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

Report of The River Master Of the Delaware River

For the period December 1,1996 - November 30, 1997

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

With a section on Water Quality

By Andrew G. Reif and Hugh Darling

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Reston, Virginia

1999

U.S. Department of the Interior
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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

January 5, 2000

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-fourth Annual Report of the River Master of the Delaware River for the year December 1, 1996 to November 30, 1997.

Monthly precipitation in the upper Delaware River Basin during the 1997 River Master report year ranged from 51 percent of the long-term average during June 1997 to 204 percent during December 1996. Total precipitation during the report year was 3.63 inches less than the long-term average. Precipitation during the December to May period, when reservoirs typically refill, was 105 percent of the 56-year average, 0.93 inches more than the long-term average.

On December 1, 1996, when this report year began, combined storage in the New York City reservoirs in the upper Delaware River Basin was 268.431 billion gallons (Bgal), 99.1 percent of the combined storage capacity. Median combined storage on December 1, based on 29 years of data, is 166.770 Bgal. Operations on December 1, 1996 were being conducted as prescribed in the Decree. Combined storage in the New York City reservoirs reached a maximum of 281.326 Bgal, 103.9 percent of capacity, on December 3, 1996, when Pepacton Reservoir and Cannonsville Reservoir were spilling.

Precipitation during the first half of the report year was below normal during all months except December and March but storage remained above normal until May 1, 1997. Storage in the reservoirs was in fact so high because of runoff from precipitation during the fall of 1996, that the Parties to the Decree agreed on January 22, 1997, to allow limited releases from Pepacton Reservoir to reduce storage and provide some additional flood protection. That agreement and the subsequent releases are described in more detail in section II of this report.

Combined storage was near the median throughout May and was below the median from mid-June until the end of the report year. Except for August, precipitation continued to be less than the long-term average through October, with the precipitation deficit for the report year accumulating to 4.37 inches by October 31, 1997.

The Delaware River Master Advisory Committee met at Liberty, New York on May 12, 1997, to discuss hydrologic conditions in the basin and operational procedures for the 1997 release season. The River Master informed the committee that, on the basis of information provided by New York City, the excess-release quantity to be released beginning June 15 was 7.381 Bgal. He stated that, based on the formula contained in the Decree, this water would be released at rates designed to maintain the flow of the Delaware River at Montague, N.J. at 100 cubic feet per second (ft^3/s) above the normal flow objective of 1,750 ft^3/s beginning June 15, 1997. The Parties to the Decree agreed that the excess-release quantity should be released as prescribed by the Decree.

Combined storage in the New York City Delaware River Basin Reservoirs declined at above normal rates throughout the summer in response to below normal precipitation and above normal releases to meet the Montague target. On August 6, 1997, the Parties to the Decree, the Delaware River Basin Commission, and the Delaware River Master agreed to suspend the release of the remaining excess-release quantity in an effort to prevent, or at least delay, a drought warning in the basin. In spite of this action, storage continued to decline and reached the drought-warning level of the operating curves on October 22, 1997. Operations were reduced to those prescribed in the "Interstate Water Management Recommendation of the Parties to the Decree", (DRBC Resolution 83-13) in response to drought warning on October 27, 1997. Combined stor-

age continued to decline and reached the low point for the year on November 1, 1997. Details of the operations are described in section II of this report.

On October 22, the Parties to the Decree, the Delaware River Basin Commission, and the River Master, agreed to a request by New York State for an "Emergency Fisheries Protection Program" authorizing up to a maximum aggregate quantity of 3,000 cubic foot per second days [$(ft^3/s)\cdot d$] of water for special releases to protect the cold water fishery during the drought-warning period. On November 18, the agreement was modified to provide additional protection to the fishery. A copy of those agreements are attached to this report as Appendixes B and C, and the program is described in detail in Section II of this report.

During November, hydrologic conditions and combined storage in the basin began improving in response to increased precipitation. Combined storage increased to the normal zone of the operation curves on November 28, 1997, but operations continued at drought-warning levels until the end of the report year.

On November 30, 1997, the end of this report year, the combined storage in the New York City reservoirs was 111.448 Bgal, 41.1 percent of capacity, and operations in the basin were being conducted as prescribed in the "Interstate Water Management Recommendation of the Parties to the Decree" (DRBC Resolution 83-13).

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 primarily centered 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. Colleen Boshman joined the staff of the Milford office in January 1997, replacing 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 gaging station, and diversions by New Jersey. The reports were made available to 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. During the report year, ending November 30, 1997, the City of New York diverted a total of 247.976 Bgal from the basin and released 104.203 Bgal from Pepacton, Cannonsville, and Neversink Reservoirs to the Delaware River. The River Master directed releases to the Delaware River from these reservoirs totaling 81.952 Bgal.

Section III of this report describes water quality at various sites in the Delaware River Estuary. It was prepared by Andrew G. Reif and Hugh Darling, 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	Robert C. Shinn, Jr.
New York	N.G. Kaul
New York City	Joel A. Miele, Sr.
Pennsylvania	Irene B. Brooks

Throughout the year, diversions to supply water to New York City and releases designed to maintain the flow of the Delaware River at Montague were made as directed by the River Master. Diversions by New York City from the Delaware River basin reservoirs did not exceed the limit specified by the Decree or the limits in the "Interstate Water Management Recommendations of the Parties to the Decree" (DRBC Resolution 83-13).

The appreciation of the 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 River Master Advisory Committee members for comment.

Sincerely yours,

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

SECTION II

REPORT OF DELAWARE RIVER OPERATIONS

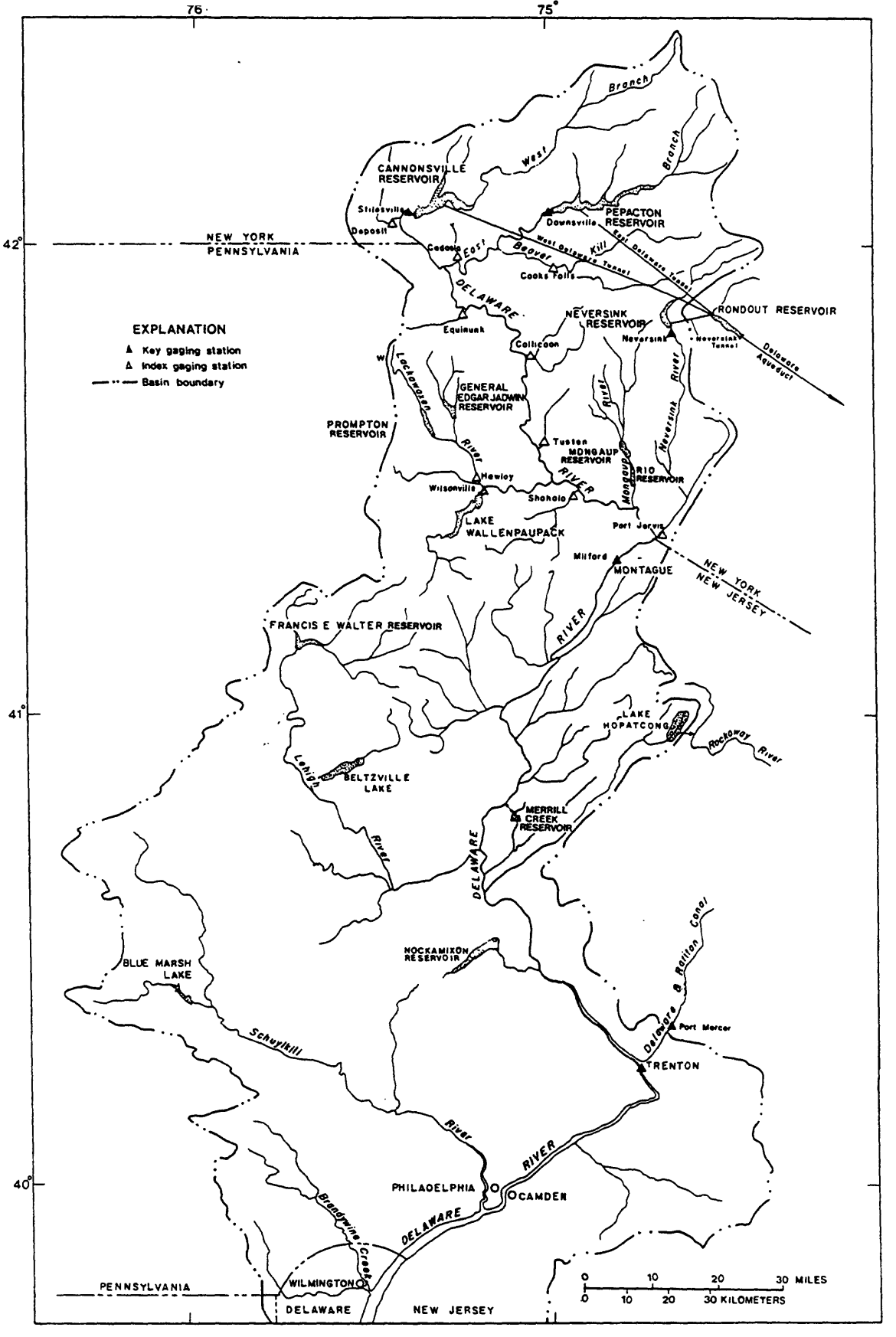

Figure 1.- Delaware River Basin upstream from Wilmington, Delaware

Section II

REPORT OF DELAWARE RIVER OPERATIONS

by William E. Harkness and Bruce E. Krejmas

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 1997 report year, December 1, 1996, to November 30, 1997, precipitation in the Delaware River Basin was 3.63 inches below average. Reservoir storage in the basin was at record levels during December 1996 and January 1997 and was above normal through April 1997. Storage declined steadily from May 26 to November 1, 1997, reaching drought-warning level October 22, 1997. Operations were conducted at reduced levels designed to conserve the low water supplies caused by the drought-warning conditions in the basin from October 27 to November 30, 1997.

Diversions from the Delaware River basin by New York City and New Jersey did not exceed those authorized by the terms of the Amended Decree, or the reduced limits imposed because of the drought. Releases were made as directed by the River Master at rates designed to meet the flow objective for the Delaware River at Montague, N.J. (hereafter called the Montague flow objective) on 138 days during the report year. Releases were made at the experimental conservation rates, at rates designed to relieve thermal stress and protect the fishery in the streams downstream from the reservoirs, on all other days.

New York City and New Jersey complied fully with the terms of the Decree, and during the drought-warning period, with the terms of the "Interstate Water Management Recommendations of the Parties to the Decree" (DRBC Resolution 83-13), and with the directives of the River Master during 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, 1996 to November 30, 1997.

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 at Troy, New York, at Malvern and Lemoyne, Pennsylvania, and at West Trenton, 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) shows the location of pertinent streams, reservoirs, and gaging stations.

Capacity. - Total usable volume in a reservoir 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 mathematical difference between the daily mean discharge of the Delaware River at Montague, N.J. 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 that contribute to the daily mean discharge at Montague between 1,750 ft^3/s and the excess-release rate.

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 flow objective 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 6 and a 25-hour day October 26.

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 39.66 inches for the 1997 report year and was 3.63 inches below the long-term (56-year) average. Monthly precipitation ranged from 51 percent of the long-term average in June, 1997 to 204 percent of the average in December, 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; the 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- and ground-water reservoirs fill. During this period in 1996-97, average precipitation at the 10 stations was 21.14 inches, which was 105 percent of the 56-year average. During June to November, average precipitation at the 10 stations was 18.52 inches, which was 80 percent of the long-term

1. All numbered tables in Section II are grouped at the end of this section, beginning on page 32.

average. The maximum monthly precipitation measured was 8.24 inches in December, 1996, at Liberty, New York; the minimum monthly precipitation was 1.38 inches in October, at Downsville Reservoir, New York.

Acknowledgments

The River Master's 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 for Pepacton, Cannonsville, and Neversink Reservoirs by the New York City Department of Environmental Protection, Bureau of Water Supply, Quality, and Protection; for Delaware and Raritan Canal by the New Jersey Water Supply Authority; for Lake Wallenpaupack by the Pennsylvania Power & Light Company; and for 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.

OPERATIONS

December to May

Operations on December 1, 1996, 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 Pepacton Reservoir and Neversink Reservoir were being made at the experimental levels, and at the augmented levels from Cannonsville Reservoir (table 2).

During the first half of the report year, total precipitation was 0.93 inches above average and monthly precipitation ranged from 204 percent of the long-term average in December to 72 percent in February (table 1). Runoff in the upper basin was above normal during December and was within the normal range from January through May.

Combined storage in the New York City, Delaware River Basin Reservoirs was above median levels for much of the 1996 River Master report year. Cannonsville Reservoir had filled to capacity and began spilling on October 25, 1996, and Pepacton Reservoir began spilling on November 9, 1996. On December 1, 1996, when the 1997 report year began, Pepacton Reservoir contained 140.671 Bgal of water in storage above the point of maximum depletion, or 100.3 percent of the reservoir's storage capacity of 140.190 Bgal, and Cannonsville Reservoir contained 98.233 Bgal, or 102.6 percent of the reservoir's storage capacity of 95.706 Bgal, and both reservoirs were spilling. Neversink Reservoir contained 29.527 Bgal, or 84.5 percent of the reservoir's storage capacity of 34.941 Bgal. The combined storage in the three reservoirs as of December 1 was 268.431 Bgal, or 99.1 percent of their combined capacity, which was the highest storage for December during the period of record, exceeding the previous high by 3.0 Bgal. Daily storage contents 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

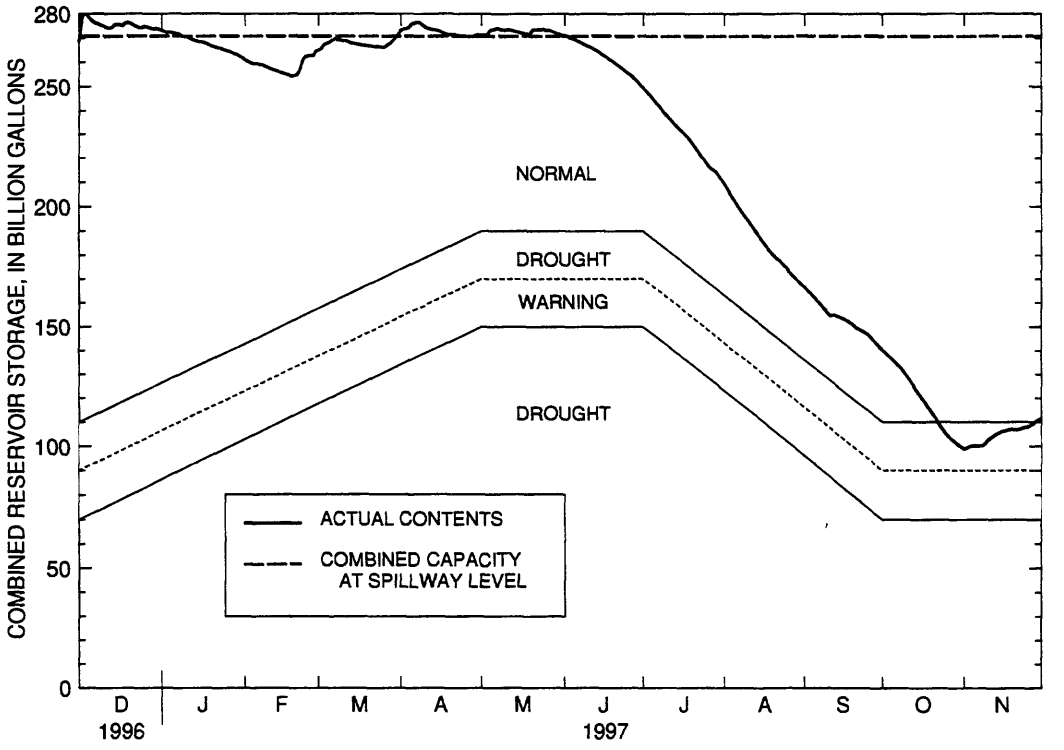

Figure 2. - Operating curves for New York City reservoirs in the Delaware River basin compared with the actual contents of the reservoirs, December 1, 1996, to November 30, 1997 (Sources: Operating curves from Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree of 1954, reservoir contents from New York City Bureau of Water Supply data.)

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 56-year period, December 1940 to May 1996, was 301.5 Bgal. During the corresponding six months of the current report year, inflow to the three reservoirs totaled 376.2 Bgal. Evaporation loss was not included in the computation.

Usually, combined storage increases seasonally from December to May. However, the 1997 report year began with storage at record levels and two of the three New York City reservoirs were spilling. During the 1997 report year, the maximum combined storage was 281.326 Bgal on December 3, 1996 (fig. 2). Normally, maximum storage in the individual reservoirs occurs on different days. The maximum storage in Pepacton Reservoir was 144.343 Bgal on December 2, 1996, the maximum storage in Cannonsville Reservoir was 102.900 Bgal on December 3, 1996, and the maximum storage in Neversink Reservoir was 35.135 Bgal on April 8, 1997. As discussed earlier, both Pepacton Reservoir and Cannonsville Reservoir were spilling on December 1, 1996. Pepacton Reservoir spilled from November 9, 1996, to January 12, 1997, March 3-15 and March 28 to May 30, 1997. Cannonsville Reservoir spilled from October 25,

1996, to February 13, 1997, and February 20 to June 4, 1997. Neversink Reservoir filled to capacity and began spilling on December 4, 1996, and spilled December 4-10, 18-20, 1996, and April 7-9, 1997. A total of 215.669 Bgal spilled from all three reservoirs during the report year.

On January 22, 1997, in response to a request by officials of the local communities immediately downstream from Pepacton Reservoir, the Parties to the Decree, the Delaware River Basin Commission (DRBC), and the River Master unanimously agreed to a limited reduction in the storage in Pepacton Reservoir in order to provide additional flood protection. This action was taken because of the unusually high storage contents for this time of year. A copy of the agreement (DRBC Resolution No. 97-2) and the unanimous consent by the Parties to the Decree are attached to this report as Appendix A.

The releases directed by the River Master and resulting reductions in storage levels in Pepacton Reservoir are summarized in table 6. A total of 2.796 Bgal was released between January 27, 1997, and February 28, 1997, to provide at least 5 Bgal of available storage in the reservoir. Per the agreement, the releases were stopped on February 28, 1997, and the reservoir filled to capacity and began spilling again on March 4, 1997.

During the December to May period, diversions to Rondout Reservoir by New York City totaled 118.006 Bgal (648 Mgal/d). The forecast discharge at Montague, exclusive of water released from the City reservoirs, did not fall below the flow objective, therefore no releases were directed. The observed discharge at Montague also did not fall below the flow objective. New York City made releases from Pepacton and Neversink Reservoirs for conservation purposes at the experimental conservation rates shown in table 2 on all days during the period. At Cannonsville Reservoir, conservation releases were made at the augmented rate December 1, 1996, through February 28, 1997, and at the experimental rate March 1 to May 31, 1997.

June to November

Monthly precipitation during the June to November period was below average in June, July, September, and October and was above average in August and November. Total precipitation during the period was 18.52 inches or 4.56 inches less than the 56-year average of 23.08 inches (table 1).

Releases were directed to satisfy the Montague flow objective on 138 days between June 1 and November 30, 1997, when the forecasted discharge at Montague, exclusive of water released from the New York City reservoirs, fell below the applicable flow objective (table 7). Releases at various 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 526 $(ft^3/s)\cdot d$ (340 Mgal) was released for the relief of thermal stress from June 10 to July 15, and 621 $(ft^3/s)\cdot d$ (401 Mgal) was released to protect the fishery November 4-30, 1997 (table 8).

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 flow objective on 2 days during the period, and releases were directed.

The New York City Department of Environmental Protection, Bureau of Water Supply, furnished the River Master with the following advance data for the 1997 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 1997 of 1.665 Bgal/d x 365 days = 607.725 Bgal.

2. The estimated consumption that the City must provide from all its sources of supply during calendar year 1997 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 (607.725 - 598.832) or 7.381 Bgal. The Montague flow objective during the excess release period beginning June 15, 1997, was computed as:

$$1{,}750\ ft^3/s + \frac{7.381\ Bgal \times 1{,}547\ (ft^3/s)/(Bgal/d)}{120\ days} = 1{,}850\ ft^3/s$$

Data on consumption of water by the City of New York for each calendar year, since 1950, are shown in table 9.

On June 15, 1997, the seasonal period for the release of the excess quantity began and the Montague flow objective was increased to 1,850 ft^3/s. Between June 15 and August 6, in response to below normal runoff from precipitation and above normal releases to meet the Montague flow objective, the storage in the New York City reservoirs declined rapidly. On August 6, 1997, in an effort to prevent or at least delay entry into drought warning, the Parties to the Decree, the DRBC and the River Master unanimously agreed to suspend the release of the excess quantity. The remainder of the excess-release quantity was placed in an excess-release bank to be used, if necessary, to provide lower Delaware River Basin drought assistance per procedures previously approved in DRBC Resolution 88-22 (Revised). The Montague flow objective was returned to 1,750 ft^3/s effective August 10, 1997. A total of 3.956 Bgal of the 7.381 Bgal excess-release quantity was released and the remainder, 3.425 Bgal, was put in the excess-release bank to be used if needed for lower basin drought assistance at a later date. A copy of the agreement is attached to this report as Appendix B.

During August, precipitation was slightly above normal but during September and October, precipitation was significantly below normal, releases required to meet the Montague flow objective were very high, and storage continued to decline at greater than normal rates. Combined storage declined below the drought-warning level of the operation curves on October 22, 1997, and remained below that level for five days. On October 27, 1997, the Montague flow objective was reduced to 1,655 ft^3/s and the allowable diversions to New York City and New Jersey were reduced to 680 Mgal/d and 85 Mgal/d respectively, as required by the "Interstate Water Management Recommendations of the Parties to the Decree" (DRBC Resolution 83-13).

On October 21, 1997, in anticipation of entry into drought-warning in the basin, New York State requested that the Parties to the Decree, the DRBC, and the Delaware River Master consider the establishment of an emergency fisheries protection program designed to allow special releases from the New York City Delaware River Basin reservoirs to protect the fishery during the drought-warning period. In response to this request, the Parties to the Decree, the DRBC, and the

River Master met on October 22, 1997, and unanimously agreed to allow New York State to request special releases totaling a maximum of 3,000 $(ft^3/s)\cdot d$ and specified that the amount released be paid back through reductions in the releases required to meet the Montague target. A copy of the agreement is attached to this report as Appendix C.

On November 18, 1997, the Parties to the Decree, the DRBC, and the River Master agreed to a modification of the agreement to allow fishery protection releases to be made prior to the compensating reductions in the Montague releases. A copy of the modified agreement is attached to this report as Appendix D.

A total of 621 $(ft^3/s)\cdot d$ was released to protect the fishery and 400 $(ft^3/s)\cdot d$ was set aside in a fishery protection bank through reductions in releases to meet the Montague flow objective between October 25, when the agreement became effective, and November 30, 1997. The special releases and the reductions in release requirements are summarized in table 8.

Combined storage continued to decline during October and reached the minimum for the year on November 1, 1997, 11.175 Bgal into the drought-warning zone of the operation curves.

An average of 1.56 inches of precipitation fell in the Upper Delaware River Basin on November 1-3, 1997, and was followed by an additional inch of precipitation during the following week. The runoff from these two storms was sufficient to eliminate the need for directed releases from the reservoirs to meet the Montague flow objective and to begin the recovery of storage in the reservoirs. Storage continued to increase steadily during November and combined storage reached the normal zone of the operation curves on November 28, 1997, and was 1.448 Bgal above the drought-warning zone on November 30, 1997, the end of this report year.

Between June 15, when release of the excess quantity began, and November 30, 1997, the forecasted flow at Montague, exclusive of releases from the New York City reservoirs, was below the flow objective on 136 days and releases were directed. On 67 days during the June 15 to November 30 period, the observed flow fell below the applicable flow objective. Of those 67 days, 39 were within 10 percent of the flow objective and 28 were more than 10 percent below the flow objective.

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 June 1 to November 30, 1997, totaled 129.970 Bgal.

Summary of Operations

From December 1, 1996, to November 30, 1997, diversions to Rondout Reservoir totaled 247.976 Bgal, and all releases from the New York City reservoirs to the Delaware River totaled 104.203 Bgal. Directed releases to the Delaware River from these reservoirs totaled 81.952 Bgal.

During the year, the maximum storage in Pepacton Reservoir was 104.203 Bgal, on December 2, 1996. The maximum storage in Cannonsville Reservoir was 102.900 Bgal, on December 3, 1996, and the maximum storage in Neversink Reservoir was 35.135 Bgal, on April 8, 1997, when the reservoirs were spilling. The maximum combined storage in the three reservoirs during the year was 281.326 Bgal, on December 3, 1996.

