various physical, chemical, and biological properties of the water. In general, increases in water temperature have deleterious effects on water quality by lowering the saturation level of dissolved oxygen and increasing biological activities. The primary factors that control water temperature in the estuary are climatic; however, various uses of the water by man can also have significant effects.

Records from Benjamin Franklin Bridge (Pier 12 North), Philadelphia, Pa., show that mean monthly temperatures for April to November, 1996, were below the long-term mean during the entire period. The long-term mean is based on historical temperature records from 1962 to 1995 (fig. 7).

Specific Conductance and Chloride

Specific conductance is a measure of the ability of a solution to conduct electricity. It can be used as an indicator of the amount of ionized material in solution and relates approximately to dissolved-solids content. Specific conductance values in bodies of water usually reflect the geochemistry of the drainage basin; however, pollution and the intrusion of oceanic salts also affect specific conductance. Increasing streamflows reduce the concentration of dissolved solids, thus lowering specific conductance and chloride levels. Decreasing flows have the opposite effects.

In the Delaware Estuary, the intrusion of oceanic salts is important to those who use the estuary as a water supply. For this reason, chloride concentration is of great interest. Water with chloride concentrations in excess of 250 mg/L (milligrams per liter) is usually considered undesir-

2. All numbered tables in Section III are grouped at the end of this section, beginning on page 72.

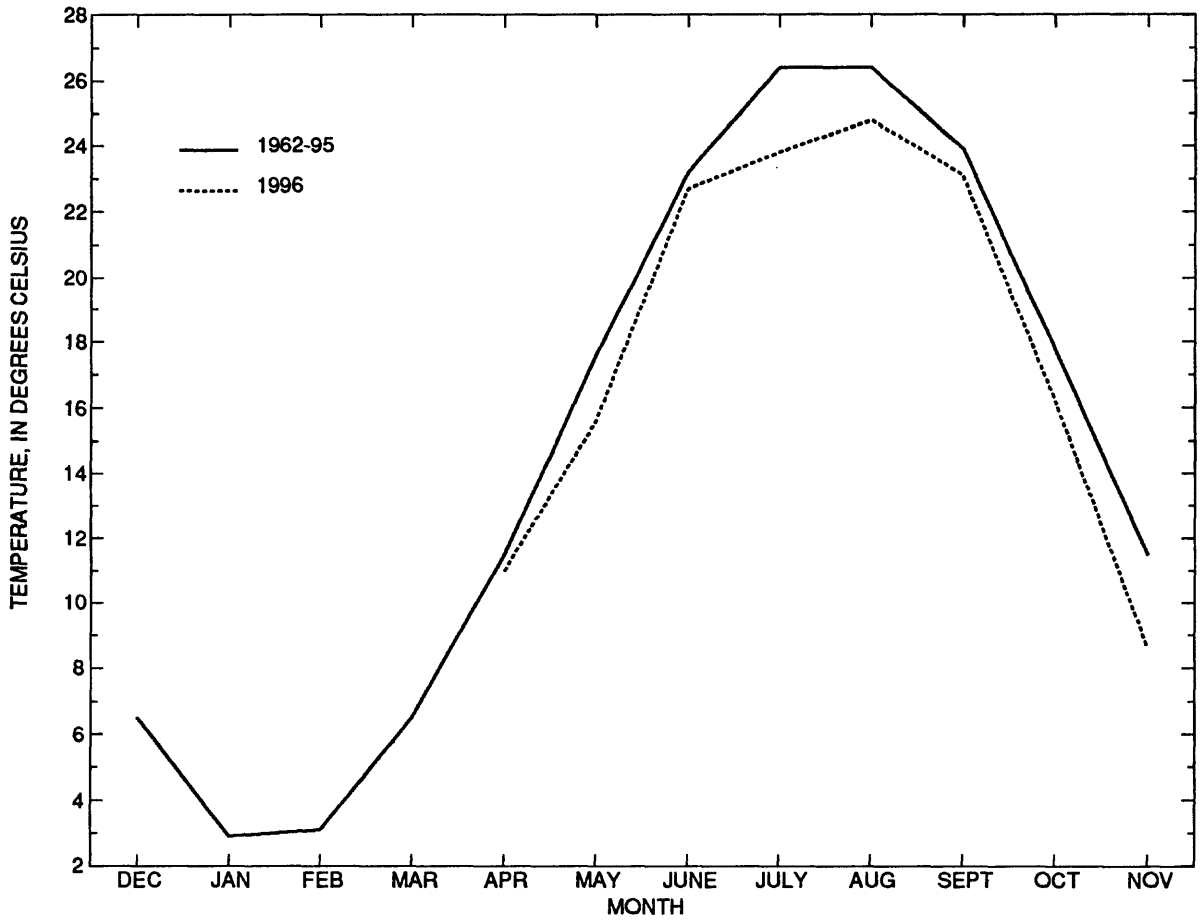

Figure 7.- Monthly mean temperatures of the Delaware River at Benjamin Franklin Bridge, Philadelphia, Pennsylvania, April to November 1996, and long-term mean monthly temperatures, 1962 to 1995.

able for domestic use, and water with concentrations in excess of 50 mg/L is unsatisfactory for some industrial uses.