Minimum combined storage in the reservoirs during the year was 98.825 Bgal on November 1, 1997. Minimum storage in Pepacton Reservoir was 63.653 Bgal (45.4 percent of capacity) on November 8, 1997, and minimum storage in Cannonsville Reservoir was 23.180 Bgal (24.2 percent of capacity) on November 1, 1997, and minimum storage in Neversink Reservoir was 10.869 Bgal (31.1 percent of capacity) also on November 1, 1997.

On November 30, 1997, combined storage in the three reservoirs was 111.448 Bgal, or 41.1 percent of their combined capacity. During the year, combined storage decreased 157.083 Bgal, or 58 percent of capacity.

The combined storage of the three reservoirs on the first day of the month June 1967 to November 1997, is shown in figure 4. Storage on December 1, 1996, and January 1, 1997, was the highest ever during the period of record, June 1967 to November 1997. Storage was above the median February through April and June. Storage was below the median in May and July through November, and was below the 25th percentile from September through November.

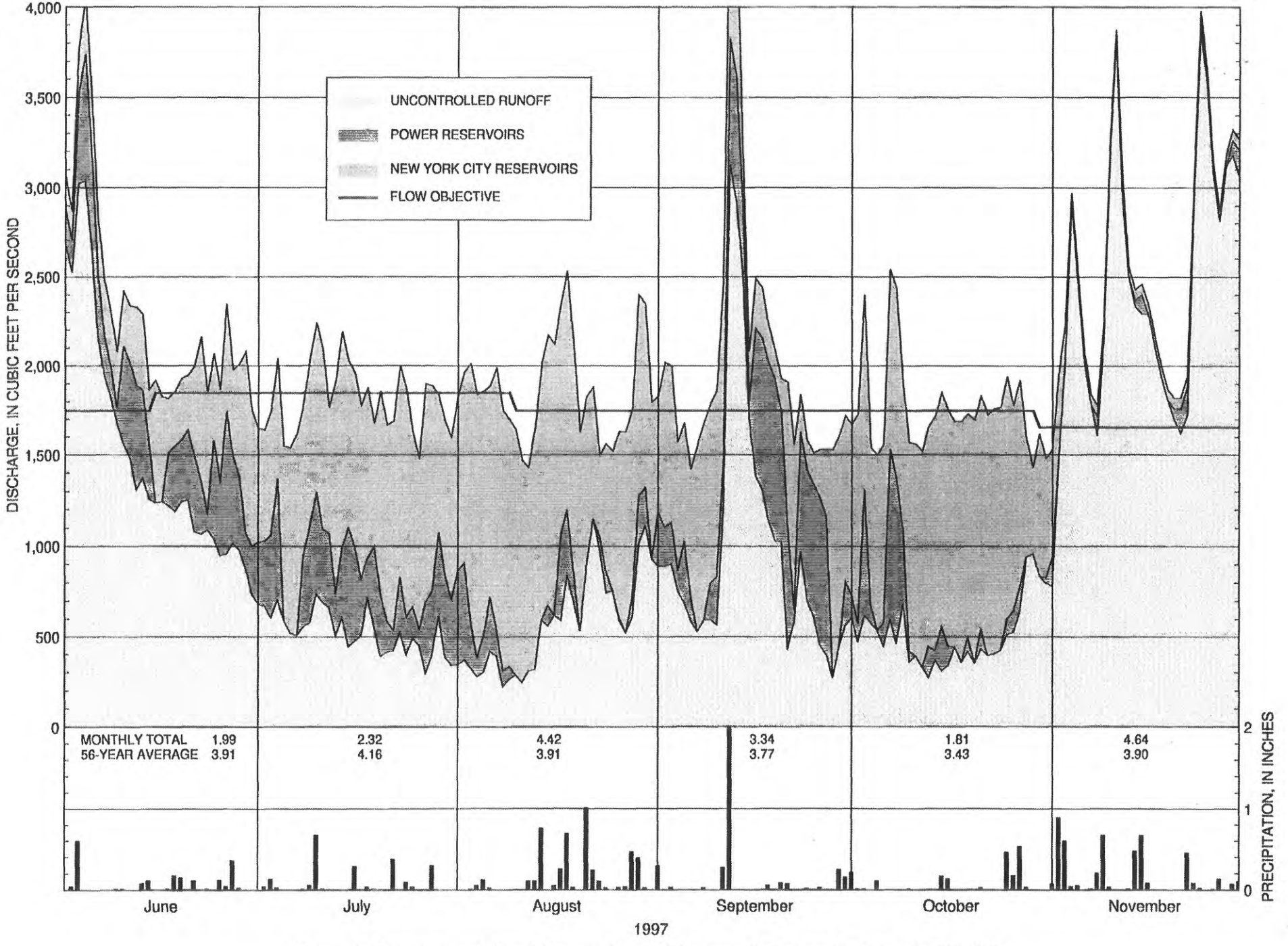

Figure 3. -Components of flow, Delaware River at Montague, N.J., June 1 to November 30, 1997.

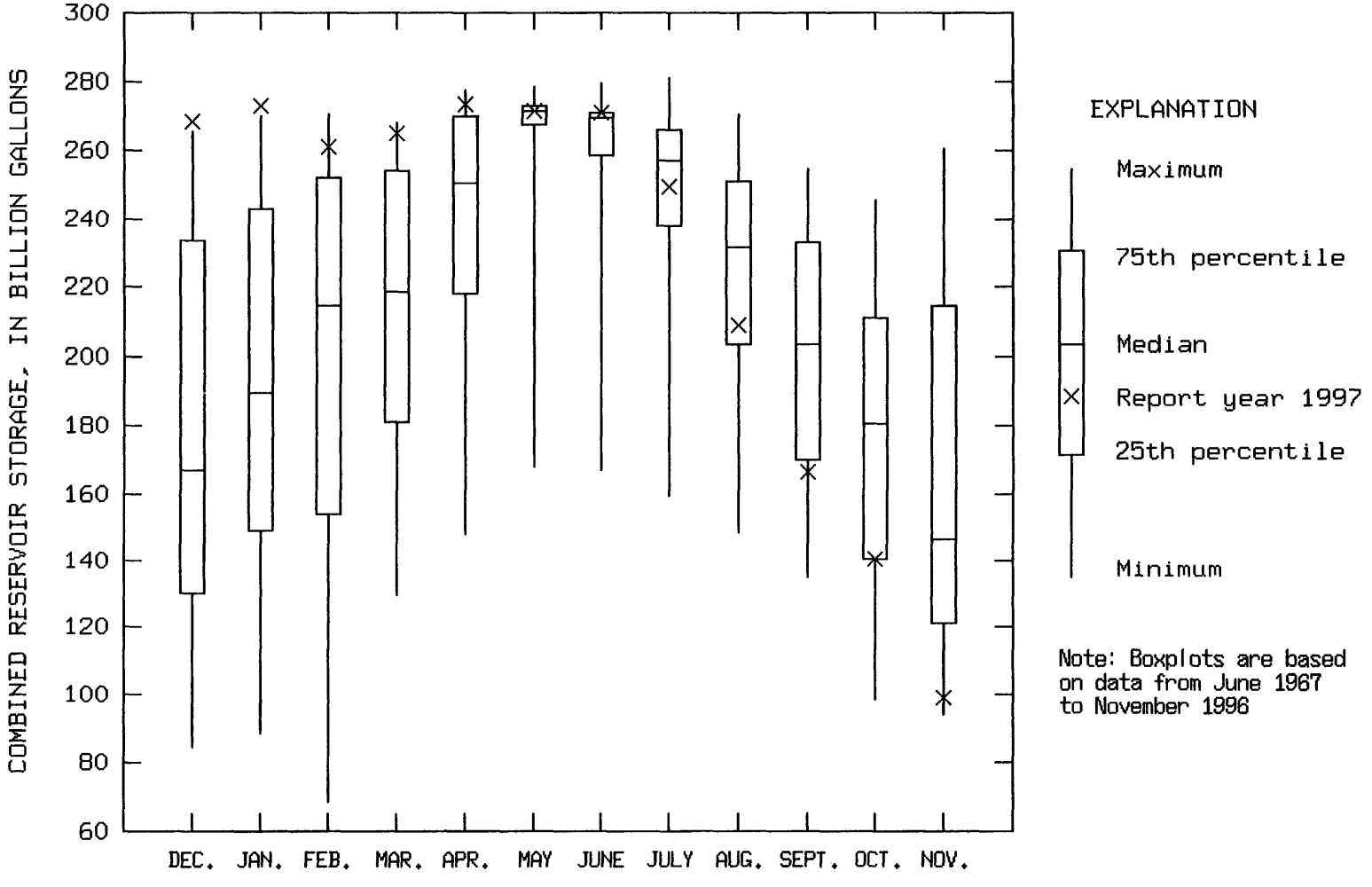

Figure 4.- Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs on the first day of the month, December 1996 to November 1997 (this report year), compared to values for the period of record, June 1967 to November 1996.

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 report 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 10), and the segregation of the daily average flow at Montague among its various source components (table 11).

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 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 Montague flow objective were computed from the forecasted flow at Montague, exclusive of the controlled releases from the 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 1997 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 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 later. 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 generally 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 11. 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 that the River Master 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 10.

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, advance estimates were subject to many modifying factors such as the influence of the vagaries of weather upon demand. In addition, the power companies are members of wide-area power pools that may present unforeseen demands for power generation. As a result, the actual use of water for power generation was at times at considerable variance with the advance estimates that were used by the River Master's office in design computation.

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 10.

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 (mi^2)
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 10 under the heading of "Weather Adjustment." Throughout the low-flow periods, the National Weather Service

Office at 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 9), 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 10.

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 flow objective most days from June 13 to November 3, 1997. The following tabulation compares the advance estimates of the various contributions to the flow at Montague to the observed operations during that period.

	Advance estimates [$(ft^3/s)\cdot d$]	Observed operations [$(ft^3/s)\cdot d$]
Directed releases from New York City reservoirs	[a] 126,779	[b] 126,764
Power releases		
Lake Wallenpaupack	18,714	27,897
Rio Reservoir	4,868	10,068
Runoff from uncontrolled area	100,199	103,972

[a] Directed release as designed.
[b] Actual release in response to direction.

During the period, New York City released slightly less water than was directed, the power companies released 49 percent more water from Lake Wallenpaupack and 107 percent

more water from Rio Reservoir than was forecast, and the observed runoff from the uncontrolled area was 3.8 percent more than the forecasted runoff.

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 121,753 $(ft^3/s)\cdot d$. Directed releases totaled 126,764 $(ft^3/s)\cdot d$, or 4.1 percent more than for exact forecasting.

A comparison of the hydrographs of forecasted runoff and the actual runoff (fig. 5) from the uncontrolled area indicate that the forecasting procedures tended to underestimate runoff during high precipitation events, but the forecasts were generally adequate. Adjustments were made when needed 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 indicate 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 are 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.

Table 12 shows diversions from Pepacton, Cannonsville, and Neversink Reservoirs to the New York City water-supply system (Rondout Reservoir) during the report year. The table includes a running account of the average rates of the combined diversions from the reservoirs, computed as prescribed by the Decree or the "Interstate Water Management Recommendations of the Parties to the Decree (DRBC Resolution 83-13)." 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)
June 1, 1996 to May 31, 1997	800	663
June 1 to October 26, 1997	800	767
October 27 to November 30, 1997	680	472

During the year, a total of 247.976 Bgal of water was diverted to the New York City water supply system. The allowable diversion during the year was 310.259 Bgal.

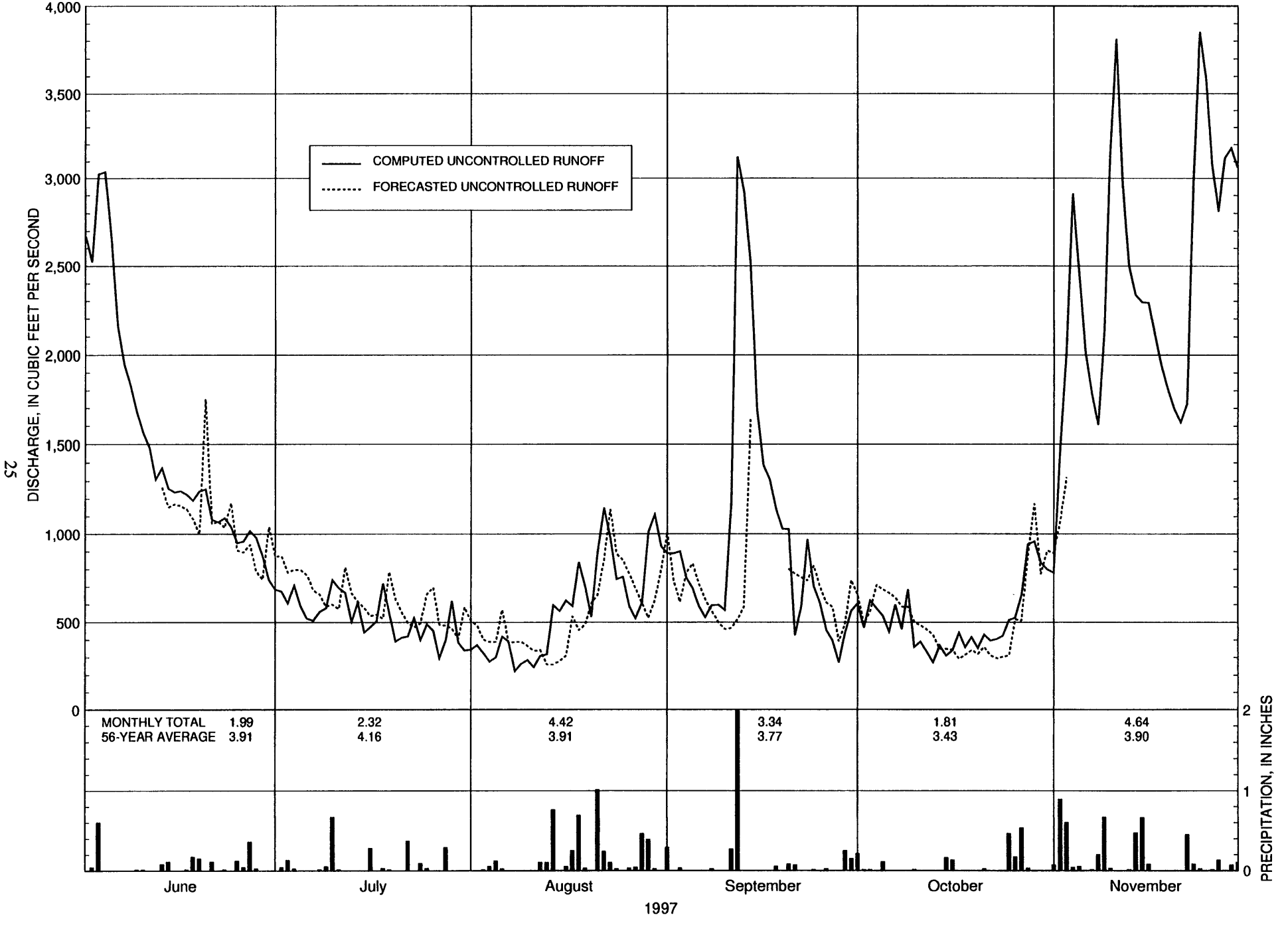

Figure 5.-Uncontrolled runoff component, Delaware River at Montague, N.J., June 1 to November 30, 1997.

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 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, 1996, combined storage in the three reservoirs was 268.431 Bgal, which was an all time high for December 1. As discussed earlier, storage was above normal from December through April. Pepacton Reservoir spilled from December 1, 1996 to January 12, 1997, March 4-15, and March 28 to May 30, 1997. A total of 78.621 Bgal spilled during the above periods. In addition 2.796 Bgal was released for flood control from January 27 to February 28, 1997. Cannonsville Reservoir spilled continuously from December 1, 1996, to June 4, 1997, except for a brief period, February 14-19, 1997. A total of 135.869 Bgal spilled during the year. Neversink Reservoir filled to capacity and spilled December 4-10, and 18-20, 1996, and again April 7-9, 1997. A total of 1.179 Bgal spilled during the year. The maximum combined storage for the year occurred December 3, 1996, when Pepacton and Cannonsville Reservoirs were spilling.

The seasonal decline in storage began in late May and continued at greater than normal rates, reaching drought-warning level on October 22. Storage continued to decline, until reaching the minimum for the year on November 1, 1997. The minimum combined storage was 98.825 Bgal. Storage began to recover during November and reached 111.448 Bgal, 41.1 percent of capacity on November 30, 1997.

COMPARISON OF RIVER MASTER OPERATION DATA WITH OTHER STREAMFLOW RECORDS

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 compare records used in the River Master operations and published records from U.S. Geological Survey gaging stations. 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 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 (table 11) 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 13) for the flow objective shown.

Flow objective (ft^3/s)	19	45	70	95	300-500
USGS flow (ft^3/s)	19.9	44.9	68.5	92.7	421
NYC flow (ft^3/s)	18.6	46.0	69.9	95.0	457
Percent difference NYC flow is from USGS flow	-6.5	+2.4	+2.0	+2.5	+8.6

The differences in all cases are closer than the differences observed in previous years and the agreement in the data is considered to be very good. 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 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 (table 11) 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 14) for the flow objective shown.

Flow objective (ft^3/s)	23	100-300	300-500	500-900	> 900
USGS flow (ft^3/s)	23.2	162	375	661	1,055
NYC flow (ft^3/s)	26.3	197	434	731	1,086
Percent difference NYC flow is from USGS flow	+13	+22	+16	+11	+2.9

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. The differences in flow between reservoir release records and USGS gaging station records continue to be monitored in cooperation with New York City and the USGS field office at Troy, N.Y. In an effort to investigate the differences further, two discharge measurements were 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 include the seepage at the base of the dam. The measurements were adjusted for the seepage of 2.4 ft^3/s as discussed above. A comparison of the two adjusted measurements to the New York City release records showed a difference of +1.2% at 161 ft^3/s and +4.1 percent at 639 ft^3/s.

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 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 (table 11) reported by New York City to the final records for the USGS gaging station on the Neversink River at Neversink, N.Y. (table 15) for the flow objective shown

.

Flow objective (ft^3/s)	15	25	53	95	110-130
USGS flow (ft^3/s)	15.1	23.8	47.8	84.3	89.8
NYC flow (ft^3/s)	15.5	24.7	52.5	94.4	104.2
Percent difference NYC flow is from USGS flow	+2.6	+3.8	+9.8	+12	+16

The flow objectives are the basic and the experimental conservation release rates except for the two highest release rates, which represented the higher rates of release for thermal protection made during the report year. The River Master Office made six discharge measurements, four during the year and one just before and one just after the year, to further investigate the differ-

ences between reservoir release records and USGS gaging station records. These measurements showed results similar to the data in the tabulation at the 15 ft^3/s, 25 ft^3/s and 53 ft^3/s flows.

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. (table 16). These discharges 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 (table 11).

From December 1996 through November 1997, the River Master's record agrees with the published U.S. Geological Survey record except for some small variations primarily due to the difference in the time frame and rounding of the computations. However, some days show unexplained differences. Overall, the records agree within 0.26 percent for the year.

Delaware River at Montague, N.J.

The River Master's operation record for the Delaware River at Montague, N.J. (table 11) indicated 0.07 percent less discharge for the year than the published U.S. Geological Survey record for the gaging station at that site (table 17), and daily values from the two 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. At five-minute intervals, the computer system calculates the release and diversion quantities for the preceding five-minute period based on the latest instantaneous rates-of-flow from each instrument. 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 were corrected when necessary. 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 report year because of high water levels in Rondout Reservoir. 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 1997 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 52 days during the 1997 report year, the unmeasured leakage was approximately 0.4 Bgal. Based upon the measurements obtained this year and 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. Three current-meter measurements of flow in the West Delaware Tunnel outlet channel were made during the year. Those measurements and an additional measurement made just before the beginning of the report year, indicated that on average, the venturi instruments gave higher results, +3.2 percent for the totalizer and +2.6 percent for the rate-of-flow indicator. Inspections of the channel downstream from the outlet, when valves were closed, showed negligible leakage.

A hydroelectric powerplant uses water diverted through the West Delaware Tunnel, but the plant operates only when diversions are less than 300 Mgal/d. When the powerplant is not operating, the valves on the pipelines to the plant 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. One measurement of flow from the Neversink Tunnel was made during the year. That measurement, two measurements made during the 1996 report year, and one measurement made during the 1998 report year, indicated that on average, the venturi instruments were 5.8 percent higher for the totalizer and 4.3 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 1997 report year, the power plant did not operate for part of the day most of the time and was not operated the equivalent of 177 days. Based on the above rate and on records of power plant operation, approximately 1.6 Bgal of water was diverted but was unrecorded.

DIVERSIONS BY NEW JERSEY

The Amended 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 gag-

ing 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 18).

The following tabulation lists the allowable diversions by New Jersey, the periods that they were in effect, and the maximum monthly diversion during each period for the report year:

Effective dates	Allowable diversion Mgal/d	Maximum monthly average diversion (Mgal/d)
Dec. 1, 1996 to Oct. 26, 1997	100	97.5
Oct. 27 to Nov. 30, 1997	85	82.5

The 30-day average diversion was computed weekly throughout the year to monitor compliance with the terms of the Decree and with the reduced diversions allowed during the period of drought warning. The maximum 30-day average diversion was 98.7 Mgal/d during the 30-day period ending October 26, 1997. The maximum daily diversion was 103 Mgal on January 19-22, and October 25, 1997. These computations show that the diversions by New Jersey, as measured at Port Mercer, were within the allowable limits as prescribed by the Decree and the reduced limits by the "Interstate Water Management Recommendations of the Parties to the Decree" (DRBC Resolution 83-13).

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

Operations were conducted as prescribed by the Decree from December 1, 1996, to August 9, 1997; by unanimous agreement of the Parties to the Decree, August 10 to October 26, 1997; and by the "Interstate Water Management Recommendations of the Parties to the Decree (DRBC Resolution 83-13)," which were designed to alleviate the drought-warning conditions in the basin from October 27 to November 30, 1997.

Diversions from the Delaware River Basin to the New York City water-supply system were less than those authorized by the Decree and the "Interstate Water Management Recommendations of the Parties to 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 within the limits prescribed by the Decree. New Jersey also complied fully with the requests of the River Master.