Because sea water has a chloride concentration of approximately 19,000 mg/L, the location of a body of water in relation to the sea can influence chloride levels in that body of water. Thus chloride concentrations in the Delaware Estuary generally increase with distance downstream toward the Delaware Bay and Atlantic Ocean.

Chloride concentration was not measured directly at Fort Mifflin, Pa., and Reedy Island Jetty, Del., but a correlation between specific conductance and chloride concentration has been developed on the basis of analyses of water samples collected from the estuary. Chloride concentrations estimated from that correlation are presented in tables 18 and 19. The correlation is less reliable when chloride concentrations are lower than 30 mg/L because other ionized materials may be present in amounts large enough to affect the conductance-chloride correlation. Therefore, chloride concentrations derived from specific conductance are not given when chloride concentrations of less than 30 mg/L are indicated. Chloride concentrations at Chester, Pa., (table 20) were furnished by Kimberly Clark Chester Operations.

At Fort Mifflin, the daily maximum chloride concentration for April 2 through November 30 exceeded 50 mg/L on three days, September 9, 17, and November 9. The daily maximum chloride concentration for the period was 56 mg/L on September 9 (table 18). At Chester, the daily minimum chloride concentration equaled or exceeded 50 mg/L 8 percent of the time. The daily maximum concentration was greater than 50 mg/L 40 percent of the time (table 20). The daily maximum chloride concentration was 126 mg/L on January 19. At Reedy Island Jetty, minimum chloride concentrations were greater than 30 mg/L on most days except for May 2 through May 23 (table 19). Daily maximum chloride concentrations ranged from 30 mg/L on May 11 to 8,400 mg/L on January 19.

Dissolved Oxygen

Dissolved oxygen is necessary in water for the respiration of aquatic organisms. It also plays a significant role in chemical reactions in aquatic environments. The major sources of dissolved oxygen in water are diffusion from the atmosphere and photosynthesis in aquatic plants. The principal factors that affect dissolved-oxygen concentrations are water temperature, point and nonpoint biochemical oxygen demand (BOD), fresh-water inflow to the estuary, phytoplankton populations, turbidity, salinity, and tidal and wind driven mixing. Dissolved-oxygen concentrations in the estuary tend to be highest near Trenton and tend to decrease with distance downstream to a point near or somewhat downstream from the Benjamin Franklin Bridge, where minimum concentrations are usually reached.

Dissolved-oxygen concentration has been measured by the U.S. Geological Survey at various continuous monitor sites in the Delaware Estuary since 1962. Two of these sites, Benjamin Franklin Bridge at Philadelphia, Pa., and Chester, Pa., have nearly continuous record and are in the reach of the estuary that has been most affected by pollutant loadings. Changes in mean monthly dissolved-oxygen concentrations in July at these two stations for 1965 to 1996 are shown in figure 8. A marked improvement (increase) in DO with time is apparent. Although concentrations have increased substantially from 1965 to 1996, substantial variation in monthly means can be seen from year to year. The low dissolved-oxygen concentrations during 1976-80 at the Benjamin Franklin bridge may be related primarily to construction of secondary treatment facilities at the Philadelphia waste-water treatment plants. Although the three upgraded waste-water treatment plants in Philadelphia were fully operational by fall 1986, the trend in dissolved-oxygen concentration is still upward after 1986. Gradual oxidation of BOD from bottom sediments may be responsible for the observed trend. If this is true, some future improvement in DO with time may occur even without further improvements to waste-water treatment plants.

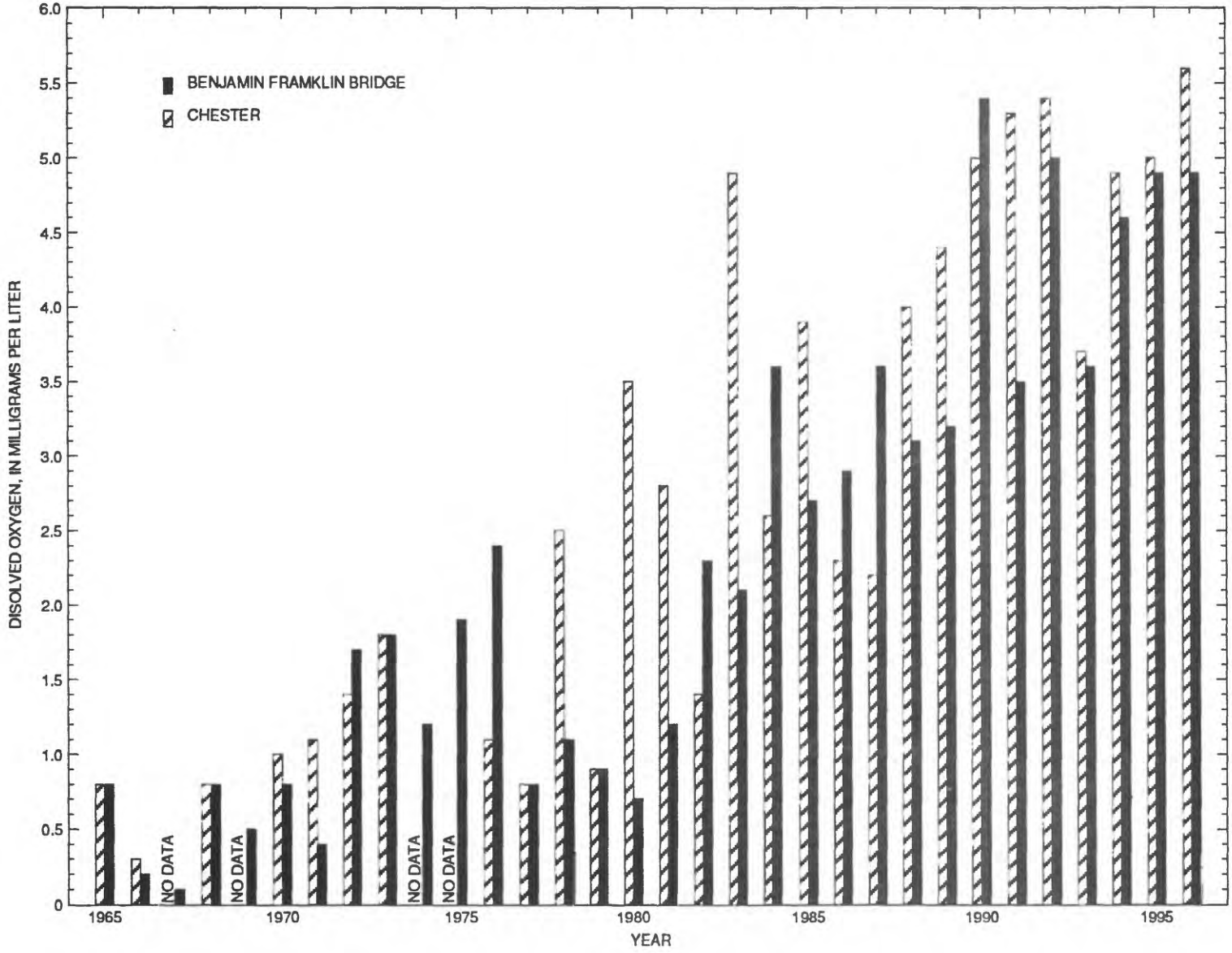

Figure 8.- Mean monthly dissolved-oxygen concentrations for two stations in the Delaware River for July, 1965-96.

During the past year, daily mean dissolved-oxygen concentration at the Benjamin Franklin Bridge was below 5 mg/L on most days in late June, early July, and early August (table 21). The minimum daily mean was 2.9 mg/L on June 19 and July 3. At Chester, the daily mean dissolved-oxygen concentration was below 5 mg/L on 4 days in June, 8 days in July, and 3 days in September (table 22). The lowest daily mean was 4.4 mg/L on July 3 and 4. The minimum hourly value was 4.0 mg/L on July 4. At Reedy Island Jetty, the minimum hourly value was 5.1 on June 26 and 28.

Figure 9 shows the frequency of hourly dissolved-oxygen concentrations at Benjamin Franklin Bridge and Chester during the critical summer period, July through September 1996. At Chester, dissolved-oxygen concentration was equal to or below 4 mg/L 0.1 percent of the time in 1996 as compared to 3 percent of the time in 1995 and 2 percent of the time in 1994. At Benjamin Franklin Bridge, the dissolved-oxygen concentration was equal to or below 4 mg/L 13 percent of the time in 1996, as compared with 1 percent of the time in 1995 and 15 percent of the time in 1994.

Hydrogen-Ion Activity (pH)

Hydrogen-ion activity (pH) is fundamentally a measure of acidity or alkalinity. Values of pH below 7 indicate acidic water, whereas values above 7 indicate alkaline water. In natural waters, pH generally ranges from 6.0 to 8.5. The main factors controlling the pH of a body of water are usually the geochemistry of the drainage basin and external influences such as pollution. Photosynthetic activity can also have a considerable influence on pH values. Increased photosynthetic activity (algal bloom) produces higher pH values. All pH values at Benjamin Franklin Bridge, Chester, and Reedy Island Jetty were in a range of 6.3 to 8.1. The pH range for each station is: Reedy Island Jetty, 6.5 to 8.1; Chester, 6.3 to 7.4; Benjamin Franklin Bridge, 6.4 to 7.6. The pH in the estuary tends to be lowest near Trenton, N.J., and tends to increase downstream. Somewhat lower than normal pH ranges in 1996 for all three stations probably are due to higher than normal fresh water inflows to the estuary.