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

Month	December 1940 to November 1996 Monthly Average	December 1996 to November 1997			
		Amount	Percentage of average	Excess (+) or deficit (-) Month	Cumulative
December	3.34	6.80	204	+3.46	+3.46
January	2.96	2.38	80	-.58	+2.88
February	2.67	1.91	72	-.76	+2.12
March	3.28	3.69	112	+.41	+2.53
April	3.78	2.78	74	-1.00	+1.53
May	4.18	3.58	86	-.60	+.93
June	3.91	1.99	51	-1.92	-.99
July	4.16	2.32	56	-1.84	-2.83
August	3.91	4.42	113	+.51	-2.32
September	3.77	3.34	89	-.43	-2.75
October	3.43	1.81	53	-1.62	-4.37
November	3.90	4.64	119	+.74	-3.63
12 months	43.29	39.66	92	-3.63	

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 May 31	23	45	45
	June 1-14	23	45	160
	June 15 to August 15	23	325	160
	August 16 to September 15	23	45	160
	September 16 to October 31	23	45	45
	November 1-30	23	33	45
	December 1-31	8	33	45

Table 3. Storage in Pepacton Reservoir, N.Y. for year ending November 30, 1997.
(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	140,671	140,968	136,217	137,893	141,857	140,690	140,043	129,324	116,612	100,838	84,271	64,776
2	144,343	140,820	135,729	138,590	141,764	140,634	139,840	128,743	116,127	100,017	83,696	64,534
3	143,948	140,801	135,221	139,638	141,580	140,523	139,619	128,251	115,592	99,413	83,123	64,498
4	142,920	140,987	134,859	140,394	141,691	141,098	139,472	127,864	115,061	98,690	82,552	64,413
5	142,285	140,894	134,768	140,708	142,136	141,172	139,160	127,390	114,611	98,030	82,051	64,304
6	142,024	140,838	134,732	141,153	142,211	141,264	138,811	126,971	114,197	97,343	81,415	64,087
7	141,746	140,708	134,714	141,079	142,192	141,449	138,627	126,394	113,749	96,658	80,809	63,881
8	141,691	140,542	134,390	141,023	142,062	141,375	138,168	125,888	113,272	95,932	80,165	63,653
9	141,468	140,486	134,102	140,820	141,802	141,246	137,820	125,436	112,794	95,267	79,442	63,773
10	141,375	140,560	133,833	140,746	141,486	141,338	137,510	125,019	112,316	94,471	78,816	64,087
11	141,246	140,468	133,563	140,746	141,394	141,375	137,127	124,620	111,824	93,662	78,072	64,292
12	141,190	140,209	133,347	140,616	141,357	141,283	136,763	124,447	111,301	93,662	77,320	64,655
13	141,209	140,153	133,114	140,394	141,209	141,190	136,381	124,031	110,908	93,467	76,541	64,813
14	141,561	140,116	132,880	140,394	141,172	141,098	136,109	123,670	110,485	93,140	75,824	64,970
15	141,617	140,043	132,755	140,338	140,950	140,931	135,801	123,376	110,013	92,709	75,083	65,067
16	141,506	139,914	132,487	140,190	140,616	140,801	135,294	123,050	109,494	92,308	74,426	65,079
17	141,338	139,767	132,290	140,190	140,560	140,671	134,986	122,636	109,024	91,909	73,641	64,970
18	141,876	139,509	131,951	140,061	140,375	140,486	134,372	122,138	108,572	91,482	72,873	64,970
19	142,024	139,252	131,755	140,116	140,320	140,375	134,084	121,609	108,088	90,834	72,124	64,909
20	141,931	139,032	131,791	139,914	140,542	141,005	133,707	121,197	107,621	90,306	71,494	64,643
21	141,635	138,866	131,933	139,748	140,838	141,116	133,276	120,582	107,204	89,782	70,727	64,413
22	141,486	138,627	132,952	139,730	140,653	141,135	132,952	120,191	106,836	89,316	69,927	64,304
23	141,320	138,700	134,732	139,693	140,653	141,172	132,523	119,682	106,404	88,878	69,336	64,329
24	141,357	138,351	135,783	139,509	140,579	141,116	132,076	119,257	105,701	88,431	68,656	64,317
25	141,635	138,296	136,345	139,491	140,523	140,746	131,612	118,765	104,986	87,940	67,858	64,317
26	141,506	138,149	136,690	139,583	140,579	140,764	131,416	118,344	104,256	87,281	67,410	64,595
27	141,486	137,857	136,854	139,840	140,597	140,634	130,954	118,276	103,672	86,609	66,941	64,643
28	141,301	137,802	137,583	140,153	140,634	140,523	130,599	118,242	103,105	85,995	66,424	64,934
29	141,264	137,437		140,542	140,783	140,505	130,156	118,107	102,523	85,512	65,958	64,958
30	141,412	137,000		140,894	140,746	140,320	129,678	117,534	102,101	84,848	65,617	64,970
31	141,098	136,672		141,190		140,098		117,098	101,320		65,189	
Change	+464	-4,426	+911	+3,607	-444	-648	-10,420	-12,580	-15,778	-16,472	-19,659	-219
Equiv. Mgal/d	+15.0	-142.8	+32.5	+116.4	-14.8	-20.9	-347.3	-405.8	-509.0	-549.1	-634.2	-7.3
Equiv. ft^3/s	+23.2	-221	+50.3	+180.0	-22.9	-32.3	-537	-628	-788	-849	-981	-11.3
Change for year -75,664 Mgal					Equiv. for year -207.3 Mgal/d						Equiv. for year -320.7 ft^3/s	

Table 4. Storage in Cannonsville Reservoir, N.Y. for year ending November 30, 1997.
(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	98,233	98,104	95,851	99,327	98,893	96,913	96,269	88,632	65,013	45,979	40,934	23,180
2	100,518	97,862	95,835	99,150	98,828	96881	96,076	88,071	63,943	45,912	40,577	23,234
3	102,900	97,878	95,899	99,311	98,989	96913	95,883	87,435	62,848	45,768	40,157	23,366
4	101,774	97,927	95,835	98,764	99,086	97,476	95,754	86,756	61,919	45,634	39,652	23,560
5	100,759	97,959	95,947	98,506	99,585	97,685	95,691	85,831	60,964	45,479	39,285	23,707
6	99,939	97,943	96,028	98,571	99,665	97,653	95,539	84,950	59,853	45,089	38,822	23,823
7	99,424	97,927	96,028	98,861	99,569	97,750	95,478	84,501	58,815	44,789	38,465	23,947
8	99,086	97,798	96,092	98,651	99,311	97,428	95,371	83,504	57,814	44,489	38,244	24,086
9	98,732	97,605	96,092	98,410	98,764	97,379	95,250	82,724	56,886	44,189	37,510	24,287
10	98,490	97,621	95,931	98,184	98,329	97,476	95,158	82,059	56,043	43,933	36,766	24,736
11	98,297	97,621	95,787	98,104	98,088	97,782	95,402	81,467	55,152	43,633	36,162	25,145
12	98,120	97,460	95,770	97,959	97,895	97,895	95,280	80,488	54,241	43,688	35,340	25,502
13	98,362	97,315	95,819	97,573	97,669	97,814	95,158	79,673	53,109	43,666	34,666	25,741
14	99,054	97,234	95,676	97,299	97,589	97,653	94,793	78,996	52,514	43,666	33,834	26047
15	99,150	97,041	95,630	97,025	97,540	97,621	94,413	78,263	51,686	43,710	33,139	26,345
16	99,231	97,154	95,600	96,961	97,379	97,492	94,215	77,559	51,079	43,655	32,379	26,566
17	99,166	97,138	95,539	96,720	97,090	97,347	94,018	77,006	50,367	43,655	31,712	26,804
18	99,440	97,234	95,493	96,591	96,929	97,267	93,850	76,412	49,679	43,644	30,859	26,966
19	99,472	97,154	95,432	96,446	96,961	97,202	93,653	75,542	49,212	43,622	30,136	27,170
20	99,327	97,058	95,676	96,334	96,977	97,943	93,242	74,616	48,792	43,435	29,246	27,272
21	99,118	96,993	96,301	96,301	96,977	98,313	92,892	73,689	48,514	43,109	28,447	27,434
22	98,764	96,977	97,428	96,269	96,913	98,249	92,527	72,788	48,392	43,067	27,621	27,604
23	98,506	97,009	99,038	96,559	96,881	98,136	92,344	71,940	48,036	43,046	26,855	27,894
24	98,281	96,945	99,247	96,527	97,058	98,297	91,842	71,291	47,758	42,973	26,115	28,243
25	98,716	96,768	98,941	96,253	96,977	97,975	91,538	70,298	47,525	43,036	25,570	28,464
26	98,716	96,720	98,683	96,285	96,784	97,943	91,112	69,450	47,191	42,773	24,873	28,755
27	98,539	96,607	98,394	96,800	96,768	97,508	90,747	68,642	46,913	42,363	24,464	29,153
28	98,394	96,237	99,376	96,993	96,800	97,202	90,184	68,086	46,591	41,985	24,303	29,821
29	98,281	96,366		97,379	96,993	96,897	89,697	67,410	46,468	41,596	24,016	30,330
30	98,362	96,269		97,862	97,090	96,575	89,149	66,617	46,212	41,165	23,637	30,840
31	98,249	96,189		98,249		96,398		65,854	46,090		23,335	
Change	-64	-2,060	+3,187	-1,127	-1,159	-692	-7,249	-23,295	-19,764	-4,925	-17,830	+7,505
Equiv. Mgal/d	-2.1	-66.5	+113.8	-36.4	-38.6	-22.3	-241.6	-751.5	-637.5	-164.2	-575.2	+250.2
Equiv. ft^3/s	-3.2	-103	+176	-56.2	-59.7	-34.5	-374	-1,162	-986	-254	-890	+387
Change for year -67,473 Mgal					Equiv. for year -184.9 Mgal/d					Equiv. for year -286 ft^3/s		

Table 5. Storage in Neversink Reservoir, N.Y. for year ending November 30, 1997.
(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	29,527	34,003	28,795	27,632	32,515	33,679	34,635	31,537	27,442	19,759	15,206	10,869
2	33,019	33,804	28,756	27,719	33,110	33,664	34,650	31,443	27,215	19,467	15,094	11,389
3	34,478	33,659	28,618	28,171	33,278	33,746	34,626	31,350	26,988	19,061	14,952	11,888
4	34,828	33,529	28,491	28,499	33,494	34,267	34,626	31,234	26,749	18,736	14,819	12,079
5	35,021	33,321	28,390	28,773	33,906	34,528	34,567	31,132	26,473	18,437	14,705	12,139
6	34,956	33,125	28,329	29,159	34,267	34,798	34,423	30,998	26,363	18,186	14,580	12,147
7	35,100	33,005	28,267	29,571	34,803	34,951	34,281	30,882	26,253	17,938	14,421	12,289
8	35,120	32,781	28,132	29,728	35,135	34,858	34,145	30,790	26,118	17,698	14,280	12,433
9	35,105	32,624	28,005	29,937	35,021	34,754	34,008	30,666	26,030	17,514	14,151	12,877
10	35,080	32,425	27,857	30,105	34,848	34,542	33,858	30,579	25,887	17,349	14,006	13,442
11	34,961	32,203	27,740	30,150	34,705	34,350	33,625	30,465	25,750	17,175	13,853	13,737
12	34,734	31,948	27,593	30,168	34,572	34,160	33,456	30,341	25,600	17,435	13,710	13,945
13	34,739	31,653	27,468	30,132	34,582	33,983	33,312	30,227	25,470	17,574	13,589	14,145
14	34,848	31,551	27,339	30,119	34,626	33,910	33,230	30,091	25,295	17,532	13,433	14,290
15	34,902	31,401	27,215	30,191	34,562	33,848	33,144	29,946	24,973	17,521	13,295	14,477
16	34,818	31,318	27,124	30,259	34,468	33,775	33,053	29,901	24,670	17,418	13,066	14,586
17	34,700	31,146	27,039	30,227	34,350	33,775	32,981	29,787	24,389	17,305	13,010	14,699
18	34,897	30,910	26,940	30,246	34,184	33,765	32,905	29,611	24,023	17,158	12,863	14,841
19	35,006	30,588	26,817	30,264	34,072	33,813	32,810	29,464	23,645	16,982	12,699	14,857
20	34,931	30,401	26,791	30,296	33,862	34,374	32,728	29,338	23,270	16,891	12,520	14,930
21	34,730	30,241	26,732	30,324	33,708	34,111	32,662	29,240	22,940	16,718	12,438	14,920
22	34,611	30,077	26,799	30,319	33,568	34,238	32,591	29,097	22,673	16,638	12,289	14,936
23	34,458	29,946	27,116	30,324	33,490	34,286	32,439	28,981	22,396	16,474	12,156	15,057
24	34,335	29,783	27,215	30,305	33,398	34,370	32,330	28,861	22,081	16,318	11,994	15,091
25	34,492	29,629	27,236	30,310	33,278	34,512	32,217	28,769	22,004	16,122	11,854	15,097
26	34,463	29,566	27,288	30,369	33,278	34,625	32,127	28,628	21,596	16,000	11,729	15,197
27	34,276	29,432	27,313	30,492	33,187	34,754	32,061	28,508	21,291	15,850	11,626	15,322
28	34,204	29,338	27,485	30,657	33,245	34,655	31,944	28,377	20,965	15,697	11,520	15,422
29	34,130	29,231		31,021	33,553	34,591	31,836	28,123	20,693	15,532	11,303	15,544
30	34,204	29,088		31,438	33,630	34,631	31,663	27,866	20,424	15,361	11,158	15,638
31	34,165	28,920		32,047		34,601		27,683	20,087		11,008	
Change	+4,581	+5,245	-1,435	+4,562	+1,583	+971	-2,938	-3,980	-7,596	-4,726	-4,353	+4,630
Equiv. Mgal/d	+147.8	-169.2	-51.2	+147.2	+52.8	+31.3	-97.9	-128.4	-245.0	-157.5	-140.4	+154.3
Equiv. ft^3/s	+229	-262	-79.3	+228	+81.6	+48.5	-152	-199	-379	-244	-217	+239
Change for year -13,946 Mgal					Equiv. for year -38.2 Mgal/d						Equiv. for year -59.1 ft^3/s	

Table 6. Flood control releases from Pepacton Reservoir pursuant to DRBC Resolution 97-2
[All values except elevation in million gallons (Mgal); elevation in feet above sea level (ft)]

Date 1997	Elevation	Storage	Requested release	Actual release	Conser-vation release	Flood control release	Cumulative flood control releases
Jan. 27	1278.73	137,857	100	101	29	72	72
28	1278.70	137,802	100	100	29	71	143
29	1278.50	137,437	200	201	29	172	315
30	1278.26	137,000	200	207	29	178	493
31	1278.08	136,672	300	304	29	275	768
Feb. 1	1277.83	136,217	300	293	29	264	1,032
2	1277.56	135,729	300	287	29	258	1,290
3	1277.28	135,221	0	35	29	6	1,296
4	1277.08	134,859	0	30	30	0	1,296
Storage more than 5 Bgal below spillway level February 4 - 23, 1997.							
23	1277.01	134,732	0	29	29	0	1,296
24	1277.59	135,783	200	198	29	169	1,465
25	1277.90	136,345	300	290	29	261	1,726
26	1278.09	136,690	350	353	29	324	2,050
27	1278.18	136,854	500	498	29	469	2,519
28	1278.58	137,583	300	306	29	277	2,796
Mar. 1	1278.75	137,893	0	Flood control releases stopped per Resolution 97-2			
2	1279.13	138,590					
3	1279.70	139,638					
4	1280.11	140,394		Reservoir spilling			

Note: Target storage = 140,190 Mgal - 5,000 Mgal = 135,190 Mgal through the end of February.

Table 7. Design rates for the Delaware River at Montague, N.J. gaging station December 1, 1996 to November 30, 1997
[ft^3/s, cubic feet per second]

Effective dates	Montague Design Rate (ft^3/s)
December 1, 1996 to June 14, 1997	1,750
June 15 to August 9, 1997	1,850
August 10 to October 29, 1997	1,750
October 30 to November 15, 1997	1,655

Table 8: Summary releases during the administration of the emergency fishery protection program
October 25, 1997 to November 30, 1997, (All values in cubic feet per second).
[Bal. Adj. = Balancing adjustment from design table]

Design Date 1997	Daily mean flow at Trenton on previous day	Montague Date 1997	Directed Releases				Pepacton				Cannonsville				Neversink				Cumulative fishery	
			Defi-ciency	Bal. Adj.	Fishery reduction	Directed	Directed	Conser-vation	Fishery release	Total	Directed	Conser-vation	Fishery release	Total	Directed	Conser-vation.	Fishery release	Total	Reduc-tions	Releases
Oct. 25	2,920	Oct. 28	727	-100	0	627	175	0	0	175	449	0	0	449	25	0	0	25	0	0
26	3,130	29	526	-100	0	426	20	0	0	20	427	0	0	427	25	0	0	25	0	0
27	3,510	30	882	0	100	782	149	0	0	149	608	0	0	608	25	0	0	25	100	0
28	3,950	31	748	0	100	648	149	0	0	149	478	0	0	478	25	0	0	25	200	0
29	3,760	Nov. 1	692	0	100	592	45	0	0	45	524	0	0	524	25	0	0	25	300	0
30	3,650	2	580	0	100	480	45	0	0	45	413	0	0	413	25	0	0	25	400	0
31	3,150	3	194	-6	0	188	45	0	0	45	118	0	0	118	25	0	0	25	400	0
Nov. 1	2,910	4	0	+1	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	23
2	3,320	5	0	+4	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	46
3	4,270	6	0	-36	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	69
4	5,250	7	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	92
5	5,620	8	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	115
6	5,660	9	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	138
7	5,900	10	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	161
8	5,090	11	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	184
9	4,590	12	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	207
10	4,290	13	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	230
11	4,440	14	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	253
12	4,810	15	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	276
13	6,480	16	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	299
14	6,070	17	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	322
15	5,480	17	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	345
16	5,670	19	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	368
17	5,470	20	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	391
18	5.090	21	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	414
19	4,810	22	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	437
20	4,470	23	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	460
21	4,170	24	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	483
22	4,000	25	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	506
23	4,430	26	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	529
24	4,790	27	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	552
25	5,500	28	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	575
26	7,210	29	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	598
27	7,350	30	0	-50	0	0	0	6	13	19	0	26	0	26	0	5	10	15	400	621

Table 9. Consumption of Water by New York City - 1950 to 1997
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
97	1,201.3	123.5	1,324.8	483.552

Table 10. 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		Actual deficiency		Cumulative	Balancing
Date of advance estimate	Lake Wallenpaupack ft^3/s	Rio Reservoir ft^3/s	Current conditions ft^3/s	Weather adjustment ft^3/s	Date	Discharge ft^3/s	deficiency ft^3/s	adjustment ft^3/s	release ft^3/s	Daily ft^3/s	Cumulative $(ft^3/s)\cdot d$	Daily ft^3/s	Cumulative $(ft^3/s)\cdot d$	difference $(ft^3/s)\cdot d$	adjustment ft^3/s
1997	1	2	3	4		5	6	7	8	9	10	11	12	13	14
MONTAGUE DESIGN RATE = 1,750 ft^3/s DECEMBER 1, 1996 TO JUNE 14, 1997															
The estimated Montague discharge was greater than the Montague design rate December 1, 1996 to June 12, 1997															
June 10	287	113	1,234	28	June 13	1,662	88		88						
11	287	99	1,125	28	14	1,539	211		211						
MONTAGUE DESIGN RATE = 1,850 ft^3/s JUNE 15 TO AUGUST 9, 1997															
June 12	0	0	1,080	90	June 15	1,170	680		680	682	682	612	612	70	-7
13	0	106	1,076	83	16	1,265	585		585	586	1,268	606	1,218	50	-5
14	287	213	1,141	0	17	1,641	209		209	209	1,477	339	1,557	-80	+8
15	287	213	1,026	59	18	1,585	265		265	265	1,742	301	1,858	-116	+12
16	287	213	926	72	19	1,498	352	-7	345	350	2,092	270	2,128	-36	+4
17	287	0	877	876	20	2,040	0	-5	0	0	2,092	211	2,339	-247	+25
18	287	0	1,018	38	21	1,343	507	+8	515	508	2,600	358	2,697	-97	+10
19	0	0	1,070	0	22	1,070	780	+12	792	800	3,400	490	3,187	213	-21
20	0	142	974	61	23	1,177	673	+4	677	671	4,071	671	3,858	213	-21
21	287	142	987	190	24	1,606	244	+25	269	269	4,340	269	4,127	213	-21
22	287	142	868	38	25	1,335	515	+10	525	520	4,860	500	4,627	233	-23
23	405	0	790	106	26	1,301	549	-21	528	525	5,385	104	4,731	654	-65
24	405	0	741	199	27	1,345	505	-21	484	488	5,873	358	5,089	784	-78
25	405	0	790	0	28	1,195	655	-21	634	629	6,502	469	5,558	944	-94
26	0	71	742	0	29	813	1,037	-23	1,014	1,009	7,511	779	6,337	1,174	-100
27	0	0	1,039	0	30	1,039	811	-65	746	749	8,260	849	7,186	1,074	-100

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 Col. 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 11.
Col. 10 = Summation of Col. 9.
Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 11), 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 ±100.

Note:--Cols. 9-14 are used only for the computation of the balancing adjustment June 15 to November 30, 1997.

Table 10. 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]

Date of advance estimate	Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases: Powerplant release forecasts: Lake Wallenpaupack ft^3/s	Powerplant release forecasts: Rio Reservoir ft^3/s	Uncontrolled runoff: Current conditions ft^3/s	Uncontrolled runoff: Weather adjustment ft^3/s	Date	Discharge ft^3/s	Indicated deficiency ft^3/s	Balancing adjustment ft^3/s	Directed release ft^3/s	Computation of the balancing adjustment: Adjusted directed release: Daily ft^3/s	Adjusted directed release: Cumulative $(ft^3/s)\cdot d$	Actual deficiency: Daily ft^3/s	Actual deficiency: Cumulative $(ft^3/s)\cdot d$	Cumulative difference $(ft^3/s)\cdot d$	Balancing adjustment ft^3/s
1997	1	2	3	4		5	6	7	8	9	10	11	12	13	14
June 28	280	0	874	0	July 1	1,154	696	-78	618	627	8,887	827	8,013	874	-87
29	280	0	868	6	2	1,154	696	-94	602	612	9,499	822	8,835	664	-66
30	280	0	756	26	3	1,062	788	-100	688	691	10,190	791	9,626	564	-56
July 1	280	0	682	116	4	1,078	772	-100	672	673	10,863	483	10,109	754	-75
2	0	0	649	147	5	796	1,054	-87	967	958	11,821	1,258	11,367	454	-45
3	0	0	691	76	6	767	1,083	-66	1,017	1,020	12,841	1,330	12,697	144	-14
4	0	0	672	9	7	681	1,169	-56	1,113	1,112	13,953	1,342	14,039	-86	+9
5	288	0	631	25	8	944	906	-75	831	835	14,788	895	14,934	-146	+15
6	288	0	575	13	9	876	974	-45	929	931	15,719	741	15,675	44	-4
7	288	0	548	52	10	888	962	-14	948	948	16,667	558	16,233	434	-43
8	288	0	518	57	11	863	987	+9	996	997	17,664	757	16,990	674	-67
9	288	64	548	263	12	1,163	687	+15	702	702	18,366	782	17,772	594	-59
10	0	0	664	0	13	664	1,186	-4	1,182	1,181	19,547	1,111	18,883	664	-66
11	0	0	614	0	14	614	1,236	-43	1,193	1,196	20,743	859	19,742	1,001	-100
12	288	0	582	0	15	870	980	-67	913	913	21,656	751	20,493	1,163	-100
13	288	0	535	0	16	823	1,027	-59	968	967	22,623	857	21,350	1,273	-100
14	288	0	499	44	17	831	1,019	-66	953	953	23,576	1,026	22,376	1,200	-100
15	288	0	489	32	18	809	1,041	-100	941	946	24,522	916	23,292	1,230	-100
16	288	0	751	34	19	1,073	777	-100	677	680	25,202	850	24,142	1,060	-100
17	0	0	610	22	20	632	1,218	-100	1,118	1,116	26,318	1,106	25,248	1,070	-100
18	0	0	538	18	21	556	1,294	-100	1,194	1,082	27,400	1,262	26,510	890	-89
19	0	106	497	0	22	603	1,247	-100	1,147	1,153	28,553	1,313	27,823	730	-73
20	0	106	466	6	23	578	1,272	-100	1,172	1,170	29,723	1,020	28,843	880	-88
21	0	0	456	38	24	494	1,356	-100	1,256	1,257	30,980	1,237	30,080	900	-90
22	0	142	489	169	25	800	1,050	-89	961	961	31,944	1,181	31,261	680	-68
23	0	142	484	212	26	838	1,012	-73	939	939	32,880	1,309	32,570	310	-31
24	0	71	470	16	27	557	1,293	-88	1,205	1,203	34,083	1,153	33,723	360	-36
25	0	142	470	11	28	623	1,227	-90	1,137	1,137	35,220	1,097	34,820	400	-40
26	487	71	448	17	29	1,023	827	-68	759	764	35,984	774	35,594	390	-39
27	487	71	397	9	30	964	886	-31	855	852	36,836	1,012	36,606	230	-23
28	268	71	578	6	31	923	927	-36	891	891	37,727	1,141	37,747	-20	+2

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 Col. 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 11.
Col. 10 = Summation of Col. 9.
Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 11), 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 ±100.

Table 10. 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 deficiency	Balancing adjustment	Directed release	Computation of the balancing adjustment					
	Powerplant release forecasts		Uncontrolled runoff							Adjusted directed release		Actual deficiency			
Date of advance estimate	Lake Wallenpaupack	Rio Reservoir	Current conditions	Weather adjustment	Date	Discharge				Daily	Cumulative	Daily	Cumulative	Cumulative difference	Balancing 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
1997	1	2	3	4		5	6	7	8	9	10	11	12	13	14
July 29	268	71	509	0	Aug. 1	848	1,002	-40	962	964	38,691	984	38,731	-40	+4
30	268	0	479	0	2	747	1,103	-39	1,064	1,063	39,754	943	39,674	80	-8
31	0	0	402	0	3	402	1,448	-23	1,425	1,427	41,181	1,267	40,941	240	-24
Aug. 1	0	0	389	0	4	389	1,461	+2	1,463	1,459	42,640	1,469	42,410	230	-23
2	107	0	371	18	5	496	1,354	+4	1,358	1,356	43,996	1,346	43,756	240	-24
3	107	0	371	200	6	678	1,172	-8	1,164	1,168	45,164	1,128	44,884	280	-28
4	0	0	369	16	7	385	1,465	-24	1,441	1,442	46,606	1,302	46,186	420	-42
5	0	0	389	0	8	389	1,461	-23	1,438	1,438	48,044	1,538	47,724	320	-32
6	0	71	389	0	9	460	1,390	-24	1,366	1,366	49,410	1,516	49,240	170	-17
MONTAGUE DESIGN RATE = 1,750 ft^3/s AUGUST 10 TO OCTOBER 29, 1997															
Aug. 7	0	0	367	0	Aug. 10	367	1,383	-28	1,355	1,355	50,765	1,465	50,705	60	-6
8	0	142	339	0	11	481	1,269	-42	1,227	1,225	51,990	1,505	52,210	-220	+22
9	0	248	330	13	12	591	1,159	-32	1,127	1,121	53,111	1,441	53,651	-540	+54
10	0	142	239	21	13	402	1,348	-17	1,331	1,332	54,443	1,432	55,083	-640	+64
11	0	71	236	24	14	331	1,419	-6	1,413	1,414	55,857	1,154	56,237	-380	+38
12	0	0	242	39	15	281	1,469	+22	1,491	1,494	57,351	1,074	57,311	40	-4
13	0	0	278	32	16	310	1,440	+54	1,494	1,498	58,849	1,128	58,439	410	-41
14	0	0	502	31	17	533	1,217	+64	1,281	1,287	60,136	687	59,126	1,010	-100
15	0	0	433	22	18	455	1,295	+38	1,333	1,336	61,472	556	59,682	1,790	-100
16	0	0	433	53	19	486	1,264	-4	1,260	1,261	62,733	891	60,573	2,160	-100
17	0	0	436	173	20	609	1,141	-41	1,100	1,100	63,833	1,220	61,793	2,040	-100
18	0	60	540	112	21	712	1,038	-100	938	938	64,771	858	62,651	2,120	-100
19	0	60	544	314	22	918	832	-100	732	731	65,502	601	63,252	2,250	-100
20	0	60	459	681	23	1,200	550	-100	450	449	65,951	699	63,951	2,000	-100
21	0	60	704	184	24	948	802	-100	702	703	66,654	893	64,844	1,810	-100
22	0	35	829	22	25	886	864	-100	764	763	67,417	993	65,837	1,580	-100
23	0	35	773	0	26	808	942	-100	842	842	68,259	1,146	66,983	1,276	-100
24	0	35	691	0	27	726	1,024	-100	924	924	69,183	1,228	68,211	972	-97
25	0	0	594	13	28	607	1,143	-100	1,043	1,045	70,228	1,035	69,246	982	-98
26	0	0	510	14	29	524	1,226	-100	1,126	1,126	71,354	476	69,722	1,632	-100
27	0	0	503	119	30	622	1,128	-100	1,028	1,031	72,385	431	70,153	2,232	-100
28	0	0	775	21	31	796	954	-97	857	868	73,253	818	70,971	2,282	-100

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 Col. 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 11.
Col. 10 = Summation of Col. 9.

Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 11), 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 ±100.

Table 10. 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 deficiency	Balancing adjustment	Directed release	Computation of the balancing adjustment					
	Powerplant release forecasts		Uncontrolled runoff							Adjusted directed release		Actual deficiency		Cumulative difference	Balancing adjustment
Date of advance estimate	Lake Wallenpaupack	Rio Reservoir	Current conditions	Weather adjustment	Date	Discharge				Daily	Cumulative	Daily	Cumulative		
	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
1997	1	2	3	4		5	6	7	8	9	10	11	12	13	14
Aug. 29	0	0	1,009	0	Sept. 1	1,009	741	-98	643	645	73,898	565	71,536	2,362	-100
30	0	0	735	0	2	735	1,015	-100	915	916	74,814	646	72,182	2,632	-100
31	165	0	611	3	3	779	971	-100	871	870	75,684	620	72,802	2,882	-100
Sept. 1	165	0	729	52	4	946	804	-100	704	704	76,388	884	73,686	2,702	-100
2	165	0	815	17	5	997	753	-100	653	653	77,041	723	74,409	2,632	-100
3	165	71	715	0	6	951	799	-100	699	700	77,741	1,030	75,439	2,302	-100
4	0	0	628	0	7	628	1,122	-100	1,022	1,022	78,763	1,222	76,661	2,102	-100
5	0	0	551	13	8	564	1,186	-100	1,086	1,085	79,848	1,155	77,816	2,032	-100
6	165	0	486	13	9	664	1,086	-100	986	992	80,840	952	78,768	2,072	-100
7	165	0	460	0	10	625	1,125	-100	1,025	1,025	81,865	915	79,683	2,182	-100
8	165	0	459	8	11	632	1,118	-100	1,018	1,016	82,881	306	79,989	2,892	-100
9	165	0	460	56	12	681	1,069	-100	969	967	83,848	0	79,989	3,859	-100
10	165	43	461	127	13	796	954	-100	854	854	84,702	0	79,989	4,713	-100
11	0	0	506	1,132	14	1,638	112	-100	12	12	84,714	0	79,989	4,725	-100
The estimated Montague discharge was greater than Montague design rate September 15-19, 1997															
Sept. 17	711	0	802	0	Sept. 20	1,513	237	-100	137	137	84,851	7	79,996	4,855	-100
18	0	0	774	0	21	845	905	-100	805	809	85,660	649	80,645	5,015	-100
19	0	71	725	29	22	754	996	-100	896	902	86,562	1,092	81,737	4,825	-100
20	704	0	712	25	23	1,441	309	-100	209	214	86,776	124	81,861	4,915	-100
21	704	0	730	90	24	1,524	226	-100	126	126	86,902	336	82,197	4,705	-100
22	704	71	639	63	25	1,477	273	-100	173	172	87,074	412	82,609	4,465	-100
23	704	71	592	19	26	1,386	364	-100	264	265	87,339	485	83,094	4,245	-100
24	704	0	576	11	27	1,291	459	-100	359	367	87,706	587	83,681	4,025	-100
25	0	0	384	7	28	391	1,359	-100	1,259	1,259	88,965	1,479	85,160	3,805	-100
26	0	0	492	0	29	492	1,258	-100	1,158	1,159	90,124	1,309	86,469	3,655	-100
27	0	0	522	216	30	738	1,012	-100	912	913	91,037	943	87,412	3,625	-100

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 Col. 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 11.
Col. 10 = Summation of Col. 9.
Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 11), 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 ±100.

Table 10. 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 deficiency	Balancing adjustment	Directed release	Computation of the balancing adjustment					
	Powerplant release forecasts		Uncontrolled runoff							Adjusted directed release		Actual deficiency			
Date of advance estimate	Lake Wallenpaupack ft^3/s	Rio Reservoir ft^3/s	Current conditions ft^3/s	Weather adjustment ft^3/s	Date	Discharge ft^3/s	ft^3/s	ft^3/s	ft^3/s	Daily ft^3/s	Cumulative $(ft^3/s)\cdot d$	Daily ft^3/s	Cumulative $(ft^3/s)\cdot d$	Cumulative difference $(ft^3/s)\cdot d$	Balancing adjustment ft^3/s
1997	1	2	3	4		5	6	7	8	9	10	11	12	13	14
Sept. 28	0	53	521	135	Oct. 1	709	1,041	-100	941	938	91,975	1,018	88,430	3,545	-100
29	0	0	493	0	2	493	1,257	-100	1,157	1,155	93,130	1,175	89,605	3,525	-100
30	0	0	541	22	3	563	1,187	-100	1,087	1,093	94,223	443	90,048	4,175	-100
Oct. 1	0	71	711	0	4	782	968	-100	868	865	95,088	1,075	91,123	3,965	-100
2	0	0	685	0	5	685	1,065	-100	965	964	96,052	1,214	92,337	3,715	-100
3	0	0	654	12	6	666	1,084	-100	984	981	97,033	1,171	93,508	3,525	-100
4	0	0	632	9	7	641	1,109	-100	1,009	1,009	98,042	219	93,727	4,315	-100
5	0	0	588	0	8	588	1,162	-100	1,062	1,066	99,108	376	94,103	5,005	-100
6	245	0	588	0	9	833	917	-100	817	817	99,925	657	94,760	5,165	-100
7	0	0	501	0	10	501	1,249	-100	1,149	1,150	101,075	1,330	96,090	4,985	-100
8	0	0	482	0	11	482	1,268	-100	1,168	1,170	102,245	1,360	97,450	4,795	-100
9	0	0	458	0	12	458	1,292	-100	1,192	1,188	103,433	1,418	98,868	4,565	-100
10	0	0	429	0	13	429	1,321	-100	1,221	1,217	104,650	1,307	100,175	4,475	-100
11	0	0	350	0	14	350	1,400	-100	1,300	1,298	105,948	1,328	101,503	4,445	-100
12	0	0	337	13	15	350	1,400	-100	1,300	1,298	107,246	1,198	102,701	4,545	-100
13	0	0	322	22	16	344	1,406	-100	1,306	1,303	108,549	1,303	104,004	4,545	-100
14	0	106	274	19	17	399	1,351	-100	1,251	1,250	109,799	1,310	105,314	4,485	-100
15	0	0	315	0	18	315	1,435	-100	1,335	1,331	111,130	1,391	106,705	4,425	-100
16	0	71	342	0	19	413	1,337	-100	1,237	1,237	112,367	1,257	107,962	4,405	-100
17	0	0	321	0	20	321	1,429	-100	1,329	1,346	113,713	1,396	109,358	4,355	-100
18	0	0	360	0	21	360	1,390	-100	1,290	1,287	115,000	1,207	110,565	4,435	-100
19	0	0	312	0	22	312	1,438	-100	1,338	1,334	116,334	1,354	111,919	4,415	-100
20	0	0	295	0	23	295	1,455	-100	1,355	1,355	117,689	1,345	113,264	4,425	-100
21	0	0	305	0	24	305	1,445	-100	1,345	1,346	119,035	1,326	114,590	4,445	-100
22	0	0	311	0	25	311	1,439	-100	1,339	1,337	120,372	1,147	115,737	4,635	-100
23	0	0	356	160	26	516	1,234	-100	1,134	1,134	121,506	1,104	116,841	4,665	-100
24	0	0	349	159	27	508	1,242	-100	1,142	1,139	122,645	969	117,810	4,835	-100
25	0	142	489	392	28	1,023	727	-100	627	649	123,294	809	118,619	4,675	-100
26	0	0	671	503	29	1,174	576	-100	476	472	123,766	792	119,411	4,355	-100

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 Col. 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 11.
Col. 10 = Summation of Col. 9.
Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 11), 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 100.

Table 10. 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]

Date of advance estimate	Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases						Indicated deficiency	Balancing adjustment	Directed release	Computation of the balancing adjustment					
	Powerplant release forecasts		Uncontrolled runoff		Date	Discharge				Adjusted directed release		Actual deficiency		Cumulative difference	Balancing adjustment
	Lake Wallenpaupack	Rio Reservoir	Current conditions	Weather adjustment						Daily	Cumulative	Daily	Cumulative		
	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
1997	1	2	3	4		5	6	7	8	9	10	11	12	13	14
MONTAGUE DESIGN RATE = 1,655 ft^3/s OCTOBER 30 TO NOVEMBER 30, 1997															
Oct. 27	0	0	740	33	Oct. 30	773	882	0	*782	782	782	717	717	65	-6
28	0	0	907	0	31	907	748	0	*648	652	1,434	727	1,444	-10	+1
29	0	71	892	0	Nov. 1	963	692	0	*592	594	2,028	619	2,063	-35	+4
30	0	0	800	275	2	1,075	580	0	*480	483	2,511	88	2,151	360	-36
31	0	142	751	568	3	1,461	194	-6	188	188	2,699	0	2,151	548	-50

* - The directed release was reduced by 100 ft^3/s each day October 30 to November 2, 1997 per the fishery protection program (Table).

The estimated Montague discharge was greater than the Montague design rate November 4-30, 1997

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 Col. 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 11.
Col. 10 = Summation of Col. 9.
Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 11), 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 ±50

Table 11. Controlled releases for reservoirs in the upper Delaware River basin and segregation of flow of 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 Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-	Rio		Controlled releases			Computed		Excess Release Credits	
									N.Y.C. reservoirs		Power-	uncon-			
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
Nov. 28		48	36	25	Nov. 30	408	648	Dec. 1		109	1,056	7,195	8,360		
29		48	36	25	Dec. 1	1,342	660	2		109	2,002	35,789	37,900		
30		48	36	25	2	903	851	3		109	1,754	48,737	50,600		
Dec. 1		48	36	25	3	881	844	4		109	1,725	30,166	32,000		
2		46	36	25	4	869	812	5		107	1,681	21,512	23,300		
3		46	36	25	5	870	816	6		107	1,686	18,007	19,800		
4		46	36	25	6	899	780	7		107	1,679	16,914	18,700		
5		46	34	25	7	1,420	823	8		105	2,243	15,552	17,900		
6		46	36	25	8	1,420	872	9		107	2,292	13,401	15,800		
7		46	36	25	9	964	794	10		107	1,758	11,335	13,200		
8		46	34	25	10	1,001	844	11		105	1,845	9,750	11,700		
9		45	36	25	11	1,416	766	12		106	2,182	10,112	12,400		
10		46	36	25	12	1,409	794	13		107	2,203	14,390	16,700		
11		46	36	25	13	1,402	819	14		107	2,221	24,072	26,400		
12		46	36	25	14	1,415	851	15		107	2,266	24,127	26,500		
13		46	36	25	15	1,430	748	16		107	2,178	19,415	21,700		
14		46	36	25	16	1,428	766	17		107	2,194	17,399	19,700		
15		46	36	25	17	1,428	865	18		107	2,293	19,400	21,800		
16		46	36	25	18	1,427	837	19		107	2,264	20,729	23,100		
17		46	36	25	19	1,721	787	20		107	2,508	18,685	21,300		
18		46	36	25	20	1,780	801	21		107	2,581	14,912	17,600		
19		48	36	25	21	1,780	794	22		109	2,574	12,317	15,000		
20		48	36	25	22	1,778	787	23		109	2,565	10,726	13,400		
21		48	36	25	23	1,478	794	24		109	2,272	9,919	12,300		
22		48	36	25	24	1,719	777	25		109	2,496	12,395	15,000		
23		48	36	25	25	1,693	791	26		109	2,484	12,507	15,100		
24		46	36	25	26	906	748	27		107	1,654	10,639	12,400		
25		46	36	25	27	684	738	28		107	1,422	9,971	11,500		
26		46	36	25	28	837	631	29		107	1,468	8,725	10,300		
27		46	36	25	29	404	620	30		107	1,024	9,969	11,100		
28		46	36	25	30	954	720	31		107	1,674	9,719	11,500		
Total	0	1,443	1,112	775		38,066	24,178		0	3,330	62,244	518,486	584,060		

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 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued)
and segregation of flow of 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 Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-	Rio		Controlled releases			Computed		Excess Release Credits	
									N.Y.C. reservoirs		Power-	uncon-			
Date	Amount				Date	paupack	Reservoir	Date	Directed	Other	plants	trolled	Total	Daily	Cumul.
1996/97	1	2	3	4		5	6		7	8	9	10	11	12	13
Dec. 29		46	36	25	Dec. 31	824	684	Jan. 1		107	1,508	8,195	9,810		
30		48	36	25	Jan. 1	377	780	2		109	1,157	7,754	9,020		
31		46	36	25	2	951	706	3		107	1,657	7,246	9,010		
Jan. 1		46	36	25	3	820	567	4		107	1,387	7,246	8,740		
2		46	36	25	4	277	610	5		107	887	7,626	8,620		
3		46	36	25	5	395	691	6		107	1,086	7,707	8,900		
4		45	36	25	6	789	681	7		106	1,470	7,214	8,790		
5		45	36	25	7	797	585	8		106	1,382	6,292	7,780		
6		45	36	25	8	927	0	9		106	927	5,447	6,480		
7		45	36	25	9	703	0	10		106	703	5,581	6,390		
8		45	36	25	10	942	340	11		106	1,282	5,412	6,800		
9		46	36	25	11	1,039	426	12		107	1,465	5,028	6,600		
10		46	36	25	12	901	383	13		107	1,284	4,509	5,900		
11		46	36	25	13	960	660	14		107	1,620	4,273	6,000		
12		46	36	25	14	929	560	15		107	1,489	3,904	5,500		
13		46	36	25	15	798	511	16		107	1,309	3,384	4,800		
14		46	36	25	16	485	546	17		107	1,031	4,262	5,400		
15		46	36	25	17	509	674	18		107	1,183	3,510	4,800		
16		46	36	25	18	812	532	19		107	1,344	3,049	4,500		
17		46	36	25	19	929	613	20		107	1,542	2,751	4,400		
18		46	36	25	20	934	681	21		107	1,615	2,778	4,500		
19		46	36	25	21	931	539	22		107	1,470	3,023	4,600		
20		46	36	25	22	930	238	23		107	1,168	3,225	4,500		
21		46	36	25	23	953	532	24		107	1,485	3,708	5,300		
22		46	36	25	24	817	223	25		107	1,040	3,553	4,700		
23		46	36	25	25	0	223	26		107	223	3,370	3,700		
24		45	36	25	26	104	152	27		106	256	3,438	3,800		
25		45	36	25	27	925	0	28		106	925	3,169	4,200		
26		45	36	25	28	961	202	29		106	1,163	2,931	4,200		
27		156	36	25	29	943	440	30		217	1,383	2,800	4,400		
28		155	36	25	30	951	188	31		216	1,139	2,645	4,000		
Total	0	1,639	1,116	775		23,613	13,967		0	3,530	37,580	145,030	186,140		

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 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued)
and segregation of flow of 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 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.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
Jan. 29		311	34	23	Jan. 31	824	149	Feb. 1		368	973	2,359	3,700		
30		320	34	25	Feb. 1	0	138	2		379	138	2,383	2,900		
31		470	36	25	2	0	0	3		531	0	2,269	2,800		
Feb. 1		453	36	25	3	639	433	4		514	1,072	2,114	3,700		
2		444	34	25	4	376	408	5		503	784	2,513	3,800		
3		54	34	25	5	286	472	6		113	758	3,729	4,600		
4		46	36	25	6	286	358	7		107	644	3,549	4,300		
5		46	34	25	7	172	362	8		105	534	3,171	3,810		
6		46	36	25	8	0	457	9		107	457	2,906	3,470		
7		46	36	25	9	110	447	10		107	557	2,516	3,180		
8		46	36	25	10	284	110	11		107	394	2,379	2,880		
9		46	36	25	11	279	152	12		107	431	2,312	2,850		
10		46	36	25	12	287	511	13		107	798	2,215	3,120		
11		46	36	25	13	287	184	14		107	471	2,152	2,730		
12		46	36	25	14	172	110	15		107	282	2,111	2,500		
13		43	34	25	15	0	67	16		102	67	2,061	2,230		
14		46	34	25	16	0	301	17		105	301	2,164	2,570		
15		46	34	25	17	46	408	18		105	454	2,021	2,580		
16		46	34	25	18	936	404	19		105	1,340	2,035	3,480		
17		46	34	25	19	968	309	20		105	1,277	3,148	4,530		
18		46	34	25	20	942	319	21		105	1,261	4,154	5,520		
19		46	36	25	21	822	110	22		107	932	6,741	7,780		
20		46	36	25	22	0	152	23		107	152	14,741	15,000		
21		46	36	25	23	111	532	24		107	643	13,750	14,500		
22		45	36	25	24	925	475	25		106	1,400	10,594	12,100		
23		45	36	25	25	921	475	26		106	1,396	8,798	10,300		
24		306	36	25	26	846	472	27		367	1,318	8,005	9,690		
25		449	36	25	27	949	457	28		510	1,406	10,784	12,700		
Total	0	3,722	986	698		11,468	8,772		0	5,406	20,240	127,674	153,320		

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 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued) and segregation of flow of 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 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.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
Feb. 26		546	36	25	Feb. 28	831	429	Mar. 1		607	1,260	10,833	12,700		
27		770	36	25	Mar. 1	0	425	2		831	425	9,744	11,000		
28		473	42	25	2	107	479	3		540	586	12,574	13,700		
Mar. 1		40	45	25	3	938	557	4		110	1,495	11,395	13,000		
2		42	45	25	4	918	567	5		112	1,485	9,703	11,300		
3		45	45	25	5	939	418	6		115	1,357	12,628	14,100		
4		45	45	25	6	902	674	7		115	1,576	15,109	16,800		
5		45	45	25	7	845	621	8		115	1,466	11,619	13,200		
6		46	45	25	8	0	734	9		116	734	10,150	11,000		
7		48	45	25	9	68	699	10		118	767	9,315	10,200		
8		48	45	25	10	906	617	11		118	1,523	8,559	10,200		
9		48	45	25	11	958	652	12		118	1,610	7,612	9,340		
10		48	45	25	12	942	628	13		118	1,570	6,592	8,280		
11		48	45	25	13	921	649	14		118	1,570	5,842	7,530		
12		46	45	25	14	929	681	15		116	1,610	6,454	8,180		
13		46	45	25	15	932	387	16		116	1,319	6,405	7,840		
14		46	45	25	16	950	291	17		116	1,241	5,243	6,600		
15		45	45	25	17	927	340	18		115	1,267	4,828	6,210		
16		45	45	25	18	945	319	19		115	1,264	4,581	5,960		
17		46	45	25	19	941	333	20		116	1,274	4,430	5,820		
18		43	45	25	20	940	372	21		113	1,312	4,255	5,680		
19		42	45	25	21	809	376	22		112	1,185	4,013	5,310		
20		46	45	25	22	0	362	23		116	362	5,042	5,520		
21		46	45	25	23	0	404	24		116	404	4,480	5,000		
22		46	45	25	24	113	436	25		116	549	4,155	4,820		
23		46	45	25	25	938	468	26		116	1,406	4,498	6,020		
24		46	45	25	26	284	344	27		116	628	7,176	7,920		
25		46	65	25	27	175	418	28		136	593	6,851	7,580		
26		46	45	25	28	0	433	29		116	433	7,731	8,280		
27		46	45	25	29	0	408	30		116	408	9,576	10,100		
28		46	45	25	30	109	418	31		116	527	13,257	13,900		
Total	0	3,065	1,394	775		18,267	14,939		0	5,234	33,206	244,650	283,090		

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 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued) and segregation of flow of 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 Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncon-trolled	Total	Excess Release Credits	
Date	Amount				Date			Date	Directed	Other				Daily	Cumul.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
Mar. 29		46	45	25	Mar. 31	962	184	Apr. 1		116	1,146	17,638	18,900		
30		46	45	25	Apr. 1	696	426	2		116	1,122	16,362	17,600		
31		46	45	25	2	286	440	3		116	726	16,558	17,400		
Apr. 1		46	45	25	3	294	741	4		116	1,035	17,749	18,900		
2		46	45	25	4	89	830	5		116	919	18,265	19,300		
3		46	45	25	5	0	759	6		116	759	17,825	18,700		
4		46	45	23	6	109	784	7		114	893	16,893	17,900		
5		45	43	25	7	290	809	8		113	1,099	15,388	16,600		
6		46	45	25	8	285	755	9		116	1,040	13,144	14,300		
7		46	45	25	9	749	798	10		116	1,547	10,937	12,600		
8		46	45	25	10	288	755	11		116	1,043	9,441	10,600		
9		46	45	25	11	169	638	12		116	807	8,237	9,160		
10		46	45	25	12	0	411	13		116	411	8,723	9,250		
11		46	45	25	13	117	362	14		116	479	8,955	9,550		
12		46	45	25	14	284	511	15		116	795	7,719	8,630		
13		46	45	25	15	224	397	16		116	621	6,523	7,260		
14		46	45	25	16	305	582	17		116	887	5,647	6,650		
15		46	79	25	17	283	287	18		150	570	5,540	6,260		
16		46	57	25	18	166	709	19		128	875	5,167	6,170		
17		48	45	25	19	0	489	20		118	489	5,053	5,660		
18		46	45	25	20	0	570	21		116	570	4,944	5,630		
19		46	45	25	21	0	468	22		116	468	4,876	5,460		
20		46	45	25	22	0	238	23		116	238	4,606	4,960		
21		46	45	25	23	0	299	24		116	299	4,165	4,580		
22		46	45	25	24	0	422	25		116	422	4,082	4,620		
23		46	45	25	25	0	230	26		116	230	3,824	4,170		
24		46	45	25	26	0	124	27		116	124	3,600	3,840		
25		45	45	25	27	0	348	28		115	348	3,997	4,460		
26		45	45	25	28	0	543	29		115	543	5,962	6,620		
27		46	84	25	29	0	181	30		155	181	5,704	6,040		
Total	0	1,379	1,433	748		5,596	15,090		0	3,560	20,686	277,524	301,770		