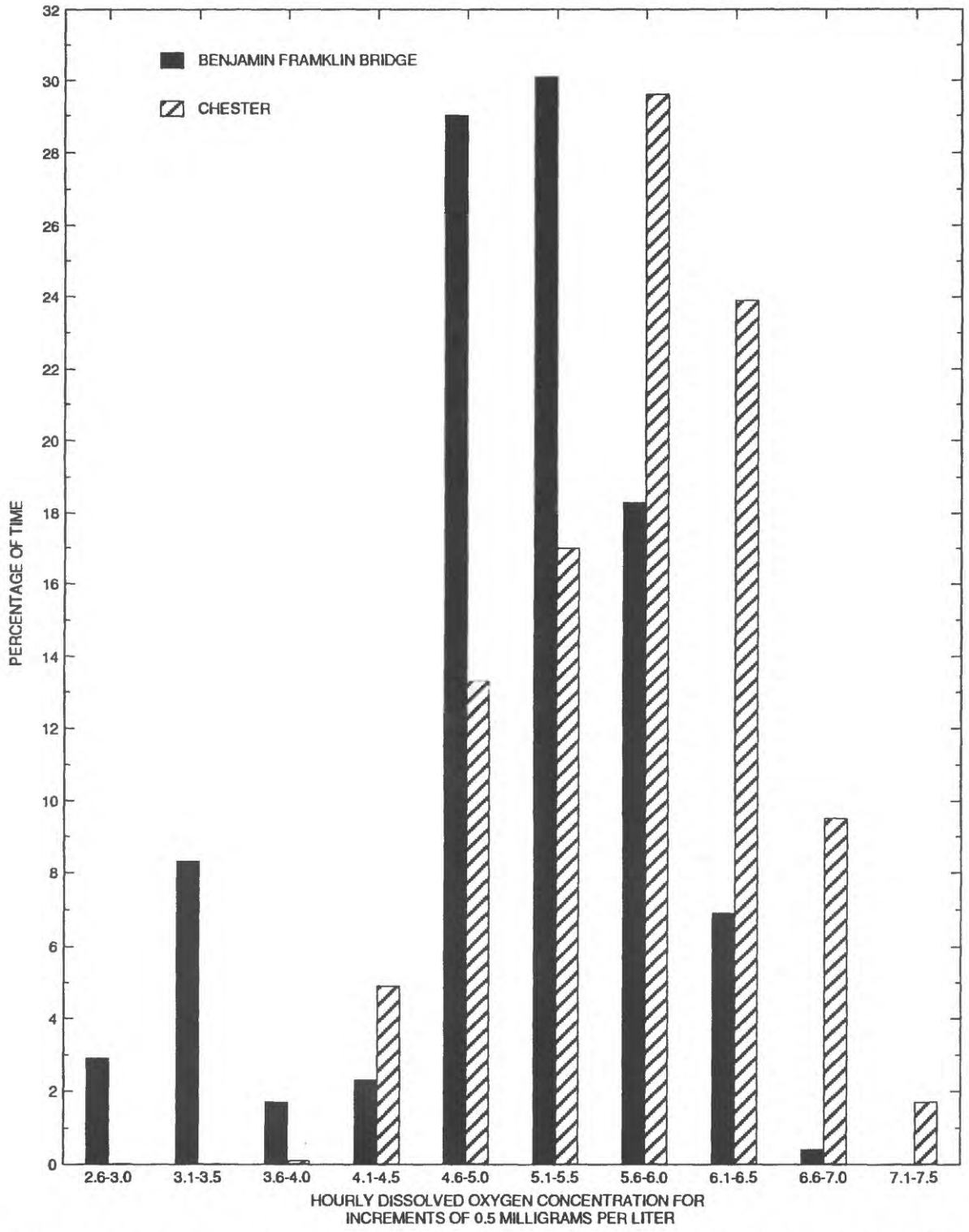

Figure 9.- Frequency of occurrence of dissolved-oxygen concentrations at two stations in the Delaware River during July, August, and September 1996.