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 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued) and segregation of flow of 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 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.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
Apr. 28		46	114	25	Apr. 30	0	96	May 1		185	96	5,039	5,320		
29		46	60	32	May 1	0	262	2		138	262	4,670	5,070		
30		50	45	50	2	0	117	3		145	117	4,818	5,080		
May 1		70	50	53	3	0	241	4		173	241	8,936	9,350		
2		70	45	51	4	118	223	5		166	341	10,293	10,800		
3		70	45	51	5	170	301	6		166	471	8,563	9,200		
4		70	45	50	6	0	333	7		165	333	8,572	9,070		
5		70	46	51	7	0	365	8		167	365	8,148	8,680		
6		71	45	51	8	0	382	9		167	382	7,261	7,810		
7		71	45	53	9	0	99	10		169	99	7,492	7,760		
8		71	45	53	10	0	0	11		169	0	7,801	7,970		
9		71	45	53	11	0	241	12		169	241	7,500	7,910		
10		71	45	53	12	0	507	13		169	507	6,724	7,400		
11		71	45	53	13	0	234	14		169	234	6,397	6,800		
12		71	46	53	14	0	312	15		170	312	5,798	6,280		
13		71	45	53	15	0	280	16		169	280	5,161	5,610		
14		71	45	53	16	0	209	17		169	209	4,742	5,120		
15		71	45	53	17	0	206	18		169	206	4,485	4,860		
16		71	45	53	18	119	181	19		169	300	4,461	4,930		
17		70	45	53	19	284	606	20		168	890	6,422	7,480		
18		70	45	53	20	168	316	21		168	484	9,648	10,300		
19		74	45	53	21	0	245	22		172	245	8,393	8,810		
20		91	45	53	22	0	326	23		189	326	7,335	7,850		
21		84	45	53	23	0	28	24		182	28	6,500	6,710		
22		70	45	53	24	0	117	25		168	117	5,845	6,130		
23		70	45	53	25	0	181	26		168	181	5,621	5,970		
24		70	45	53	26	0	238	27		168	238	5,104	5,510		
25		70	45	53	27	0	234	28		168	234	4,388	4,790		
26		70	45	53	28	0	128	29		168	128	3,734	4,030		
27		70	45	53	29	0	117	30		168	117	3,255	3,540		
28		70	45	53	30	0	138	31		168	138	2,874	3,180		
Total	0	2,152	1,486	1,580		859	7,263		0	5,218	8,122	195,980	209,320		

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 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued)
and segregation of flow of 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 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.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
May 29	0	70	67	53	May 31	0	202	June 1	0	190	202	2,668	3,060		
30	0	70	45	53	June 1	54	124	2	0	168	178	2,524	2,870		
31	0	74	125	53	2	341	163	3	0	252	504	3,024	3,780		
June 1	0	96	162	53	3	520	181	4	0	311	701	3,038	4,050		
2	0	96	162	53	4	397	135	5	0	311	532	2,657	3,500		
3	0	96	162	53	5	245	121	6	0	311	366	2,153	2,830		
4	0	96	176	53	6	169	50	7	0	325	219	1,946	2,490		
5	0	96	162	53	7	0	170	8	0	311	170	1,829	2,310		
6	0	96	162	53	8	0	92	9	0	311	92	1,677	2,080		
7	0	96	162	53	9	351	195	10	0	311	546	1,563	2,420		
8	0	94	164	62	10	281	259	11	0	320	540	1,480	2,340		
9	0	96	237	104	11	235	348	12	0	437	583	1,310	2,330		
10	88	141	232	53	12	274	220	13	88	338	494	1,370	2,290		
11	211	97	161	53	13	0	301	14	211	100	301	1,258	1,870		
12	680	97	532	53	14	0	0	15	682	0	0	1,238	1,920	170	170
13	585	97	436	53	15	0	0	16	586	0	0	1,244	1,830	80	250
14	209	97	161	51	16	287	0	17	209	100	287	1,224	1,820	70	320
15	265	97	161	53	17	276	82	18	265	46	358	1,191	1,860	100	420
16	345	97	200	53	18	277	60	19	350	0	337	1,243	1,930	180	600
17	0	97	161	53	19	286	99	20	0	311	385	1,254	1,950	100	700
18	515	99	356	53	20	412	0	21	508	0	412	1,080	2,000	250	950
19	792	105	605	90	21	294	0	22	800	0	294	1,066	2,160	410	1,360
20	677	108	473	90	22	0	89	23	671	0	89	1,090	1,850	100	1,460
21	269	111	308	70	23	395	145	24	269	220	540	1,041	2,070	100	1,560
22	525	91	376	53	24	402	0	25	520	0	402	948	1,870	120	1,680
23	528	91	429	84	25	788	0	26	525	79	788	958	2,350	521	2,201
24	484	110	294	84	26	476	0	27	488	0	476	1,016	1,980	230	2,431
25	634	110	466	53	27	402	0	28	629	0	402	979	2,010	260	2,691
26	1,014	93	826	90	28	131	64	29	1,009	0	195	876	2,080	330	3,021
27	746	93	540	116	29	216	46	30	749	0	262	739	1,750	0	3,021
Total	8,567	2,907	8,503	1,901		7,509	3,146		8,559	4,752	10,655	45,684	69,650		

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.

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, 1997 = 11,418 $(ft^3/s)\cdot d$.

Table 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued)
and segregation of flow of 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 Delaware River at Montague							
									Controlled releases			Computed		Excess Release Credits	
									N.Y.C. reservoirs		Power-	uncon-			
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir								
Date	Amount				Date			Date	Directed	Other	plants	trolled	Total	Daily	Cumul.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
June 28	618	102	398	127	June 30	274	64	July 1	627	0	338	685	1,650	-100	2,921
29	602	133	412	67	July 1	280	74	2	612	0	354	674	1,640	-110	2,811
30	688	99	541	51	2	282	170	3	691	0	452	607	1,750	0	2,811
July 1	672	91	529	53	3	568	92	4	673	0	660	707	2,040	290	3,101
2	967	93	812	53	4	0	0	5	958	0	0	592	1,550	-200	2,901
3	1,017	91	876	53	5	0	0	6	1,020	0	0	520	1,540	-210	2,691
4	1,113	91	968	53	6	0	0	7	1,112	0	0	508	1,620	-130	2,561
5	831	94	688	53	7	396	0	8	835	0	396	559	1,790	40	2,601
6	929	94	784	53	8	405	124	9	931	0	529	580	2,040	290	2,891
7	948	94	780	74	9	213	340	10	948	0	553	739	2,240	490	3,381
8	996	94	829	74	10	272	127	11	997	0	399	694	2,090	340	3,721
9	702	94	554	54	11	280	121	12	702	0	401	667	1,770	20	3,741
10	1,182	94	1,033	54	12	133	102	13	1,181	0	235	504	1,920	170	3,911
11	1,193	94	1,049	56	13	381	0	14	1,196	3	381	610	2,190	437	4,348
12	913	94	758	79	14	465	191	15	913	18	656	443	2,030	262	4,610
13	968	94	763	110	15	360	160	16	967	0	520	473	1,960	210	4,820
14	953	130	712	114	16	318	0	17	953	3	318	506	1,780	30	4,850
15	941	141	674	131	17	215	0	18	946	0	215	719	1,880	130	4,980
16	677	149	401	130	18	188	259	19	680	0	447	553	1,680	-70	4,910
17	1,118	150	910	56	19	158	195	20	1,116	0	353	391	1,860	110	5,020
18	1,194	96	933	53	20	97	78	21	1,082	0	175	413	1,670	-80	4,940
19	1,147	96	1,004	53	21	0	117	22	1,153	0	117	420	1,690	-60	4,880
20	1,172	94	1,023	53	22	134	174	23	1,170	0	308	522	2,000	250	5,130
21	1,256	93	1,111	53	23	0	213	24	1,257	0	213	400	1,870	120	5,250
22	961	94	814	53	24	0	181	25	961	0	181	488	1,630	-120	5,130
23	939	94	792	53	25	0	89	26	939	0	89	452	1,480	-270	4,860
24	1,205	94	1,015	94	26	227	174	27	1,203	0	401	296	1,900	150	5,010
25	1,137	116	927	94	27	273	82	28	1,137	0	355	398	1,890	140	5,150
26	759	116	554	94	28	323	134	29	764	0	457	619	1,840	90	5,240
27	855	114	644	94	29	357	96	30	852	0	453	385	1,690	-60	5,180
28	891	113	687	91	30	348	21	31	891	0	369	340	1,600	-150	5,030
Total	29,544	3,236	23,975	2,280		6,947	3,378		29,467	24	10,325	16,464	56,280		

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, 1997 = 11,418 $(ft^3/s)\cdot d$.

Table 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued)
and segregation of flow of 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 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.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
July 29	962	113	800	51	July 31	351	170	Aug. 1	964	0	521	345	1,830	80	5,110
30	1,064	93	919	51	Aug. 1	349	188	2	1,063	0	537	370	1,970	220	5,330
31	1,425	93	1,238	96	2	101	156	3	1,427	0	257	326	2,010	260	5,590
Aug. 1	1,463	121	1,245	93	3	104	0	4	1,459	0	104	277	1,840	90	5,680
2	1,358	121	1,139	96	4	107	96	5	1,356	0	203	301	1,860	110	5,790
3	1,164	121	993	54	5	105	199	6	1,168	0	304	418	1,890	140	5,930
4	1,441	93	1,295	54	6	0	156	7	1,442	0	156	392	1,990	240	6,170
5	1,438	94	1,290	54	7	0	89	8	1,438	0	89	223	1,750	0	6,170
6	1,366	94	1,219	53	8	0	71	9	1,366	0	71	263	1,700	-50	6,120
7	1,355	94	1,208	53	9	0	0	10	1,355	0	0	285	1,640		
8	1,227	94	1,055	76	10	0	0	11	1,225	0	0	245	1,470		
9	1,127	94	948	79	11	0	0	12	1,121	0	0	309	1,430		
10	1,331	114	1,165	53	12	0	0	13	1,332	0	0	318	1,650		
11	1,413	94	1,267	53	13	0	0	14	1,414	0	0	596	2,010		
12	1,491	94	1,347	53	14	0	113	15	1,494	0	113	563	2,170		
13	1,494	96	1,349	53	15	0	0	16	1,498	0	0	622	2,120		
14	1,281	96	1,097	94	16	323	149	17	1,287	0	472	591	2,350		
15	1,333	113	1,129	94	17	201	152	18	1,336	0	353	841	2,530		
16	1,260	113	1,054	94	18	159	0	19	1,261	0	159	700	2,120		
17	1,100	113	936	51	19	0	0	20	1,100	0	0	530	1,630		
18	938	93	792	53	20	0	0	21	938	0	0	892	1,830		
19	732	93	585	53	21	0	0	22	731	0	0	1,149	1,880		
20	450	93	303	53	22	0	71	23	449	0	71	980	1,500		
21	702	93	548	62	23	0	113	24	703	0	113	744	1,560		
22	764	93	617	53	24	0	0	25	763	0	0	757	1,520		
23	842	514	459	53	25	0	14	26	842	184	14	590	1,630		
24	924	514	541	53	26	0	0	27	924	184	0	522	1,630		
25	1,043	507	484	54	27	0	103	28	1,045	0	103	612	1,760		
26	1,126	382	684	60	28	0	262	29	1,126	0	262	1,012	2,400		
27	1,028	381	596	54	29	0	209	30	1,031	0	209	1,110	2,350		
28	857	384	430	54	30	0	0	31	868	0	0	932	1,800		
Total	35,499	5,205	28,732	1,957		1,800	2,311		35,526	368	4,111	17,815	57,820		

Note: Release of the excess quantity suspended by the Parties to the Decree effective August 10, 1997.

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, 1997 = 11,418 $(ft^3/s)\cdot d$.

Table 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued)
and segregation of flow of 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 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.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
Aug. 29	643	308	286	51	Aug. 31	188	106	Sept. 1	645	0	294	891	1,830		
30	915	458	407	51	Sept. 1	86	128	2	916	0	214	890	2,020		
31	871	458	339	73	2	161	67	3	870	0	228	902	2,000		
Sept. 1	704	348	286	70	3	12	103	4	704	0	115	751	1,570		
2	653	317	285	51	4	229	106	5	653	0	335	692	1,680		
3	699	364	285	51	5	72	60	6	700	0	132	588	1,420		
4	1,022	456	507	59	6	0	0	7	1,022	0	0	528	1,550		
5	1,086	455	577	53	7	0	0	8	1,085	0	0	595	1,680		
6	986	455	484	53	8	200	0	9	992	0	200	598	1,790		
7	1,025	455	517	53	9	153	113	10	1,025	0	266	569	1,860		
8	1,018	507	456	53	10	157	103	11	1,016	0	260	1,184	2,460		
9	969	515	399	53	11	457	238	12	967	0	695	3,128	4,790		
10	854	512	289	53	12	696	0	13	854	0	696	2,920	4,470		
11	12	77	159	53	13	400	0	14	12	277	400	2,521	3,210		
12	0	70	159	53	14	104	0	15	0	282	104	1,694	2,080		
13	0	70	159	53	15	822	0	16	0	282	822	1,386	2,490		
14	0	70	161	53	16	847	0	17	0	284	847	1,309	2,440		
15	0	70	87	53	17	877	0	18	0	210	877	1,143	2,230		
16	0	70	45	53	18	829	64	19	0	168	893	1,029	2,090		
17	137	71	63	53	19	717	0	20	137	50	717	1,026	1,930		
18	805	493	263	53	20	529	145	21	809	0	674	427	1,910		
19	896	147	702	53	21	0	71	22	902	0	71	587	1,560		
20	209	68	93	53	22	657	0	23	214	0	657	969	1,840		
21	126	68	45	53	23	712	0	24	126	40	712	702	1,580		
22	173	70	51	51	24	710	18	25	172	0	728	610	1,510		
23	264	70	144	51	25	711	99	26	265	0	810	455	1,530		
24	359	73	241	53	26	695	71	27	367	0	766	397	1,530		
25	1,259	487	719	53	27	0	0	28	1,259	0	0	271	1,530		
26	1,158	407	690	62	28	0	0	29	1,159	0	0	441	1,600		
27	912	167	693	53	29	118	124	30	913	0	242	565	1,720		
Total	17,755	8,156	9,591	1,630		11,139	1,616		17,784	1,593	12,755	29,768	61,900		

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, 1997 = 11,418 $(ft^3/s)\cdot d$.

Table 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued)
and segregation of flow of 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 Delaware River at Montague							
Directed		Pepacton	Cannonsville	Neversink		Lake Wallen-paupack	Rio Reservoir		Controlled releases			Computed uncon-trolled		Excess Release Credits	
									N.Y.C. reservoirs		Power-plants				
Date	Amount				Date			Date	Directed	Other			Total	Daily	Cumul.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
Sept. 28	941	192	693	53	Sept. 30	22	106	Oct. 1	938		128	604	1,670		
29	1,157	408	704	43	Oct. 1	0	106	2	1,155		106	469	1,730		
30	1,087	367	701	25	2	579	106	3	1,093		685	622	2,400		
Oct. 1	868	147	693	25	3	0	96	4	865		96	579	1,540		
2	965	243	696	25	4	0	0	5	964		0	536	1,500		
3	984	263	693	25	5	126	7	6	981		133	446	1,560		
4	1,009	288	696	25	6	933	0	7	1,009		933	598	2,540		
5	1,062	342	699	25	7	914	0	8	1,066		914	460	2,440		
6	817	339	453	25	8	408	0	9	817		408	685	1,910		
7	1,149	427	698	25	9	0	60	10	1,150		60	360	1,570		
8	1,168	447	698	25	10	0	0	11	1,170		0	390	1,560		
9	1,192	473	690	25	11	0	0	12	1,188		0	332	1,520		
10	1,221	501	671	45	12	0	170	13	1,217		170	273	1,660		
11	1,300	500	753	45	13	0	53	14	1,298		53	369	1,720		
12	1,300	498	755	45	14	0	241	15	1,298		241	311	1,850		
13	1,306	498	780	25	15	0	106	16	1,303		106	341	1,750		
14	1,251	495	730	25	16	0	0	17	1,250		0	440	1,690		
15	1,335	495	811	25	17	0	0	18	1,331		0	359	1,690		
16	1,237	493	719	25	18	0	78	19	1,237		78	415	1,730		
17	1,329	492	829	25	19	0	0	20	1,346		0	354	1,700		
18	1,290	490	772	25	20	113	0	21	1,287		113	430	1,830		
19	1,338	489	820	25	21	0	0	22	1,334		0	396	1,730		
20	1,355	487	843	25	22	0	0	23	1,355		0	405	1,760		
21	1,345	520	801	25	23	0	0	24	1,346		0	424	1,770		
22	1,339	523	789	25	24	0	92	25	1,337		92	511	1,940		
23	1,134	521	588	25	25	0	121	26	1,134		121	525	1,780		
24	1,142	521	593	25	26	0	131	27	1,139		131	650	1,920		
25	627	175	449	25	27	0	0	28	649		0	941	1,590		
26	476	20	427	25	28	0	0	29	472		0	958	1,430		
27	782	149	608	25	29	0	0	30	782		0	838	1,620		
28	648	149	478	25	30	0	28	31	652		28	800	1,480		
Total	34,154	11,952	21,330	881		3,095	1,501		34,163	0	4,596	15,821	54,580		

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 11. Controlled releases for reservoirs in the upper Delaware River basin (Continued)
and segregation of flow of 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 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.
1997	1	2	3	4		5	6		7	8	9	10	11	12	13
Oct. 29	592	45	524	25	Oct. 31	0	156	Nov. 1	594	0	156	780	1,530		
30	480	45	413	25	Nov. 1	0	0	2	483	0	0	1,467	1,950		
31	188	45	118	25	2	0	0	3	188	0	0	2,042	2,230		
Nov. 1	0	19	26	15	3	0	0	4	0	60	0	2,910	2.970		
2	0	19	26	15	4	0	0	5	0	60	0	2,460	2,520		
3	0	19	26	15	5	0	0	6	0	60	0	2,010	2,070		
4	0	19	26	15	6	0	0	7	0	60	0	1,780	1,840		
5	0	19	26	15	7	27	85	8	0	60	112	1,608	1,780		
6	0	19	26	15	8	0	18	9	0	60	18	2,142	2,220		
7	0	19	26	15	9	0	0	10	0	60	0	3,170	3,230		
8	0	19	26	15	10	0	0	11	0	60	0	3,810	3,870		
9	0	19	26	15	11	0	64	12	0	60	64	2,956	3,080		
10	0	19	26	15	12	0	0	13	0	60	0	2,500	2,560		
11	0	19	26	15	13	0	35	14	0	60	35	2,335	2,430		
12	0	19	26	15	14	0	106	15	0	60	106	2,294	2,460		
13	0	19	26	15	15	0	0	16	0	60	0	2,290	2,350		
14	0	19	26	15	16	0	0	17	0	60	0	2,110	2,170		
15	0	19	26	15	17	0	0	18	0	60	0	1,940	2,000		
16	0	19	26	15	18	0	0	19	0	60	0	1,810	1,870		
17	0	19	26	15	19	3	60	20	0	60	63	1,697	1,820		
18	0	19	26	15	20	43	96	21	0	60	139	1,621	1,820		
19	0	19	26	15	21	18	138	22	0	60	156	1,724	1,940		
20	0	19	26	15	22	0	0	23	0	60	0	2,970	3,030		
21	0	19	26	15	23	0	70	24	0	60	70	3,850	3,980		
22	0	19	26	15	24	5	0	25	0	60	5	3,585	3,650		
23	0	19	26	15	25	0	0	26	0	60	0	3,080	3,140		
24	0	19	26	15	26	0	0	27	0	60	0	2,810	2,870		
25	0	19	26	15	27	0	0	28	0	60	0	3,120	3,180		
26	0	19	26	15	28	0	82	29	0	60	82	3,178	3,320		
27	0	19	26	15	29	0	145	30	0	60	145	3,065	3,270		
Total	1,260	648	1,757	480		96	1,055		1,265	1,620	1,151	73,114	77,150		

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 12. 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 1996	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date	Date 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date
Dec. 1	451	0	208	677	Jan. 1	436	0	407	648
2	25	0	240	675	2	451	0	391	649
3	0	0	253	673	3	450	0	432	650
4	0	0	251	670	4	450	0	437	651
5	0	0	372	669	5	450	0	440	652
6	0	0	56	666	6	451	0	329	653
7	0	0	134	663	7	451	0	418	654
8	0	0	0	659	8	451	0	345	654
9	0	0	0	656	9	451	0	418	655
10	0	0	242	654	10	451	0	384	656
11	403	0	383	654	11	451	0	393	657
12	452	0	380	655	12	452	0	395	658
13	465	0	359	656	13	451	0	243	658
14	451	0	420	657	14	451	0	261	658
15	451	0	396	658	15	451	0	216	658
16	451	0	408	659	16	451	0	271	658
17	0	0	381	658	17	451	0	279	659
18	0	0	385	657	18	451	0	368	659
19	0	0	389	655	19	451	0	214	659
20	0	0	411	654	20	451	0	257	660
21	0	0	394	653	21	451	0	288	660
22	0	0	384	651	22	451	0	278	660
23	0	0	336	650	23	451	214	322	662
24	0	0	390	649	24	451	249	253	663
25	0	0	365	647	25	451	249	170	664
26	0	0	401	646	26	450	249	210	665
27	305	0	347	646	27	452	249	190	666
28	291	0	356	646	28	451	249	220	667
29	292	0	271	646	29	451	249	199	668
30	435	0	328	646	30	450	248	224	669
31	436	0	356	647	31	446	249	189	670
Total	4,908	0	9,596			13,958	2,205	9,441	

Table 12. 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 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date	Date 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date
Feb. 1	452	250	114	670	Mar. 1	452	0	111	688
2	451	250	235	671	2	452	0	124	688
3	450	250	163	672	3	452	297	15	688
4	451	249	203	673	4	451	298	0	688
5	451	250	218	674	5	451	0	0	687
6	450	291	186	675	6	451	0	0	687
7	451	299	201	676	7	451	0	2	686
8	451	299	196	677	8	451	0	0	685
9	451	299	195	678	9	451	0	0	684
10	451	299	171	679	10	451	0	152	684
11	452	299	202	680	11	451	0	146	683
12	452	299	213	681	12	450	200	146	684
13	450	299	195	682	13	450	201	148	684
14	451	299	199	683	14	451	299	120	685
15	451	299	158	684	15	451	299	83	685
16	451	299	179	685	16	451	299	113	686
17	450	299	160	686	17	451	299	103	687
18	450	299	162	687	18	450	299	98	687
19	451	299	89	687	19	451	299	96	688
20	451	299	153	688	20	451	299	101	688
21	451	299	59	689	21	451	299	98	689
22	452	300	79	689	22	451	299	99	689
23	453	299	143	690	23	451	299	89	690
24	451	299	111	691	24	451	299	106	690
25	451	25	114	690	25	451	299	82	691
26	423	0	85	690	26	451	299	94	691
27	451	0	101	689	27	451	299	79	692
28	451	0	98	689	28	452	16	0	691
					29	452	0	103	691
					30	452	0	72	690
					31	41	0	177	689
Total	12,601	6,948	4,382			13,574	5,198	2,557	

Table 12. 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 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date	Date 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1996 to date
Apr. 1	0	0	10	686	May 1	451	0	238	675
2	291	0	193	686	2	451	0	124	675
3	291	0	200	685	3	450	0	108	675
4	287	0	131	684	4	450	0	112	674
5	298	0	182	683	5	38	0	12	673
6	299	0	198	683	6	0	0	125	671
7	285	0	369	683	7	0	0	267	670
8	0	0	392	682	8	0	0	406	669
9	0	0	428	681	9	0	0	363	668
10	0	0	409	680	10	0	0	399	667
11	0	0	381	679	11	0	0	383	667
12	0	0	386	678	12	0	0	363	666
13	0	0	377	677	13	301	0	228	665
14	398	0	369	678	14	300	0	210	665
15	452	0	344	678	15	302	0	170	664
16	451	0	342	678	16	452	0	106	664
17	451	0	391	679	17	451	0	94	664
18	450	0	362	679	18	451	0	96	663
19	0	0	399	678	19	451	0	110	663
20	0	0	352	677	20	452	0	212	663
21	420	98	337	678	21	451	0	38	663
22	451	0	235	678	22	451	0	105	662
23	451	0	265	678	23	452	0	60	662
24	451	0	292	678	24	452	0	0	661
25	300	58	159	678	25	452	0	0	661
26	291	0	189	677	26	452	0	0	660
27	288	0	187	677	27	451	278	191	661
28	301	0	188	676	28	451	296	109	661
29	301	0	198	675	29	452	296	101	662
30	451	22	183	675	30	451	296	121	662
					31	451	296	75	663
Total	7,658	178	8,448			9,966	1,462	4,926	

Table 12. 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 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1997 to date	Date 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1997 to date
June 1	451	200	96	747	July 1	451	296	97	784
2	453	199	95	747	2	450	296	96	785
3	462	200	54	737	3	450	295	103	787
4	452	199	109	743	4	450	295	95	789
5	451	199	198	764	5	450	296	100	790
6	451	160	198	771	6	450	298	92	792
7	451	158	190	775	7	452	298	100	793
8	451	160	190	778	8	452	297	97	795
9	451	160	190	781	9	452	297	102	796
10	451	158	271	791	10	301	297	98	794
11	451	159	146	788	11	302	296	106	792
12	452	158	204	790	12	300	296	95	789
13	451	200	93	786	13	292	296	110	787
14	451	198	99	784	14	300	298	103	785
15	450	200	93	781	15	409	287	101	785
16	450	199	109	779	16	449	299	99	787
17	451	198	104	778	17	451	298	128	789
18	451	199	112	777	18	451	298	99	790
19	451	199	96	775	19	450	298	98	791
20	451	199	111	775	20	450	297	93	792
21	452	198	92	773	21	451	297	121	793
22	452	198	122	773	22	452	297	98	795
23	452	199	97	772	23	448	297	97	795
24	452	198	93	771	24	404	296	98	795
25	452	198	105	770	25	401	298	97	795
26	451	274	102	772	26	0	298	98	788
27	451	297	97	775	27	0	297	97	781
28	451	296	94	777	28	2	297	199	777
29	451	296	96	780	29	468	297	197	780
30	451	296	90	782	30	452	296	194	782
					31	452	296	211	785
Total	13,548	6,152	3,746			11,742	9,194	3,519	