Table 17. Daily mean discharge, Delaware River at Trenton, N.J., (01463500) for the year ending November 30, 1996.
(U.S. Geological Survey published record)
[All values, except total, in cubic feet per second, ft^3/s; total in cubic feet per second days, $(ft^3/s)\cdot d$]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	12600	4820	36700	22700	15300	41800	6810	8600	12000	3960	8420	11300
2	11800	4530	29200	20200	26400	53800	6310	7710	10300	3420	8000	10900
3	10700	4890	25900	17900	22900	44200	5960	8020	9430	3090	7070	10300
4	9740	4770	22600	16200	19800	36200	5480	8170	9970	3040	6080	9330
5	9380	5220	20000	14600	17400	30800	6290	7890	7910	3120	5460	8560
6	10400	4660	16800	15700	15900	27600	6890	6970	7460	3370	5320	8090
7	10500	5030	16100	19800	14500	26500	6200	6700	7470	3570	4940	7700
8	9920	5140	14800	19800	16000	25500	5840	6260	7880	4850	4550	7770
9	9550	5380	15400	16400	16100	23400	5830	7230	6700	5120	9970	26400
10	8840	5670	16000	14200	16600	21500	5930	7850	6200	5190	10100	73300
11	7140	6150	15600	13000	15400	21200	6900	7070	6670	4930	10200	62100
12	5980	6190	15300	12900	14000	29000	13300	5980	5980	4190	8860	48400
13	6410	6430	13500	13500	13000	39800	15700	12100	5430	3500	8210	37100
14	6770	5600	11800	13600	13300	39200	15500	28300	6160	3390	7120	29300
15	6270	5100	11200	14900	21700	34000	15500	35400	6470	3470	6050	24400
16	7200	4500	10700	17000	41600	28600	12000	29700	5360	3430	6100	21200
17	8170	5300	9970	19000	66100	25300	10800	28100	4640	4960	5600	18200
18	7540	6100	9570	17400	59900	22200	9950	25200	4970	6260	5170	15900
19	6930	44400	8580	16400	46200	19600	9790	20300	4840	8420	28800	14800
20	6980	116000	8060	22900	36900	17600	10300	17400	4400	11600	63700	14500
21	6740	129000	15200	27000	30400	16200	9780	15000	4020	8400	49900	15500
22	6500	60400	26000	28700	25700	15600	9920	13300	3990	6890	42100	15000
23	6680	45500	31600	24700	22800	14700	12700	11500	3620	6270	33800	14000
24	6120	41600	32900	20800	21300	13700	8900	10900	4620	5420	26100	12700
25	5080	49600	34200	18200	21700	12600	8100	9830	5030	5670	22400	11700
26	4910	45900	33500	17000	21000	11400	7810	10000	4500	5850	19700	18400
27	4940	49400	30500	16500	19800	9470	6840	13600	4530	5320	16300	22200
28	5060	107000	26900	15800	17900	8850	6190	14800	4250	5280	14000	21000
29	5760	95600	24200	18000	16700	8220	5650	12200	4110	7380	13100	18800
30	5570	67000	---	19700	22400	7930	6600	10700	3620	8500	12100	16600
31	4970	50500	---	17000	---	7380	---	14000	3990	---	12100	---
Total	235150	997380	582780	561500	728700	733850	263770	420780	186520	157860	481320	625450
Mean	7585	32170	20100	18110	24290	23670	8792	13570	6017	5262	15530	20850

Year total 5,975,060 $(ft^3/s)\cdot d$ Mean 16,330 ft^3/s

Table 18. Estimated daily maximum and minimum chloride concentrations, Delaware River at Fort Mifflin, Pa.
December 1, 1995 to November 30, 1996

[All values in milligrams per liter, computed from measurements of specific conductance; Monitor was not in operation December 1, 1995 to April 2, 1996; --, missing data;*, less than 30 milligrams per liter; Max, maximum value; Min, minimum value]

	December		January		February		March		April		May		June		July		August		September		October		November	
Date	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1											--	--	*	*	39	*	*	*	37	*	38	*	31	*
2											42	*	*	*	30	*	*	*	32	*	38	*	*	*
3									*	*	--	--	*	*	32	*	*	*	34	*	33	*	*	*
4									*	*	38	*	*	*	32	*	*	*	32	*	*	*	*	*
5									*	*	35	*	*	*	*	*	*	*	30	*	*	*	*	*
6									*	*	34	*	30	*	*	*	*	*	33	*	*	*	*	*
7									*	*	32	*	37	*	32	*	*	*	32	*	*	*	*	*
8									30	*	32	*	32	*	31	*	*	*	42	*	*	*	*	*
9									*	*	33	*	31	*	*	*	31	*	56	*	--	--	55	*
10									*	*	34	*	--	--	37	*	30	*	43	30	*	*	37	*
11									30	*	34	*	35	*	30	*	*	*	38	*	*	*	*	*
12									30	*	37	*	36	*	34	*	*	*	36	30	*	*	*	*
13									30	*	32	*	42	*	38	*	41	*	35	30	*	*	*	*
14									31	*	*	*	40	*	36	*	*	*	34	*	*	*	*	*
15									30	*	*	*	33	*	*	*	*	*	34	30	*	*	*	*
16									32	*	*	*	37	*	--	--	*	*	35	31	*	*	*	*
17									*	*	31	*	32	*	--	--	*	*	53	31	*	*	*	*
18									*	*	30	*	34	*	--	--	*	*	39	32	*	*	*	*
19									*	*	*	*	--	--	--	--	*	*	34	*	36	*	*	*
20									*	*	*	*	--	--	--	--	*	*	32	*	*	*	*	*
21									*	*	*	*	--	--	--	--	*	*	30	*	*	*	30	*
22									*	*	*	*	--	--	--	--	*	*	30	*	*	*	31	*
23									--	--	*	*	--	--	*	*	31	*	31	*	*	*	*	*
24									--	--	*	*	--	--	*	*	46	*	32	*	*	*	*	*
25									--	--	*	*	--	--	*	*	41	*	34	*	*	*	*	*
26									32	*	*	*	34	*	*	*	37	*	31	*	*	*	35	*
27									*	*	*	*	33	*	32	*	34	*	31	*	*	*	*	*
28									37	*	*	*	33	*	34	*	37	*	30	*	*	*	*	*
29									40	*	*	*	35	*	*	*	34	*	37	*	*	*	*	*
30									47	*	44	*	--	--	33	*	32	*	35	*	*	*	*	*
31											*	*			36	*	30	*			34	*		

Table 19. Estimated daily maximum and minimum chloride concentrations, Delaware River at Reedy Island Jetty, Del. December 1, 1995 to November 30, 1996.