Table 12. 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 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1997 to date	Date 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average June 1, 1997 to date
Aug. 1	452	298	184	788	Sept. 1	450	0	302	791
2	452	298	200	790	2	452	0	377	792
3	452	297	195	793	3	451	0	316	791
4	452	297	209	795	4	450	0	290	791
5	377	296	99	795	5	451	0	239	790
6	450	296	99	796	6	451	0	258	789
7	452	253	108	796	7	451	0	234	788
8	452	226	93	795	8	451	0	171	786
9	452	225	99	795	9	451	0	127	784
10	452	258	99	795	10	452	0	167	783
11	452	259	107	796	11	452	0	285	782
12	452	258	107	796	12	451	0	127	780
13	452	36	217	795	13	451	0	151	778
14	452	0	314	794	14	451	0	60	776
15	451	0	279	794	15	451	0	161	774
16	451	0	245	792	16	435	0	154	773
17	451	0	354	792	17	452	0	163	771
18	451	0	354	793	18	451	0	183	770
19	450	0	369	793	19	451	0	140	768
20	450	0	359	793	20	451	0	157	767
21	450	0	365	793	21	450	0	93	765
22	449	0	337	793	22	451	0	154	764
23	449	0	334	793	23	451	0	161	762
24	448	0	80	790	24	451	0	208	761
25	451	0	390	791	25	451	0	108	760
26	451	0	342	791	26	451	0	154	758
27	451	0	353	791	27	451	0	163	757
28	451	0	350	791	28	450	0	158	756
29	451	0	352	791	29	451	0	184	755
30	451	0	384	792	30	451	0	186	754
31	450	0	347	792					
Total	13,907	3,297	7,724			13,514	0	5,631	

Table 12. 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 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average to date June 1, 1997 or Oct. 27, 1997	Date 1997	East Delaware Tunnel	West Delaware Tunnel	Never-sink Tunnel	Average Oct. 27, 1997 to date
Oct. 1	451	0	136	753	Nov. 1	451	0	176	653
2	450	0	165	751	2	450	0	186	651
3	452	0	160	750	3	450	0	187	649
4	452	0	156	749	4	449	0	199	649
5	452	0	158	748	5	452	0	182	647
6	452	0	164	747	6	451	0	0	630
7	452	0	163	746	7	451	0	0	615
8	451	276	156	747	8	451	0	0	602
9	452	297	174	748	9	451	0	0	591
10	451	297	168	750	10	451	0	0	582
11	450	297	159	751	11	0	0	0	546
12	450	296	93	752	12	299	0	0	531
13	449	296	168	753	13	294	0	0	518
14	451	296	154	754	14	300	0	0	506
15	451	296	253	756	15	300	0	0	496
16	451	298	51	756	16	300	0	0	487
17	451	298	186	757	17	298	0	0	478
18	450	297	177	758	18	413	0	95	479
19	450	297	176	760	19	451	0	35	480
20	451	297	87	760	20	450	0	98	482
21	451	298	154	761	21	450	0	101	485
22	450	298	179	762	22	450	0	107	488
23	450	298	188	763	23	450	0	119	491
24	451	299	156	764	24	300	0	97	487
25	470	311	182	766	25	299	0	0	481
26	451	297	148	767	26	280	0	0	475
27	451	0	203	654	27	438	0	0	474
28	451	0	245	675	28	449	0	0	473
29	451	0	204	668	29	451	0	0	472
30	452	0	193	663	30	451	0	0	472
31	451	0	191	658					
Total	13,998	5,639	5,147			11,630	0	1,582	

Table 13. Daily mean discharge, East Branch Delaware River at Downsville, N.Y., (01417000) for the year ending November 30, 1997.
(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	900	719	418	215	2340	260	88	90	105	381	245	34
2	8980	596	420	42	2010	248	97	91	119	313	172	21
3	6800	563	233	45	1680	356	93	91	119	310	227	20
4	3990	592	46	266	2110	816	92	90	106	380	245	21
5	2820	513	46	580	2810	979	92	91	93	424	282	21
6	2360	474	45	1030	2880	1270	92	92	94	424	310	21
7	1910	400	45	1030	2880	1370	92	92	94	424	348	21
8	1620	316	45	829	2620	1260	92	92	95	446	397	21
9	1390	274	45	646	2180	1190	92	92	95	483	419	21
10	1200	253	45	545	1760	1380	115	92	105	484	443	20
11	992	181	45	453	1480	1350	115	92	105	285	457	20
12	748	93	46	333	1300	1250	95	92	95	68	457	20
13	1040	53	45	222	1300	1090	95	92	96	68	457	20
14	1540	43	45	184	1100	778	95	108	98	68	456	20
15	1460	43	45	154	618	581	95	124	104	69	456	20
16	1280	43	45	108	363	455	95	146	113	69	455	20
17	1380	43	45	60	244	304	95	142	112	69	454	20
18	2210	43	45	46	184	198	95	119	104	254	451	20
19	2460	43	46	43	246	220	99	92	95	311	450	20
20	2230	43	46	44	481	863	98	92	95	103	449	19
21	1840	43	46	45	655	950	109	92	95	69	463	19
22	1540	44	46	46	424	836	100	92	95	69	477	19
23	1350	44	46	46	287	699	88	92	284	67	476	19
24	1410	45	167	46	222	541	96	92	481	69	475	19
25	1940	45	354	46	180	434	103	102	479	253	330	19
26	1760	45	467	46	218	368	98	112	413	431	84	19
27	1520	92	627	47	245	264	90	112	363	269	77	19
28	1130	139	645	78	358	157	88	112	364	157	138	19
29	1060	216	---	266	404	106	113	112	330	277	92	19
30	1230	306	---	681	362	71	116	101	361	361	46	19
31	980	364	---	1510	---	69	---	92	436	---	46	---
Total	63070	6711	4239	9732	33941	20713	2923	3123	5743	7455	10334	610
Mean	2035	216	151	314	1131	668	97.4	101	185	249	333	20.3

Year total 168,594 $(ft^3/s)\cdot d$ Mean 462 ft^3/s

Table 14. Daily mean discharge, West Branch Delaware River at Stilesville, N.Y., (01425000) for the year ending November 30, 1997.
(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, $(ft^3/s)\cdot d$; e, estimated]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	1740	e1500	120	2980	2740	825	331	452	1190	304	e620	107
2	5420	e1300	114	2830	2680	824	319	456	1220	241	e620	e23
3	7760	e1350	101	2820	2650	896	281	752	1120	240	e620	e23
4	5840	e1400	84	2370	2940	1260	238	787	939	240	e620	e23
5	4310	e1350	70	2040	3420	1400	211	920	1260	412	e620	e23
6	3440	e1300	72	2340	3450	1420	150	600	1280	493	e620	e23
7	2850	e1250	108	2480	3250	1460	124	723	1190	399	e370	e23
8	2410	e1200	142	2240	2840	1380	115	697	1180	448	e620	e23
9	2060	e1150	136	1970	2420	1310	117	784	1030	383	e620	e25
10	1760	e1100	117	1780	2050	1460	177	508	899	322	e620	e23
11	1530	1060	93	1640	1750	1610	196	955	1150	261	e600	e23
12	1470	1010	70	1440	1520	1550	118	1010	1240	e150	e680	e23
13	1780	899	56	1140	1420	1490	436	718	1350	e130	e600	e23
14	2540	824	49	934	1320	1400	364	704	1330	e130	e760	e24
15	2740	786	45	788	1190	1280	138	654	1090	e130	640	e25
16	2650	731	44	662	1090	1170	122	624	1100	e76	753	e23
17	2610	740	45	511	955	1090	164	323	1030	e35	632	e23
18	2890	702	44	429	876	1020	126	875	913	e50	791	e23
19	2890	582	45	368	857	1070	274	876	733	e210	696	e23
20	2710	504	49	323	846	1610	520	964	517	e620	777	e23
21	2360	470	166	292	837	1890	396	978	262	e86	782	e23
22	2040	469	956	313	837	1830	262	1100	470	e35	757	e23
23	1790	463	2530	372	831	1690	303	790	552	e40	723	e23
24	1680	470	2640	336	809	1520	362	706	411	e110	568	e23
25	2090	393	2260	299	766	1370	246	1010	450	e200	510	e23
26	2050	322	2020	451	721	1270	383	865	428	e640	373	e23
27	1880	303	2310	717	694	1090	739	499	587	e620	368	e23
28	1740	259	3160	896	808	795	473	545	570	e620	560	e23
29	1650	228	---	1230	945	565	335	609	353	e620	427	e23
30	1690	183	---	1650	866	436	350	739	254	e620	449	e23
31	1590	142	---	2170	---	324	---	868	330	---	376	---
Total	81960	24440	17646	40811	48378	38305	8370	23091	26428	8865	18772	779
Mean	2644	788	630	1316	1613	1236	279	745	853	296	606	26.0

Year total 337,845 $(ft^3/s)\cdot d$ Mean 926 ft^3/s

Table 15. Daily mean discharge, Neversink River at Neversink, N.Y., (0143600) for the year ending November 30, 1997.
(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	24	24	23	26	25	38	48	54	60	54	32	24
2	25	24	23	26	25	47	48	46	84	65	23	21
3	24	23	23	26	26	49	48	46	84	55	24	16
4	24	24	24	26	26	48	48	46	71	46	24	16
5	31	24	24	26	26	47	48	46	48	47	23	16
6	81	23	23	25	25	69	48	46	48	54	23	15
7	307	22	24	24	25	117	48	46	48	48	23	16
8	264	22	24	25	211	50	48	54	48	48	24	16
9	312	23	24	25	171	49	48	66	55	48	23	16
10	250	23	23	25	53	49	72	59	68	48	23	15
11	33	23	24	25	22	49	71	48	64	49	30	15
12	24	22	23	24	22	49	46	47	48	48	42	15
13	24	22	23	25	23	49	46	56	48	48	42	15
14	25	22	24	25	27	49	46	81	48	48	36	15
15	24	23	23	24	22	49	46	97	61	48	25	15
16	24	23	23	25	22	49	46	106	85	48	25	15
17	24	23	23	25	22	49	48	114	85	48	25	15
18	45	22	23	25	22	48	48	92	70	48	25	15
19	120	23	24	25	22	49	48	47	47	48	25	15
20	96	23	24	25	22	48	58	47	48	47	25	15
21	25	23	24	25	23	49	79	47	48	47	24	15
22	24	23	25	25	23	49	72	47	48	48	23	15
23	24	23	24	25	23	49	56	46	56	47	23	15
24	24	23	24	25	23	49	56	46	48	47	23	14
25	28	23	24	25	22	49	74	60	48	48	23	15
26	24	23	24	25	22	49	64	84	48	48	24	15
27	24	23	25	25	23	49	59	85	49	48	23	13
28	24	23	26	26	23	48	80	83	55	56	23	15
29	23	23	---	26	23	48	113	83	48	48	23	15
30	23	23	---	25	23	48	93	67	48	48	23	15
31	23	23	---	26	---	48	---	45	46	---	24	---
Total	2047	711	665	780	1067	1586	1753	1937	1760	1478	798	468
Mean	66.0	22.9	23.8	25.2	35.6	51.2	58.4	62.5	56.8	49.3	25.7	15.6

Year total 15,050 $(ft^3/s)\cdot d$ Mean 41.2 ft^3/s

Table 16. Daily mean discharge, Wallenpaupack Creek at Wilsonville, Pa., (01432000) for the year ending November 30, 1997.
(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, $(ft^3/s)\cdot d$]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	854	274	0	0	701	0	0	280	349	86	0	0
2	1280	944	0	0	287	0	282	282	101	161	579	0
3	882	930	550	935	289	0	633	568	104	12	0	0
4	875	277	356	916	205	0	284	0	107	229	0	0
5	866	336	282	936	0	288	253	0	105	72	0	0
6	899	746	282	971	0	288	274	0	0	0	939	0
7	1060	788	287	954	283	0	0	396	0	0	918	27
8	1420	928	0	0	289	0	0	404	0	0	526	0
9	1320	812	0	0	745	0	351	213	0	153	0	0
10	997	831	282	899	288	0	281	272	0	157	0	0
11	1060	926	280	915	285	0	235	280	0	457	0	0
12	1410	917	284	945	0	0	274	133	0	696	0	0
13	10	939	287	921	0	0	0	381	0	0	0	0
14	1410	925	286	930	286	0	0	465	0	0	0	0
15	1430	920	0	929	290	0	0	360	0	809	0	0
16	1430	432	0	951	236	0	287	318	323	963	0	0
17	1430	502	0	930	289	0	276	215	207	878	0	0
18	1430	759	867	944	278	0	277	188	159	829	0	0
19	1610	922	965	944	0	289	286	158	0	717	0	3
20	1780	933	943	935	0	283	412	97	0	529	113	43
21	1780	939	939	925	0	0	239	0	0	0	0	18
22	1780	933	0	0	0	0	0	134	0	657	0	0
23	1780	948	0	0	0	0	395	0	0	712	0	0
24	1440	931	920	0	0	0	402	0	0	710	0	5
25	1710	0	923	940	0	0	788	0	0	711	0	0
26	1380	0	925	283	0	0	476	227	0	695	0	0
27	648	930	868	288	0	0	402	273	0	0	0	0
28	949	956	947	0	0	0	216	323	0	0	0	0
29	280	949	---	0	0	0	274	357	0	118	0	0
30	959	951	---	0	0	0	0	348	0	22	0	0
31	939	936	---	954	---	0	---	351	188	---	0	---
Total	38488	23514	11473	18345	4751	1148	7597	7023	1643	10973	3075	96
Mean	1242	759	410	592	158	37.0	253	227	53.0	366	99.2	3.20

Year total 128,126 $(ft^3/s)\cdot d$ Mean 351 ft^3/s

Table 17. Daily mean discharge, Delaware River at Montague, N.J., (01438500) for the year ending November 30, 1997.
(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, $(ft^3/s)\cdot d$; e, estimated]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
1	8340	9800	e3700	12700	18800	5310	3060	1640	1980	1930	1670	1510
2	37900	9010	e2900	11000	17700	5070	2860	1640	2100	2110	1740	1930
3	50600	9000	e2800	13800	17400	5080	3770	1750	2150	2020	2550	2210
4	32000	8740	e3700	13000	18800	9340	4040	2020	1990	1590	1700	2960
5	23300	8610	e3700	11300	19300	10800	3500	1550	2010	1690	1650	2520
6	19700	8900	e3800	14100	18700	9190	2830	1550	2050	1430	1640	2070
7	18600	8780	e4600	16900	17900	9060	2490	1610	2110	1560	2630	1840
8	17900	7790	e4300	13300	16500	8680	2300	1780	1840	1670	2530	1770
9	15800	6500	3490	11100	14300	7800	2070	2030	1770	1790	2000	2040
10	13200	6420	3190	10200	12500	7750	2350	2220	1650	1850	1660	3190
11	11600	e6800	2890	10200	10600	7950	2250	2150	1460	2450	1650	3890
12	12400	e6600	2860	9370	9150	7900	2240	1870	1420	4790	1610	3090
13	16700	e5900	3130	8310	9240	7390	2200	2010	1670	4470	1750	2560
14	26400	e6000	2740	7550	9530	6790	1750	2270	2040	3140	1810	2420
15	26500	e5500	2520	8190	8610	6270	1800	2110	2190	1920	1950	2460
16	21700	e4800	2240	7790	7260	5610	1710	2050	2140	2380	1850	2340
17	19700	e5400	2580	6610	6640	5120	1710	1880	2370	2310	1750	2170
18	21800	e4800	2600	6190	6250	4850	1750	1980	2550	2080	1740	1990
19	23100	e4500	3500	5960	6170	4930	1820	1790	2150	1930	1770	1870
20	21300	e4400	4550	5810	5650	7460	1840	1960	1660	1780	1750	1820
21	17600	e4500	5540	5680	5620	10200	1890	1780	1870	1760	1870	1820
22	15000	e4600	7800	5330	5460	8800	2060	1800	1930	1580	1750	1930
23	13400	e4500	15000	5510	4960	7840	1660	2090	1500	1840	1790	3010
24	12300	e5300	14500	5020	4570	6700	1940	1970	1560	1580	1780	3980
25	15000	e4700	12100	4790	4610	6130	1760	1730	1520	1510	1950	3650
26	15100	e3700	10300	5990	4170	5970	2280	1580	1620	1540	1800	3140
27	12400	e3800	9710	7880	3840	5510	1880	1990	1620	1530	1920	2870
28	11500	e4200	12700	7580	4450	4790	2010	2010	1760	1540	1580	3170
29	10300	e4200	---	8230	6610	4030	2060	1970	2390	1610	1410	3320
30	11100	e4400	---	10100	6040	3540	1740	1850	2410	1730	1620	3270
31	11500	e4000	---	13700	---	3180	---	1760	1910	---	1480	---
Total	583740	186150	153440	283190	301330	209040	67620	58390	59390	61110	56350	76810
Mean	18830	6005	5480	9135	10040	6743	2254	1884	1916	2037	1818	2560

Year total 2,096,560 $(ft^3/s)\cdot d$ Mean 5,744 ft^3/s

Table 18. Diversions by New Jersey; daily mean discharge, Delaware and Raritan Canal at Port Mercer, N.J. (01460440) for the year ending November 30, 1997. (U.S. Geological Survey published record)

[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	81	93	91	98	71	96	98	93	96	98	98	96
2	19	91	93	98	83	94	90	93	95	96	99	73
3	71	91	94	100	94	92	84	93	96	96	100	81
4	89	93	95	97	96	89	95	93	97	96	101	90
5	95	93	72	95	98	95	97	93	98	96	95	95
6	56	92	81	94	101	97	96	94	94	97	94	95
7	58	90	87	95	98	96	96	96	96	98	93	94
8	41	91	91	96	95	96	96	94	96	97	94	93
9	81	94	93	98	94	98	98	94	96	96	98	93
10	87	92	92	98	97	96	98	89	94	96	100	89
11	90	91	90	94	98	97	98	94	92	101	98	89
12	91	94	90	96	98	96	96	96	91	99	99	88
13	87	97	92	98	91	98	96	96	90	97	100	90
14	22	98	88	90	96	98	97	95	89	98	101	87
15	66	101	79	85	97	98	95	94	92	100	100	79
16	84	90	86	91	98	96	94	95	92	98	101	79
17	88	90	88	94	99	98	96	94	90	99	100	80
18	90	96	89	98	89	100	97	93	94	100	100	86
19	89	103	90	98	90	101	84	93	96	85	98	84
20	85	103	93	96	98	99	92	94	98	87	98	78
21	90	103	93	98	98	95	94	95	83	94	98	73
22	90	103	91	98	99	98	95	97	96	87	98	78
23	90	102	92	98	100	98	95	97	98	97	98	75
24	89	101	92	100	100	97	95	74	98	100	98	73
25	79	50	92	97	98	89	97	54	96	98	103	71
26	90	89	92	97	98	76	96	101	96	100	102	73
27	90	94	93	99	98	94	95	96	96	98	86	76
28	90	77	98	100	93	97	94	96	99	100	92	72
29	89	87	---	101	92	96	94	95	101	101	92	72
30	89	89	---	101	96	97	94	95	97	97	94	72
31	92	89	---	76	---	98	---	96	97	---	95	---
Total	2448	2867	2517	2974	2853	2965	2842	2872	2939	2902	3023	2474
Mean	79.0	92.5	89.9	95.9	95.1	95.6	94.7	92.6	94.8	96.7	97.5	82.5

Year total 33,676 Mgal

Mean 92.3 Mgal/d

Section III

QUALITY OF WATER IN THE DELAWARE RIVER ESTUARY

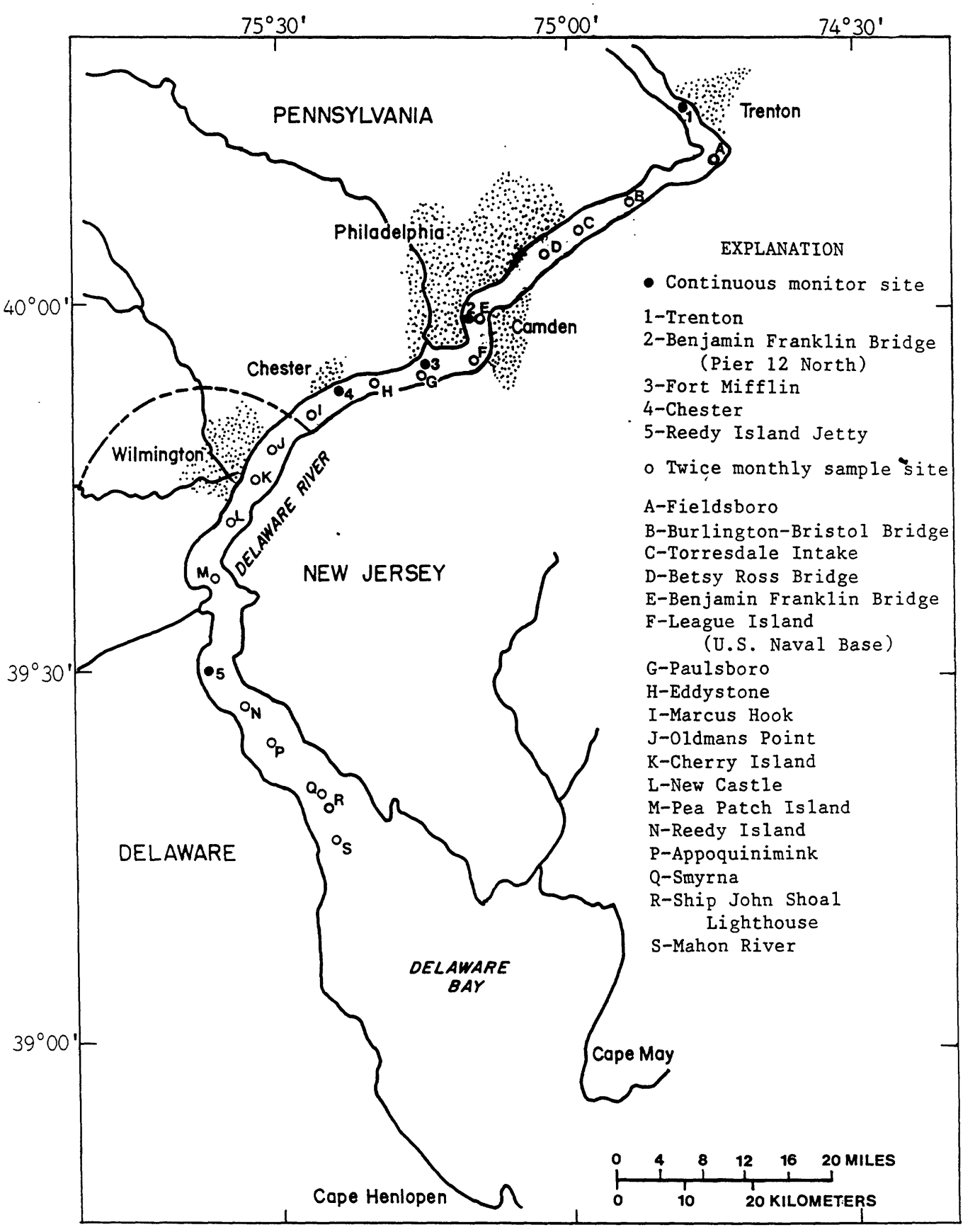

Figure 6.- Location of water-quality monitoring sites in the Delaware River Estuary.

Section III
QUALITY OF WATER IN THE DELAWARE RIVER ESTUARY
By Andrew G. Reif and Hugh Darling

INTRODUCTION

This section describes the Delaware River Estuary water-quality monitoring program conducted by the U.S. Geological Survey, in cooperation with the Delaware River Basin Commission, during the 1997 report year--December 1, 1996 to November 30, 1997. Also presented are selected data collected for this program and a brief discussion of water-quality conditions during the year.

WATER-QUALITY MONITORING PROGRAM

As part of an ongoing program, the quality of water in 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 upstream of the head of tidewater and four in the estuary (fig. 6). At Fort Mifflin, the water was monitored for temperature and specific conductance. At the remaining sites, the water was monitored for temperature, specific conductance, dissolved oxygen, and pH.

From March to November, additional water-quality data were obtained twice monthly at 18 sites between Fieldsboro, N.J., and the mouth of the Mahon River (fig. 6). At each of these sites, water samples were collected at the center of the Delaware River or Estuary channel. The samples were analyzed for various physical properties and chemical constituents including temperature, chloride, alkalinity, specific conductance, dissolved oxygen, and pH.

Data obtained from the continuous monitoring sites are stored in the U.S. Geological Survey's National Water Information System (NWIS). The data also were distributed periodically to cooperators and published annually by the U.S. Geological Survey in the report "Water Resources Data for Pennsylvania, Volume 1, Delaware River Basin." Data for the 18 sites sampled twice monthly were collected by the State of Delaware for the Delaware River Basin Commission (DRBC). These data are available from the DRBC and from STORET, the U.S. Environmental Protection Agency's data storage system.

The data-collection activities described above were carried out in cooperation with the Delaware River Basin Commission, the Office of the Delaware River Master, and other federal, state, and county government agencies.

ESTUARINE WATER-QUALITY DATA FOR 1997 REPORT YEAR

Streamflow

Streamflow has a major influence on quality of water in the estuary. Increased streamflow usually results in improvements in water quality by limiting salt-water intrusion and reducing the concentration of dissolved chemical substances, both of which contribute to lower specific conductance and chloride levels. Increased flow also aids in maintaining lower water temperature during warm periods and in supporting greater dissolved-oxygen levels. Increased streamflow is usually accompanied by increased overland runoff that carries additional nutrients to the estuary, however, which under certain conditions can lead to noxious algal blooms.

On the basis of streamflow records for the Delaware River at Trenton, mean monthly streamflow for the report year was least during October (3,206 ft^3/s) and greatest during December (42,860 ft^3/s) (table 19). During the 1997 report year, monthly mean streamflow was greater than the monthly mean for the period of record for December, January, and February and less than the monthly mean for the period of record for the remainder of the year. The annual mean streamflow for the 1997 report year was greater than the long-term mean for the period of record (1913-1996).

Temperature

The temperature of water in the estuary has a 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 reducing the saturation level of dissolved oxygen and increasing the rate of biological activity. The primary factors that control estuary water temperature are climatic, although various human activities also can have significant effects on water temperature.

Records for the Benjamin Franklin Bridge monitoring station (Pier 12 North), Philadelphia, Pa., show that monthly mean temperatures for the period April to November 1997 were less than long-term means during May, June, August, September, and November and were greater than long-term means during the remaining months. The long-term mean is computed on the basis of water temperature records for the period from 1962 to 1996 (fig. 7). The maximum daily temperature was 28.5 °C on July 17-19. The minimum daily temperature was 5.5 °C on December 2-3.

Specific Conductance and Chloride Concentration

Specific conductance is a measure of the ability of a solution to conduct an electric current. It can be used as an indicator of the amount of ionized material in solution and can be related quantitatively to dissolved-solids content. Specific conductance levels in water bodies usually reflect the geochemical composition of the contributing drainage basins; however, contaminants and the intrusion of oceanic salts also can have a considerable effect on specific conductance. Increasing streamflow generally reduces the concentration of dissolved solids, thus lowering specific conductance and chloride concentration. Decreasing flows have the opposite effect.

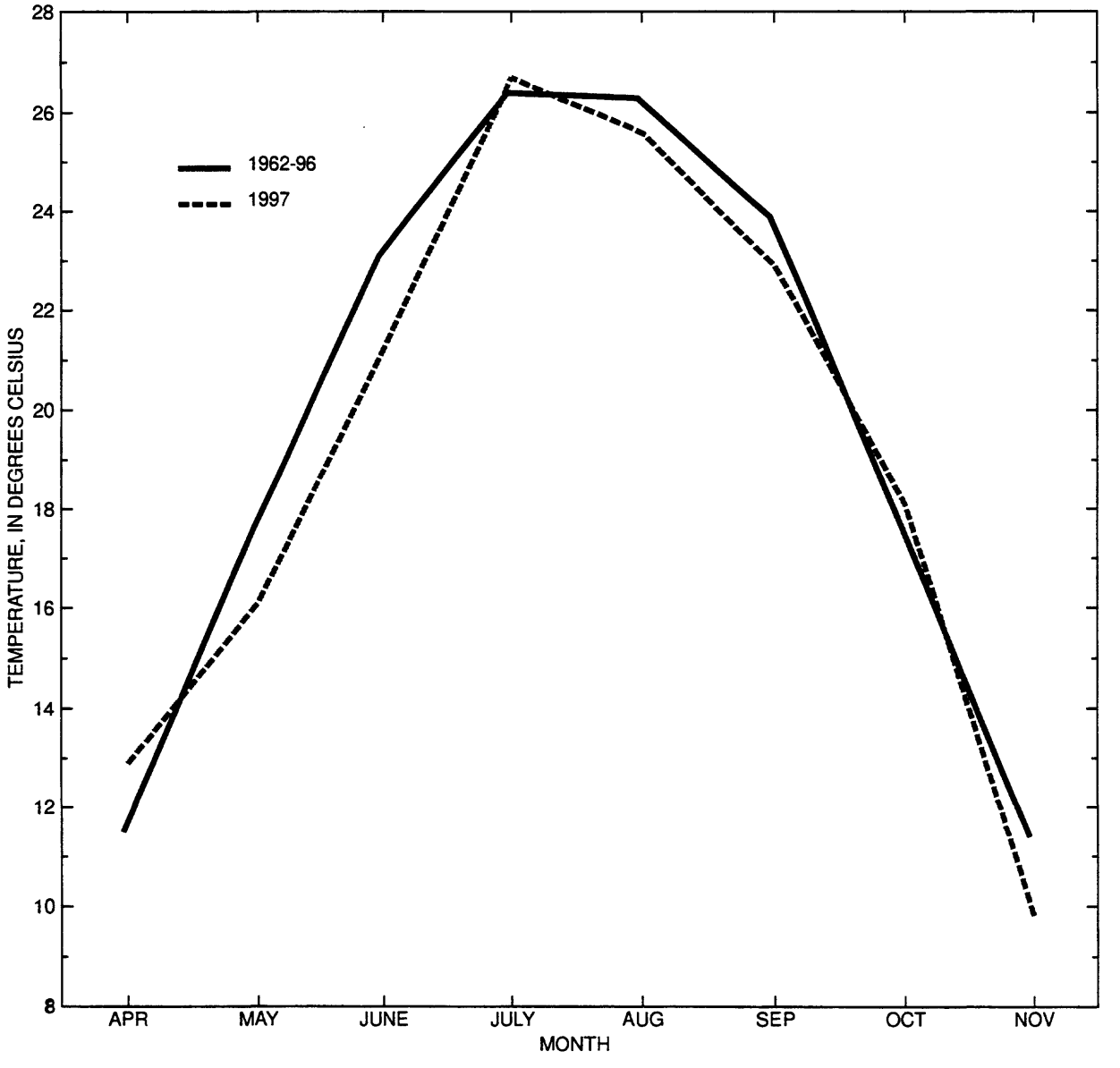

Figure 7.-Monthly mean water temperature of the Delaware Estuary at Benjamin Franklin Bridge, Philadelphia, Pennsylvania.

In the Delaware Estuary, the intrusion of oceanic salts is of concern to those who use the estuary for water supply. For this reason, chloride concentration is of particular interest. Water with chloride concentrations in excess of 250 mg/L (milligrams per liter) is usually considered undesirable for domestic use, and water with concentrations in excess of 50 mg/L is unsatisfactory for some industrial uses.

Sea water has a chloride concentration of approximately 19,000 mg/L, so the proximity of the sea in relation to a water body can influence chloride concentrations in the water body. For this reason, chloride concentrations in the Delaware Estuary generally increase with distance downstream, in the direction of Delaware Bay and the Atlantic Ocean.

Chloride concentration was not measured directly at Fort Mifflin, Pa. and Reedy Island Jetty, Del., but was estimated through use of a correlation between specific conductance and chloride concentration. This correlation was developed on the basis of analyses of water samples collected from the estuary. Chloride concentrations estimated from that correlation are presented in tables 20 and 21. The correlation is less reliable when chloride concentrations are less than 30 mg/L because other ionized substances may be present in amounts large enough to affect the conductance-chloride correlation. Thus, chloride concentrations estimated from specific conductance measurements are not presented when estimated values are less than 30 mg/L. Instead, estimated values less than 30 mg/L are reported as < 30 mg/L. Chloride concentrations at Chester, Pa., (table 22) were furnished by Kimberly Clark Chester Operations.

At Fort Mifflin, the maximum estimated daily chloride concentration for the period April 1 to November 30 was 119 mg/L, on October 19 (table 20). The maximum estimated daily chloride concentration for the period exceeded the 50 mg/L threshold 17 percent of the time. The minimum estimated daily chloride concentration for the same period was < 30 mg/L (table 20). The minimum estimated daily chloride concentration for the period exceeded the 50 mg/L threshold 4 percent of the time. From April to July, minimum estimated chloride concentrations typically ranged from < 30 to 40 mg/L and maximum estimated chloride concentrations typically ranged from 30 to 50 mg/L. From August to November, minimum estimated chloride concentrations typically ranged from 30 to 50 mg/L and maximum estimated chloride concentrations typically ranged from 35 to 100 mg/L.

At Chester, the maximum daily chloride concentration was 385 mg/L on October 17 (table 22). The maximum daily chloride concentration for the period exceeded the 50 mg/L threshold 55 percent of the time. The minimum daily chloride concentration was 10 mg/L on December 13 (table 22). The minimum daily chloride concentration for the period exceeded the 50 mg/L threshold 41 percent of the time. From December to June, minimum chloride concentrations at Chester typically ranged from 20 to 50 mg/L and maximum chloride concentrations typically ranged from 30 to 80 mg/L. From July to November, minimum chloride concentrations typically ranged from 40 to 240 mg/L and maximum chloride concentrations typically ranged from 50 to 300 mg/L.

At Reedy Island Jetty, the maximum estimated daily chloride concentration was 8,450 mg/L on November 14 (table 21). The maximum estimated daily chloride concentration for the period exceeded the 1,000 mg/L threshold 82 percent of the time. The minimum estimated daily chloride concentration for the period April 1 to November 30 was 38 mg/L on December 27 (table 21). The minimum estimated daily chloride concentration for the period exceeded the 1,000 mg/L threshold 51 percent of the time. From December to May, minimum estimated chloride concentrations at Reedy Island Jetty typically ranged from 40 to 1,500 mg/L and maximum estimated chloride concentrations typically ranged from 60 to 4,000 mg/L. From June to November, minimum estimated chloride concentrations typically ranged from 1,000 to 5,000 mg/L and maximum estimated chloride concentrations typically ranged from 3,000 to 8,000 mg/L. Estimated chloride concentrations were smallest in December as a result of above-normal streamflow.

Dissolved Oxygen

Dissolved oxygen in water is necessary for the respiration processes of aquatic organisms. It also has an important role in chemical reactions in aquatic environments. The major sources of dissolved oxygen in water are diffusion from the atmosphere and photosynthesis by 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, turbidity, salinity, and tidal-and wind-driven mixing. The concentrations of dissolved oxygen in the estuary generally are greatest near Trenton and tend to decrease with distance downstream to a point near or downstream from the Benjamin Franklin Bridge, where minimum concentrations usually are reached.

Dissolved-oxygen concentration has been measured by the U.S. Geological Survey at various monitor sites on the Delaware Estuary since 1962. Two of these sites, Benjamin Franklin Bridge at Philadelphia, Pa., and Chester, Pa., (fig. 6) have nearly continuous records and are in the reach of the estuary that has been most affected by contaminant loadings. Patterns of dissolved-oxygen concentration from 1965 to 1997 at these two locations are shown in figure 8. A marked improvement in dissolved oxygen concentrations with time is apparent. Although concentrations increased significantly during this period, substantial variation in monthly means occurred from year to year. The low dissolved-oxygen concentrations during 1976-81 at the Benjamin Franklin Bridge site may reflect the construction of secondary treatment facilities at Philadelphia's wastewater treatment plants. Although three upgraded wastewater treatment plants in Philadelphia were fully operational by fall 1986, dissolved-oxygen concentrations continued to increase after 1986. Some BOD may be from bottom sediments that gradually are being oxidized. If this is the case, then some future increases in dissolved-oxygen concentrations may occur even without further improvements to wastewater treatment plants, as BOD in bottom sediments is further depleted.

During the report year, daily mean dissolved-oxygen concentration at the Benjamin Franklin Bridge was less than 5 mg/L from June 22 to July 8 (table 23). The minimum daily mean was 4.3 mg/L on June 25 and 26. The minimum hourly value was 3.9 mg/L on June 26. At Chester, the daily mean dissolved-oxygen concentration was less than 5 mg/L from July 3 to July 12, on July

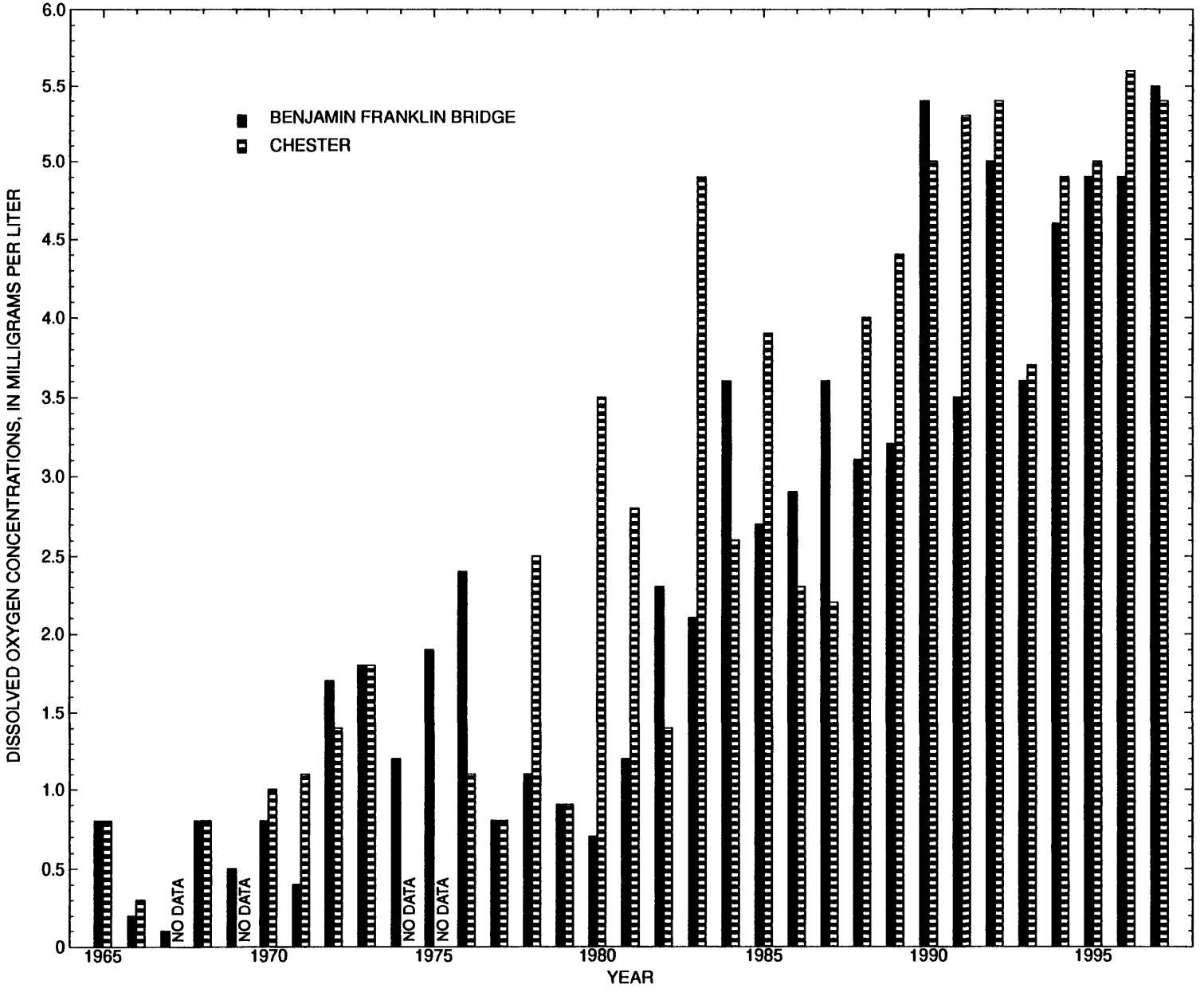

Figure 8.- Mean monthly dissolved-oxygen concentrations during July for two monitor stations on the Delaware River, 1965-97.

27, and from August 22 to August 24 (table 24). The smallest daily mean was 4.5 mg/L on July 5 and 6 and August 22. The minimum hourly value was 4.3 mg/L on July 6.

The temporal distribution of hourly dissolved-oxygen concentrations at the Benjamin Franklin Bridge and Chester during the critical summer period--July to September 1997--is shown in figure 9. At the Benjamin Franklin Bridge, no dissolved-oxygen concentrations less than 4 mg/L were measured in 1997. Concentrations less than 4mg/L were measured 13 percent of the time in 1996, 1 percent of the time in 1995, and 15 percent of the time in 1994. From April to early June and again from October to November, minimum daily mean dissolved-oxygen concentrations are typically greater than 6.0 mg/L. At Chester, no dissolved-oxygen concentrations less than 4 mg/L were measured in 1997. Concentrations less than 4 mg/L were measured 0.1 percent of the time in 1996, 3 percent of the time in 1995, and 2 percent of the time in 1994. From April to early June and from September to November, minimum daily mean dissolved-oxygen concentrations were typically greater than 6.0 mg/L.

Hydrogen-Ion Activity (pH)

Values of pH (hydrogen-ion activity) less than 7 indicate acidic water, whereas values greater than 7 indicate alkaline water. In natural waters, pH generally ranges from 6.0 to 8.5. Commonly, the major factors controlling the pH of a water body are the geochemical characteristics of the contributing drainage basins and external influences including contaminants introduced by human activities. Photosynthetic activity also can affect pH. Increased photosynthetic activity (for example, algal blooms) results in increased pH. All pH values measured at the Benjamin Franklin Bridge, Chester, and Reedy Island Jetty were in a range from 6.7 to 7.9. These values are not considered stressful to aquatic life. The pH range by individual station is: Benjamin Franklin Bridge, 6.7 to 7.5; Chester, 6.7 to 7.5; Reedy Island Jetty, 7.0 to 7.9. The pH of water in the estuary generally is lowest near Trenton, N.J. and tends to increase with distance downstream.

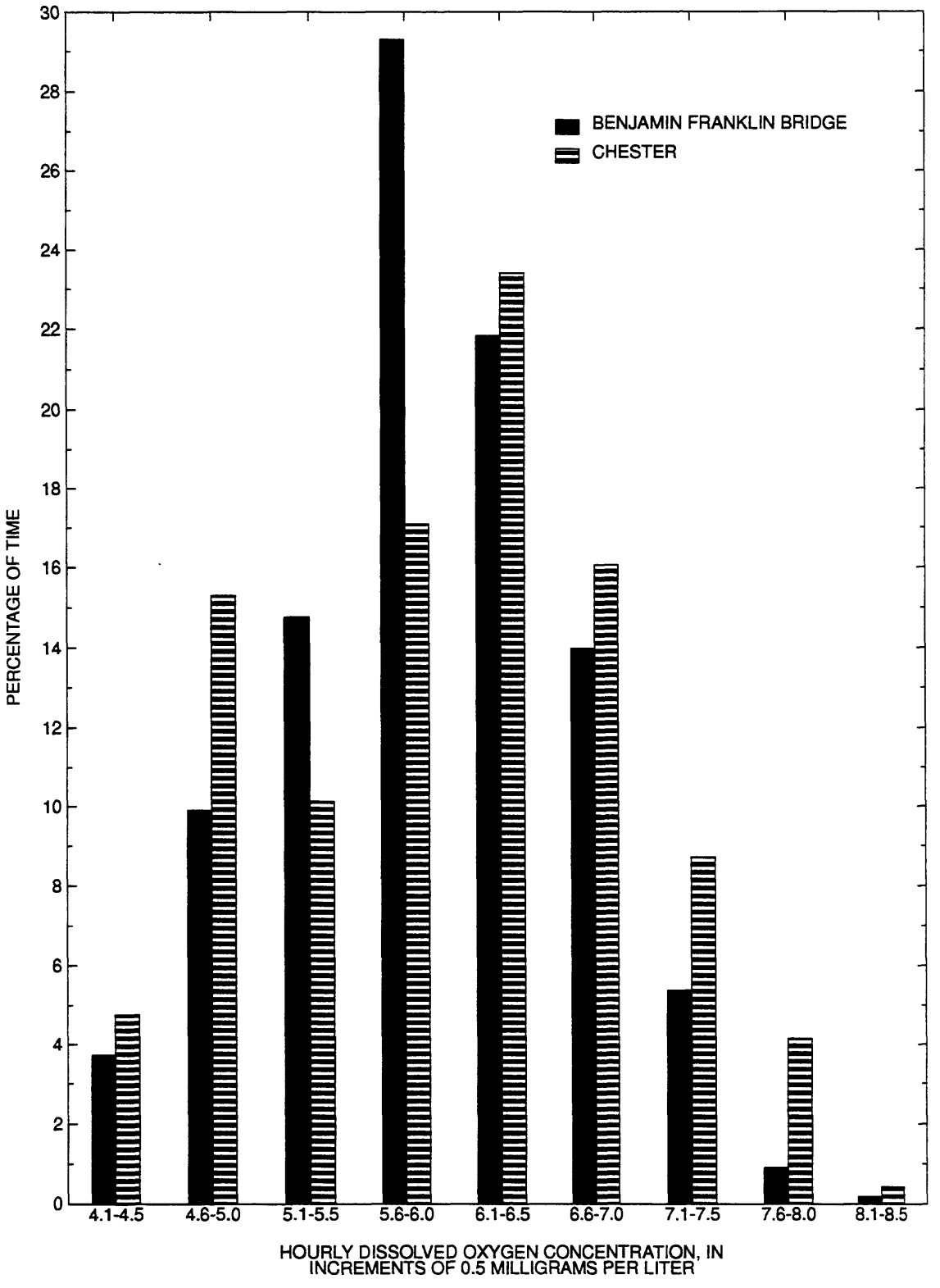

Figure 9.- Temporal distribution of dissolved-oxygen concentration at two monitor stations on the Delaware River, July to September 1997.

Table 19. Daily mean discharge, Delaware River at Trenton, N.J. (USGS station number 01463500), for the year ending November 30, 1997
(U.S. Geological Survey preliminary 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	December	January	February	March	April	May	June	July	August	September	October	November
1	19100	22100	11200	20400	30500	12100	7050	3970	3240	3810	3240	3340
2	62700	19600	11300	20300	3500	11000	6870	3520	3060	3670	3220	4270
3	92100	18300	10600	18700	32400	11200	9840	3780	3190	3820	3130	5250
4	76900	18000	10400	21700	31800	13500	10500	3830	3310	3510	3350	5610
5	56300	17300	14900	21200	33200	16300	10400	3720	3650	3330	3670	5650
6	52900	17200	19300	20700	32700	17700	8820	3740	3620	2930	3130	5900
7	52500	16900	16000	24500	31100	16100	7760	3260	3310	2970	2940	5120
8	52800	16400	14200	26000	29200	15300	6910	3110	3180	2590	2990	4630
9	42900	15200	12700	22100	26600	15200	6260	3230	3190	2660	3830	4320
10	36500	13800	11200	19800	23300	14600	5780	4100	2950	2850	3680	4480
11	31100	13300	10200	19100	20700	13900	5480	4540	2810	3170	3170	4850
12	29500	12600	9580	18400	18400	13700	5350	4020	2750	14200	2750	6490
13	32700	12100	9140	16900	19000	13200	5350	3600	2690	13100	2770	6100
14	74600	12100	9450	17000	18600	12600	5280	3320	2710	11000	2790	5500
15	68800	11100	10800	27600	17600	11800	5060	3320	3030	8730	2950	5670
16	5800	11900	10800	23600	16400	10900	4690	3530	3180	6870	3160	5840
17	49600	12900	9260	20100	14700	10100	4490	3310	3560	5740	3280	5120
18	43900	10500	8700	17800	14700	9490	4150	3140	4260	5210	3180	4840
19	44200	e9470	8600	16500	14200	9180	4720	3070	5460	4820	3100	4510
20	43000	e9130	9540	15500	13600	9520	5460	3310	5620	4410	3060	4190
21	37700	e10100	11300	14700	12600	11700	4880	3040	6720	4280	2970	4020
22	32200	e11000	13000	14100	11900	14700	4510	3510	6870	4110	2960	4480
23	28700	e11900	16900	13300	11500	13100	4370	4040	5320	3620	2940	4820
24	26200	12700	25900	12600	11100	12000	4210	7360	4650	3420	2940	5540
25	29900	23900	24000	12100	10200	11800	4060	13000	3930	3590	3150	7240
26	30300	19200	21000	11900	9990	13500	4100	6680	3580	3310	3520	7360
27	29200	13000	18400	13700	9490	11500	3940	4660	3330	3200	3960	6760
28	25900	15400	17500	15200	10200	10200	4200	3860	3320	3170	3780	6260
29	23600	17400		15200	11400	9180	3860	3900	4000	3140	3660	6120
30	22400	13000		15700	12700	8320	4060	3710	3810	3180	3180	6430
31	22500	11400		20400		7360		3480	4150		2930	
Total	1328700	448900	375870	566800	584780	380750	172410	128660	118450	144410	99380	160350
Mean	42860	14480	13420	18280	19490	12280	5747	4150	3821	4814	3206	5345

e, Estimated

Year total = 4,509,460 (ft3/s) • d

Mean 12,354 ft^3/s

Table 20. Daily maximum and minimum chloride concentrations, Delaware River at Fort Mifflin, Pa., April 1, 1997, to November 30, 1997, estimated from measured specific conductance measurements.