[All values in milligrams per liter, computed from measurements of specific conductance; --, missing data; *, less than 30 milligrams per liter; Max, maximum value; Min, minimum value]

	December		January		February		March		April		May		June		July		August		September		October		November	
Date	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	3,500	540	6,900	3,000	1,300	82	2,200	190	--	--	630	50	3,100	840	4,400	1,400	2,900	700	3,700	1,600	3,200	1,200	830	240
2	1,500	430	6,900	3,100	1,500	100	2,800	560	--	--	630	*	3,000	820	4,200	1,400	2,400	600	4,400	1,800	3,000	1,200	1,400	260
3	2,300	420	7,800	3,700	2,800	130	2,800	290	--	--	120	*	3,000	860	4,200	1,400	2,300	630	3,600	1,800	2,700	1,200	2,200	240
4	2,500	470	6,300	3,100	3,600	550	600	110	2,100	420	47	*	3,100	960	4,000	1,400	2,200	630	4,200	1,800	4,100	1,000	2,400	350
5	2,800	540	6,800	2,800	--	--	910	130	1,800	360	38	*	3,000	850	4,000	1,300	2,100	610	4,100	1,900	3,800	1,700	2,500	450
6	2,400	610	5,100	2,800	--	--	760	120	2,200	380	55	33	2,600	840	3,700	1,400	2,300	600	4,100	2,100	4,200	1,800	3,000	560
7	2,500	570	--	--	--	--	1,900	190	2,300	420	74	40	2,700	890	3,000	1,300	2,600	630	3,700	1,500	4,400	1,900	3,200	740
8	2,700	560	--	--	--	--	1,500	140	2,400	410	48	*	2,300	860	3,200	1,300	2,700	660	3,900	1,400	5,600	1,900	3,000	1,200
9	2,900	550	--	--	--	--	890	110	2,600	440	45	33	2,100	800	3,600	1,300	2,700	630	3,900	1,600	5,300	2,000	2,300	750
10	2,300	540	--	--	2,300	510	1,200	140	1,900	400	45	*	2,200	800	3,600	1,200	3,200	550	3,900	1,500	5,100	1,900	1,600	400
11	1,400	340	--	--	2,300	520	2,200	190	1,600	240	30	*	2,200	780	3,900	1,200	3,900	660	3,900	1,500	4,500	1,600	730	190
12	2,900	340	--	--	2,000	370	2,600	320	2,300	300	42	*	1,900	750	3,900	1,200	3,900	950	4,000	1,600	4,600	1,800	300	140
13	3,600	580	--	--	2,400	360	3,100	340	2,600	380	1,100	*	1,900	600	4,400	840	3,800	900	4,800	2,000	4,100	1,500	220	130
14	4,000	1,000	--	--	3,400	490	3,000	540	2,500	500	1,500	*	1,900	550	2,500	820	4,000	820	4,100	2,000	3,700	1,400	220	120
15	4,000	1,200	6,900	4,100	3,800	570	3,000	580	2,700	430	1,500	43	2,000	490	2,900	710	3,600	860	4,400	2,100	3,800	1,400	480	120
16	5,100	1,300	7,800	4,100	3,700	800	2,800	550	2,900	440	520	43	2,100	470	1,700	500	3,400	880	4,100	2,000	3,500	1,300	750	100
17	4,800	1,700	7,900	3,900	4,000	910	2,600	530	1,600	150	440	*	2,100	500	1,800	370	3,300	890	4,100	2,000	3,700	1,200	1,000	85
18	5,300	1,300	7,400	4,100	4,000	890	2,100	460	330	120	490	*	2,300	460	1,800	290	3,400	880	4,000	1,600	4,400	1,400	1,400	120
19	5,400	1,900	8,400	4,200	3,500	890	3,800	520	210	55	310	*	2,500	570	1,900	360	3,100	850	4,400	1,600	4,400	1,700	1,500	120
20	6,900	2,300	4,200	760	3,800	1,000	3,800	590	120	45	460	*	2,200	510	1,300	260	3,600	970	4,700	1,800	3,000	570	1,200	150
21	5,900	2,300	1,700	220	3,400	860	1,700	420	120	48	660	*	2,200	450	1,900	180	3,200	1,000	4,400	1,700	1,200	270	1,300	150
22	3,900	1,900	460	180	2,600	700	--	--	120	47	620	*	2,300	440	2,200	270	3,600	880	4,100	1,800	600	220	970	150
23	6,000	2,000	420	190	1,900	580	--	--	85	37	980	*	2,900	430	2,700	520	3,600	900	4,500	1,500	450	200	1,900	150
24	5,900	2,300	520	250	1,800	580	--	--	170	60	1,100	30	3,200	540	--	--	3,800	920	4,800	1,600	410	190	1,700	160
25	5,800	2,400	520	250	870	380	--	--	710	42	1,800	170	3,700	840	--	--	4,000	950	4,100	1,700	420	270	2,000	210
26	4,400	2,300	390	230	980	260	--	--	660	74	2,200	310	3,800	760	--	--	4,200	1,200	4,000	1,700	370	240	1,600	260
27	4,400	2,100	290	180	1,500	240	--	--	640	37	2,400	400	4,800	1,000	--	--	4,200	1,250	4,100	1,700	290	210	680	160
28	6,000	2,100	310	82	2,100	280	--	--	1,200	43	2,400	650	5,300	1,300	3,600	620	4,100	1,300	3,900	1,700	340	200	2,100	200
29	5,900	2,100	150	74	1,500	240	--	--	790	48	3,000	780	5,300	1,500	3,600	720	4,100	1,500	3,200	1,400	390	210	1,900	240
30	6,200	2,500	97	50			--	--	880	47	3,200	660	5,200	1,900	3,600	770	3,700	1,500	3,100	1,300	1,000	210	2,100	290
31	6,300	2,600	110	57			--	--			3,200	750			3,300	790	3,800	1,500			590	220		

Table 20. Daily maximum and minimum chloride concentrations, Delaware River at Chester, Pa. December 1, 1995 to November 30, 1996. Collection and analysis by Kimberly Clark Chester Operations.
[All values in milligrams per liter; --, missing data; Max, maximum value; Min, minimum value]

	December		January		February		March		April		May		June		July		August		September		October		November	
Date	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	81	31	81	60	66	22	46	33	66	44	34	26	50	29	30	28	48	26	48	36	49	38	51	22
2	46	30	81	60	42	24	48	34	62	40	40	28	51	28	35	28	50	30	48	36	44	39	32	22
3	40	29	92	68	36	22	51	45	61	40	42	30	34	30	70	39	42	36	49	40	46	31	41	20
4	35	30	76	60	47	22	49	38	51	30	42	28	32	29	50	33	48	30	46	30	52	48	32	26
5	40	32	73	58	58	22	60	43	--	--	42	26	64	29	62	31	70	29	42	32	58	26	32	24
6	32	28	67	57	58	23	71	35	--	--	32	28	46	30	50	32	58	35	50	35	56	32	34	27
7	34	28	62	55	58	25	70	35	--	--	30	26	50	35	51	32	36	30	52	41	48	34	58	30
8	38	28	76	70	58	26	81	45	--	--	52	30	50	33	41	37	36	30	50	43	64	34	35	33
9	42	30	71	48	89	39	78	45	--	--	42	30	50	34	40	34	54	27	59	36	42	34	38	34
10	43	38	84	58	54	32	78	45	--	--	44	22	38	30	35	32	65	27	59	38	48	31	36	25
11	51	34	81	70	70	36	50	38	--	--	47	25	56	34	40	34	49	28	61	32	36	32	46	24
12	49	42	96	62	65	43	50	28	47	38	41	23	36	33	42	34	52	28	69	36	36	34	46	26
13	51	37	94	80	62	38	72	42	40	38	45	31	56	34	60	30	62	28	57	34	36	32	36	31
14	50	40	98	68	54	37	67	40	40	31	44	28	62	34	46	38	42	34	42	36	41	34	46	38
15	68	32	90	72	71	40	72	46	--	--	31	23	38	36	46	38	51	38	42	38	42	34	46	39
16	65	42	80	62	62	43	91	44	54	33	30	22	39	36	42	37	35	30	42	38	55	53	44	20
17	64	47	100	64	52	42	71	42	54	36	46	24	40	37	48	30	40	30	52	43	44	36	29	24
18	55	45	92	52	60	45	94	46	47	36	44	22	37	32	42	36	34	30	52	42	71	32	36	20
19	53	40	126	80	61	48	68	50	52	28	42	26	40	30	42	36	50	32	51	45	38	28	28	22
20	71	45	81	62	85	42	50	42	64	22	51	30	40	32	38	30	51	30	50	45	32	24	28	22
21	62	49	84	34	76	54	49	44	54	26	54	30	47	32	36	29	41	31	50	46	32	21	30	20
22	48	46	68	43	65	52	71	40	73	22	52	24	41	33	43	32	60	33	51	40	26	20	30	20
23	52	49	72	38	64	46	71	38	68	20	44	28	37	32	43	32	51	33	48	36	25	20	28	18
24	48	42	35	25	61	52	80	36	52	18	32	25	42	31	36	32	40	35	46	40	28	20	71	21
25	55	46	34	30	60	48	62	36	68	22	34	26	38	32	44	32	42	34	46	39	48	20	34	24
26	53	34	86	30	52	42	62	36	50	22	37	30	32	30	44	32	38	30	52	37	36	16	46	24
27	62	57	70	36	50	36	62	44	34	22	38	34	32	30	40	34	39	36	60	40	22	20	24	20
28	68	55	35	25	50	44	62	38	37	22	43	32	46	42	42	30	39	36	51	44	40	18	32	26
29	72	52	62	27	48	36	48	36	42	26	46	36	36	30	32	28	42	32	56	44	42	19	36	24
30	81	50	72	23			44	36	40	24	57	34	64	45	34	29	52	36	48	44	28	18	36	27
31	72	51	71	26			42	36			49	29			51	30	42	35			25	20		

Table 21. Daily mean dissolved oxygen, Delaware River at Benjamin Franklin Bridge at Philadelphia, Pa.
December 1, 1995 to November 30, 1996.
[All values in milligrams per liter; Monitor was not in operation December 1, 1995, to March 27, 1996; --, missing data]

Date	December	January	February	March	April	May	June	July	August	September	October	November
1					11.0	8.5	6.4	3.3	5.2	5.3	6.6	--
2					10.9	8.9	6.4	3.1	5.0	5.4	6.7	--
3					10.8	9.1	6.3	2.9	4.9	5.5	7.0	--
4					10.6	9.2	6.2	3.0	4.8	5.4	7.3	--
5					10.3	9.1	6.2	3.2	4.8	5.2	7.6	--
6					10.2	8.9	6.4	3.2	4.8	4.8	7.7	10.0
7					10.1	9.0	6.7	3.3	4.8	--	7.7	9.9
8					10.0	9.0	7.0	3.4	4.9	--	7.6	10.0
9					10.1	8.8	7.2	3.6	4.9	--	7.8	10.1
10					10.3	8.8	7.2	4.2	4.8	--	8.1	10.5
11					10.5	8.9	7.0	4.8	5.1	--	8.4	10.2
12					--	8.8	6.5	5.2	5.1	--	8.6	10.3
13					--	8.7	5.9	5.1	5.2	--	8.8	10.8
14					--	8.3	5.1	5.6	5.2	--	8.8	11.1
15					--	8.3	4.3	5.6	5.2	--	8.7	11.2
16					--	8.4	4.0	5.9	5.1	--	8.8	11.3
17					--	8.6	3.7	6.1	5.0	--	8.8	11.2
18					--	8.7	3.1	6.2	4.9	--	8.8	11.2
19					--	8.7	2.9	5.9	5.0	--	8.9	11.1
20					--	8.5	3.0	5.7	5.0	--	9.2	11.2
21					--	8.2	3.0	5.7	5.0	--	8.7	11.5
22					--	8.1	3.0	5.8	4.9	--	8.9	11.6
23					--	8.0	3.1	5.5	5.0	--	9.4	11.5
24					--	7.8	3.2	5.6	4.9	--	9.9	11.4
25					9.2	7.5	3.3	5.7	4.9	--	9.6	11.2
26					9.0	7.0	3.5	5.7	5.0	--	9.5	10.8
27					8.7	6.6	3.6	5.7	5.1	5.6	9.4	11.0
28				11.6	8.6	6.5	3.7	5.9	5.0	5.9	9.3	11.1
29				11.4	8.7	6.4	3.6	6.0	5.0	6.1	9.2	11.0
30				11.2	8.5	6.2	3.6	5.8	5.1	6.3	9.1	10.8
31				11.1		6.2		5.5	5.2		--	

Table 22. Daily mean dissolved oxygen, Delaware River at Chester, Pa.
December 1, 1995 to November 30, 1996.
[All values in milligrams per liter; Monitor was not in operation December 1, 1995, to June 10, 1996; --, missing data]

Date	December	January	February	March	April	May	June	July	August	September	October	November
1								5.8	--	6.1	6.3	7.4
2								5.0	--	6.1	6.5	7.5
3								4.4	--	6.1	6.1	7.6
4								4.4	--	5.8	6.4	7.6
5								4.5	--	5.7	6.7	8.5
6								4.8	--	5.8	6.9	8.5
7								4.9	--	6.0	7.0	7.8
8								4.9	--	5.5	7.5	7.8
9								4.9	--	5.3	7.5	7.7
10								4.9	--	4.9	7.5	7.8
11							7.2	5.3	--	4.7	7.1	8.3
12							6.8	5.6	--	4.7	7.1	8.6
13							6.3	6.0	--	5.2	7.1	8.6
14							5.9	5.7	--	5.1	7.1	8.8
15							5.6	5.5	--	5.4	7.1	9.2
16							5.5	5.9	--	5.6	7.4	9.8
17							5.6	5.9	--	6.1	7.3	10.0
18							5.5	5.8	--	5.7	7.2	10.1
19							5.5	6.3	--	5.5	7.5	10.5
20							5.3	6.6	--	5.7	7.1	10.4
21							4.7	6.9	--	5.7	7.4	10.4
22							4.5	6.4	--	6.0	7.2	9.8
23							4.6	6.0	--	6.2	7.6	9.8
24							4.9	6.0	--	6.1	7.9	9.8
25							5.2	6.6	--	6.1	8.2	9.6
26							6.1	6.8	--	6.1	8.4	9.5
27							6.2	6.2	--	6.2	7.9	10.1
28							6.3	6.1	--	6.7	7.8	10.3
29							6.4	--	6.1	6.6	7.8	10.1
30							6.4	--	6.3	6.3	7.6	9.8
31								--	6.2		7.5	

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