[All values in milligrams per liter; Monitor was not in operation December 1, 1996, to March 31, 1997; --, missing data; *, less than 30 milligrams per liter; Max, maximum value; Min, minimum value]

Date	April		May		June		July		August		September		October		November	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
1	39	*	35	*	*	*	31	*	36	*	41	35	46	35	97	49
2	35	*	34	*	30	*	32	*	37	30	41	36	45	36	83	43
3	32	*	31	*	44	*	38	*	38	31	42	36	46	36	59	45
4	*	*	36	*	46	*	40	*	37	32	41	37	43	38	55	43
5	*	*	38	*	33	*	39	30	40	33	43	37	45	37	51	40
6	*	*	39	*	*	*	37	30	42	34	44	36	44	38	49	40
7	*	*	37	*	*	*	39	31	38	33	42	37	44	35	51	40
8	*	*	34	*	*	*	38	31	36	33	43	38	46	37	74	41
9	*	*	34	*	30	*	39	31	37	32	44	38	47	39	51	38
10	*	*	40	*	*	*	45	32	37	32	47	38	50	43	52	37
11	*	*	38	*	*	*	46	33	37	32	53	40	52	36	47	38
12	30	*	35	*	*	*	43	32	39	32	59	39	51	40	45	33
13	34	*	38	*	*	*	42	33	40	34	47	36	55	43	43	35
14	35	*	34	*	*	*	42	32	44	35	43	33	59	44	51	34
15	33	*	35	*	*	*	40	34	44	36	38	31	59	46	49	34
16	33	*	41	*	*	*	39	35	49	35	38	30	58	46	51	*
17	33	*	30	*	*	*	--	--	45	38	36	*	81	48	41	30
18	31	*	34	*	*	*	--	--	47	38	38	30	102	50	37	30
19	*	*	33	*	*	*	--	--	51	38	36	30	119	50	42	32
20	31	*	35	*	32	*	--	--	49	36	36	30	95	53	42	36
21	39	*	34	*	36	*	--	--	59	38	35	30	103	54	41	36
22	38	*	34	*	33	*	45	37	55	38	36	31	87	54	45	35
23	*	*	32	*	33	*	47	38	43	35	36	32	86	52	43	36
24	37	*	32	*	31	*	55	38	42	33	37	32	87	49	48	30
25	39	*	38	*	--	--	58	38	39	33	--	--	79	52	40	33
26	36	*	49	*	--	--	43	33	37	32	--	--	90	53	38	32
27	34	*	44	*	--	--	37	30	39	33	40	35	91	55	45	30
28	35	*	36	*	32	*	36	31	40	34	40	33	79	48	36	*
29	36	*	32	*	31	*	35	30	40	34	44	35	58	47	41	30
30	34	*	*	*	31	*	36	*	41	36	48	36	56	48	38	30
31			*	*			36	30	42	36			60	47		

Table 21. Daily maximum and minimum chloride concentrations, Delaware River at Reedy Island Jetty, Del., December 1, 1996, to November 30, 1997, estimated from measured specific conductance measurements

[All values in milligrams per liter; --, missing data; *, less than 30 milligrams per liter; Max, maximum value; Min, minimum value]

Date	December		January		February		March		April		May		June		July		August		September		October		November	
	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	1832	291	256	85	1671	335	--	--	2490	52	2613	1013	2207	650	4375	2053	5217	2644	--	--	--	--	6987	4300
2	1496	114	291	52	1937	310	--	--	3950	557	2294	771	--	--	4700	1983	5062	2658	--	--	--	--	6987	4325
3	128	59	839	45	--	--	--	--	4029	712	2259	757	--	--	4700	1951	4750	2739	--	--	--	--	6300	4058
4	88	57	1328	55	--	--	--	--	3510	555	2245	566	--	--	4375	1790	5124	2788	--	--	--	--	6000	3875
5	202	59	1906	111	--	--	--	--	3141	560	2245	526	--	--	4174	1776	5370	3092	--	--	--	--	5927	3800
6	991	55	1776	199	--	--	--	--	2280	391	2501	496	--	--	4145	1808	5500	3204	--	--	5825	3437	5972	3800
7	1028	59	1290	168	--	--	--	--	2102	338	1612	358	--	--	4375	1892	5370	3050	6919	3850	6250	3291	7466	4029
8	--	--	538	117	--	--	--	--	1717	291	1426	288	3364	1143	4375	1906	5972	3619	6868	3687	6375	3510	8000	5250
9	91	59	1619	117	--	--	--	--	1146	237	1780	313	3437	1061	4400	2025	6400	3510	6851	3900	6600	3653	7433	4520
10	234	57	1920	225	--	--	--	--	1209	185	1724	327	3218	1030	3900	1948	5981	3636	6375	4145	6817	3653	6834	4650
11	100	52	667	214	--	--	--	--	1825	154	1594	288	2963	1005	4600	1962	5900	3092	--	--	6936	3800	6936	4480
12	53	43	360	197	--	--	--	--	1423	*	2228	318	3291	1030	4300	2070	5981	3008	--	--	6851	3850	6907	4480
13	465	43	465	162	--	--	--	--	1479	234	1867	279	--	--	4700	1948	5900	3510	--	--	6775	4029	7133	4480
14	60	50	1377	165	--	--	394	94	1216	213	2494	321	--	--	5217	2273	5909	3099	--	--	6600	4058	8450	5250
15	59	48	2046	177	--	--	147	55	1846	228	2676	484	--	--	5900	2333	6000	3218	--	--	6834	3975	7858	5062
16	52	47	2172	251	--	--	--	--	2266	360	2308	439	--	--	5600	2137	5918	3015	--	--	6936	3925	6885	4116
17	48	42	749	194	--	--	--	--	2410	436	2553	465	--	--	5750	2522	5310	2732	--	--	7433	4087	5954	4325
18	52	43	1496	199	--	--	538	*	2809	420	3201	436	--	--	5750	2361	5400	2872	--	--	6817	4000	6250	4325
19	88	52	332	222	--	--	1454	40	4375	510	3437	594	--	--	5550	2539	5750	3026	--	--	7266	4400	6325	4375
20	105	80	276	251	--	--	1678	122	4700	1307	3437	707	4300	1626	5972	2910	5750	3040	--	--	7266	4375	5981	4520
21	111	55	271	231	--	--	1759	137	4440	1318	3127	749	4200	1689	6375	3068	--	--	--	--	6987	4200	6300	4400
22	94	57	276	242	--	--	1738	199	4058	1374	3166	752	4116	1587	6350	3124	6500	3619	--	--	5981	4400	5981	4440
23	74	40	248	91	--	--	1748	208	4300	1479	3585	746	3925	1465	6275	3159	5500	3218	--	--	6834	4300	6987	4145
24	55	42	2893	108	--	--	1986	217	4145	1598	3619	791	4116	1528	5927	3110	5280	3364	--	--	6450	4200	6450	4058
25	82	52	3602	724	--	--	1300	214	4600	1521	3687	929	4300	1615	6275	2770	5600	3208	--	--	6300	4087	6851	3653
26	88	57	1601	397	--	--	1297	179	4000	1377	2844	808	4000	1713	5750	2480	5750	3437	--	--	6953	4325	6400	3218
27	60	38	1381	420	--	--	614	134	3619	1283	3190	749	3975	1766	5124	2539	5909	3510	--	--	7400	4600	5400	2704
28	60	52	1570	380	--	--	487	125	3800	1405	3124	704	4350	1937	4375	2172	5900	3437	--	--	6000	4029	6350	2679
29	53	45	676	307			1234	165	3106	985	2263	774	4350	2060	4350	2231	5900	3364	--	--	5972	3975	6868	2907
30	74	47	946	291			707	80	2931	1053	2102	738	4325	2095	5093	2403	--	--	--	--	6275	3925	6750	3148
31	85	57	1713	294			859	52			2550	642			5217	2539	--	--			6868	3925		

Table 22. Daily maximum and minimum measured chloride concentrations, Delaware River at Chester, Pa., December 1, 1996, to November 30, 1997

[Collection and analysis by Kimberly Clark Chester Operations; All values in milligrams per liter; --, missing data; Max, maximum value; Min, minimum value]

Date	December		January		February		March		April		May		June		July		August		September		October		November	
	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	34	34	28	43	28	50	39	90	52	36	31	38	35	48	42	65	52	150	95	160	116	250	206
2	38	32	55	29	42	32	50	19	48	37	40	30	35	30	60	48	88	63	145	90	138	116	250	231
3	42	34	26	20	50	32	41	33	42	36	40	34	36	32	54	46	72	64	135	85	168	98	250	246
4	47	22	26	23	46	31	60	30	37	34	35	34	36	29	58	44	84	66	125	85	132	88	250	210
5	40	25	32	22	56	38	68	32	45	34	43	32	36	31	56	44	68	60	128	95	122	94	240	220
6	40	35	40	22	50	31	43	34	42	35	42	36	38	32	59	46	68	54	135	100	144	108	215	188
7	26	20	41	26	61	37	42	35	40	36	41	31	37	32	56	48	69	59	126	100	138	108	250	192
8	28	22	48	30	42	31	60	30	37	30	36	32	38	32	56	46	72	60	138	100	277	122	250	208
9	47	32	46	24	46	35	68	32	42	34	34	30	41	34	65	54	86	64	150	100	255	128	250	196
10	28	24	54	20	74	38	43	34	36	30	41	32	48	36	65	52	116	66	167	112	250	183	270	242
11	46	18	76	35	52	40	42	35	38	25	43	30	40	36	66	52	88	68	130	102	200	178	250	220
12	52	33	65	39	51	38	46	36	51	28	36	25	40	32	69	56	88	72	140	111	250	178	246	188
13	30	10	44	32	60	42	48	25	50	28	44	32	40	36	66	48	92	68	136	124	250	156	250	144
14	28	18	46	36	54	40	44	32	41	28	34	32	38	36	72	66	105	68	114	82	200	132	190	146
15	22	12	58	35	70	46	32	28	36	25	38	30	40	30	66	62	125	100	110	65	200	150	230	182
16	24	19	58	32	70	49	51	21	37	25	38	28	36	32	78	62	130	102	115	75	235	102	225	130
17	32	20	76	40	62	53	36	20	30	26	45	28	40	35	86	62	160	95	100	80	385	125	170	110
18	35	19	60	32	60	46	42	28	60	37	40	34	36	34	80	60	165	88	92	75	250	210	210	113
19	32	11	53	31	59	52	36	29	42	36	36	32	40	35	85	56	128	120	115	81	250	202	190	115
20	30	18	49	34	55	50	39	32	43	28	42	32	45	35	89	52	190	84	133	91	314	200	246	135
21	36	20	50	35	72	54	56	38	46	26	40	34	40	36	130	68	140	86	130	76	280	240	246	145
22	30	26	47	35	61	50	61	30	40	28	48	34	48	40	150	72	134	90	127	90	260	186	240	115
23	47	28	53	32	52	46	46	42	40	30	38	34	46	40	110	78	130	92	120	96	270	191	186	116
24	36	28	53	36	52	46	54	44	38	35	42	38	46	40	145	88	120	92	116	100	338	212	140	116
25	--	--	76	36	52	46	47	36	35	30	48	35	44	38	112	70	115	92	110	92	250	220	136	90
26	--	--	45	31	50	46	41	36	34	30	44	33	42	38	92	68	110	96	100	62	348	236	115	90
27	--	--	40	35	50	46	40	35	36	33	42	30	44	40	92	66	120	70	100	84	290	216	110	85
28	52	28	42	34	48	46	46	42	44	33	40	36	47	40	72	65	135	80	121	96	266	168	110	71
29	36	28	42	34			48	42	36	26	40	35	53	40	85	67	100	88	110	98	240	202	118	87
30	71	34	47	36			46	41	36	22	41	37	51	46	66	60	110	92	140	90	225	174	124	80
31	43	30	40	36			44	36			38	32			68	54	110	96			250	164		

Table 23. Daily mean dissolved oxygen, Delaware River at Benjamin Franklin Bridge at Philadelphia, Pa., April 1, 1997, to November 30, 1997

[All values in milligrams per liter; Monitor was not in operation December 1, 1996 to March 31, 1997; --, missing data]

	April	May	June	July	August	September	October	November
1	10.8	--	8.9	--	6.9	5.5	5.7	--
2	10.6	--	8.6	--	6.6	5.2	5.8	--
3	10.4	--	8.2	4.4	6.3	5.1	5.9	--
4	10.8	--	8.0	4.4	6.1	5.3	6.1	--
5	11.1	--	7.7	4.6	6.1	5.4	6.3	8.4
6	11.2	9.1	7.5	4.6	6.3	5.4	6.5	--
7	11.0	9.0	7.2	4.7	6.4	5.5	6.6	--
8	10.6	9.0	6.8	4.7	6.8	5.6	6.9	--
9	10.3	9.0	6.5	5.0	7.1	5.7	6.7	8.9
10	10.2	8.9	6.0	5.1	7.2	5.2	6.7	8.9
11	10.2	9.1	5.6	5.5	7.3	5.0	6.9	8.9
12	10.0	9.7	5.2	6.1	7.1	5.1	6.8	9.0
13	9.9	9.8	5.3	6.2	6.7	5.5	6.8	--
14	10.3	9.8	5.3	6.2	6.4	6.0	6.7	--
15	10.5	10.0	5.5	6.1	6.2	6.1	6.6	9.2
16	--	10.3	5.7	6.1	6.3	6.2	6.7	9.4
17	10.5	10.7	5.9	5.9	6.2	6.6	6.8	9.7
18	10.3	10.9	5.7	5.8	--	6.6	--	9.7
19	10.2	10.9	5.3	5.7	--	6.4	6.9	9.5
20	10.2	11.0	5.2	5.8	--	7.1	6.9	9.1
21	10.0	11.0	5.1	--	--	6.8	7.1	9.0
22	9.8	10.8	4.9	--	--	6.9	7.3	8.9
23	--	10.5	4.7	--	--	6.5	7.5	8.9
24	9.8	10.6	4.5	--	--	6.4	7.7	9.1
25	9.9	11.0	4.3	--	--	6.0	7.8	9.4
26	10.0	9.8	4.3	--	--	5.7	7.8	9.6
27	--	9.7	4.4	--	--	5.8	7.7	9.9
28	10.1	9.5	4.6	5.7	--	5.8	8.0	9.9
29	--	9.2	--	5.9	5.8	5.7	8.2	10.1
30	--	9.3	--	6.6	5.5	5.8	8.2	10.2
31		9.2		6.8	5.5		8.3	

Table 24. Daily mean dissolved oxygen, Delaware River at Chester, Pa., April 1, 1997, to November 30, 1997

[All values in milligrams per liter; Monitor was not in operation December 1, 1996 to March 31, 1997; --, missing data]

	April	May	June	July	August	September	October	November
1	10.3	9.9	6.5	5.5	7.1	6.4	7.6	7.3
2	10.3	9.9	6.4	5.1	7.1	6.3	7.9	7.4
3	10.3	9.6	6.8	4.7	7.0	6.1	8.2	7.3
4	10.2	9.3	6.8	4.6	6.6	6.6	8.0	6.9
5	10.2	9.4	6.4	4.5	6.2	7.1	7.8	6.6
6	10.1	9.2	6.2	4.5	6.0	7.4	--	6.5
7	10.2	8.9	6.2	4.6	6.1	7.6	--	6.6
8	10.3	8.5	6.2	4.7	6.2	7.9	--	6.5
9	10.4	8.8	6.2	4.8	6.5	7.4	6.0	7.0
10	10.7	--	6.1	4.9	6.7	6.7	6.0	--
11	10.9	--	6.0	4.9	6.9	6.7	6.1	--
12	10.8	--	5.8	4.7	6.6	6.4	6.2	--
13	10.7	--	5.9	--	6.8	5.8	6.3	--
14	10.9	--	5.8	--	6.7	5.6	6.4	8.4
15	11.2	--	6.1	--	6.6	5.7	6.4	8.6
16	11.5	10.7	--	--	6.4	5.8	6.6	8.7
17	11.4	10.7	--	6.0	6.1	5.9	6.6	8.9
18	11.2	10.8	--	6.0	5.4	6.1	6.6	9.1
19	11.4	10.8	--	6.1	5.2	6.2	6.7	9.2
20	11.7	10.5	6.0	6.4	5.1	6.4	6.9	--
21	11.8	10.3	6.0	6.6	5.0	6.4	7.0	--
22	11.5	10.4	6.1	6.1	4.5	6.7	7.1	9.3
23	11.1	10.3	6.0	5.6	4.6	6.8	7.3	9.0
24	10.7	10.2	5.9	5.6	4.9	6.5	7.5	9.1
25	10.6	9.7	5.8	5.6	5.0	6.8	7.7	9.3
26	10.5	8.9	5.7	5.1	5.2	6.8	7.8	9.6
27	10.4	8.8	5.7	4.9	5.4	6.8	8.1	--
28	10.0	8.5	5.6	5.0	--	7.1	8.1	--
29	9.8	7.9	5.6	5.7	6.0	7.1	7.8	--
30	10.0	7.4	5.5	6.6	6.1	7.5	7.2	--
31		7.0		7.0	6.3		7.2	

Section IV

APPENDIXES

NO. 97-2

A RESOLUTION to consider a request to alter reservoir releases from New York City's Pepacton Reservoir for flood protection purposes.

WHEREAS, the City has always indicated a willingness to address basinwide concerns consistent with the efficient operation of its water supply system; and

WHEREAS, congressmen, state representatives, local officials, the Upper Delaware Council (UDC) and citizens downstream of some of New York City's reservoirs have urged the City of New York (the "City") and the State of New York (the "State") to alter its wintertime water releases from some of the City's reservoirs for flood control purposes; and

WHEREAS, on May 2, 1996, the UDC and various local representatives of communities within the City's watershed wrote a letter to the Delaware River Basin Commission (DRBC) requesting DRBC to study additional wintertime releases from some of the City's reservoirs for flood control purposes; and

WHEREAS, in an effort to investigate this issue, DRBC's Flow Management Advisory Committee convened over the past several months to examine existing and forecasted hydrologic conditions as well as current water levels in the City's reservoirs; and

WHEREAS, based upon DRBC's Flow Management Advisory Committee and the City's rational and adequate study of these issues, DRBC's and the City's analysis of these exceptional circumstances has revealed that lowering water levels in the Pepacton Reservoir through additional water releases from such reservoir is a reasonable and appropriate means and method to reduce the potential impact of flood damage in the spring of 1997 downstream of the reservoir; and

WHEREAS, DRBC has noted that the water level in the Pepacton Reservoir - which is currently at 99 percent of capacity - is unprecedently high for this time of the year and additional rainfall may cause flooding conditions downstream; and

WHEREAS, based upon these extreme hydrologic conditions, on January 22, 1997, DRBC has urged the parties of the 1954 Supreme Court Decree, the River Master and the City to currently alter its reservoir releases from the City's Pepacton Reservoir to reduce the overall amount of water currently stored in such reservoir and thereby address DRBC's and local watershed communities' flooding concerns; and

WHEREAS, the Parties to the 1954 Supreme Court Decree, DRBC, the River Master and the City have agreed to cooperate during this unprecedented hydrologic winter and to offset (replace) any loss of available water supply that is attributed to the lowering of storage levels for possible flood protection by equal reduction in the quantity available for excess releases in the summer of 1997; and

WHEREAS, the Parties to the 1954 Supreme Court Decree, DRBC, the River Master and the City agree that immediate action is needed on this matter in order to protect public health, safety and welfare.

BE IT RESOLVED by the Delaware River Basin Commission:

The DRBC recommends that the City proceed immediately to lower the storage levels in the Pepacton Reservoir in an effort to provide potential flood storage in accordance with the following provisions:

(1) The rate of lowering releases shall be established daily by the Executive Director in consultation with the City and the River Master. The River Master will direct the recommended releases in such a manner as to conserve the waters of the Delaware Basin and to avoid adverse downstream impacts.

(2) When the storage level in Pepacton is 5 billion gallons below full, the releases shall be operated as necessary to maintain that level as practically as possible during the month of February 1997.

(3) During March 1997, if conditions allow, the Pepacton Reservoir shall be allowed to refill by April 1, 1997.

(4) The computations to determine the extent of excess release quantity to be credited to the City will be done by the River Master in consultation with the City and DRBC and will include the operation of Cannonsville, Pepacton, and Neversink Reservoirs.

(5) The Parties to this Agreement agree to offset (replace) any loss of available water supply that is attributed to the lowering of storage levels pursuant to this Resolution for possible flood protection by equal reduction in the quantity available for excess releases in the summer of 1997.

(6) The Parties to this Resolution agree that any releases made pursuant to this Resolution, due to the exceptional existing hydrologic conditions, are not a part of any regular release program and shall not be considered as a precedent for any future releases and/or actions.

/s/ Gerard L. Esposito
Gerard L. Esposito, Chairman pro tem

/s/ Susan M. Weisman
Susan M. Weisman, Secretary

ADOPTED: January 22, 1997

Consent to Action by

Delaware River Basin Commission

Consent of the parties to the U.S. Supreme Court Decree in New Jersey vs. New York, 347 U.S. 995 (1954) to the action of the Delaware River Basin Commission in adopting Resolution No. 97-2 recommending temporary alteration of reservoir releases from New York City's Pepacton Reservoir for flood protection purposes.

State of New Jersey

State of New York

State of Delaware

Commonwealth of Pennsylvania

State of Delaware

City of New York

AGREEMENT TO SET ASIDE THE REMAINDER OF THE EXCESS-RELEASE QUANTITY FOR THE 1997-98 SEASONAL PERIOD.

In light of the below average precipitation that has occurred in the upper Delaware River Basin during the past few months, runoff has been well below average and the current storage in the New York City reservoirs is below average for this time of year. In addition, the Delaware River Master's directed releases for 1997 have been above average. Current storage in the New York City Delaware River Basin reservoirs is about 41 billion gallons above the drought-warning level and is about 26 billion gallons below the median storage for this time of year. Continuation of the current hydrologic conditions could result in reaching drought-warning levels in the Delaware River Basin reservoirs by late summer or early fall of 1997.

Therefore, in order to conserve the waters of the Delaware River Basin, the remainder of the excess-release quantity for the 1997-98 seasonal period will be set aside and placed in an "Excess-Release Bank". The excess-release bank will be used during normal storage conditions, if needed, to provide lower basin drought-assistance releases, as designed by the Delaware River Basin Commission and pursuant to the Delaware River Master's direction, per the Lower Basin Drought-Warning and Drought Operating Plan [DRBC Resolution 88-22 (Revised)]. In addition the Delaware River Master will continue to use the +/- 100 cfs balancing adjustment while designing the releases to meet the 1,750 cfs Montague flow objective.

These modifications will take effect immediately and will continue until modified by unanimous agreement by the Parties to the Decree or terminated by any one of the Parties.

/S/ Robert R. Jordan 8/8/97	/S/ Steven Nieswand 8/7/97
State of Delaware Date	State of New Jersey Date
/S/ N.G. Kaul 8/8/97	/S/ Irene B. Brooks 8/18/97
State of New York Date	Commonwealth of Pennsylvania Date

/S/ Mark D. Hoffer 8/7/97
City of New York Date

Note: Original signatures are on file in the Delaware River Master Office.

AGREEMENT

The Parties to the U.S. Supreme Court Decree met October 22, 1997, pursuant to the Delaware River Basin Commission Resolution No. 83-13, to consider modification of current diversions to New York City and New Jersey, releases from the New York City reservoirs, and target flows at the Montague and Trenton gaging stations.

The modifications agreed to were:

1. Establishment of an emergency fisheries protection program designed to allow special stream releases designed by the NYSDEC within the terms specified by this Agreement as requested and specified in Section (d). The emergency program includes the following provisions:

   a. There will be no net loss of storage in the New York City Delaware River-Basin Reservoirs.

   b. The maximum use of 3,000 cfs-days (cubic feet per second-days) will be made available through reductions in releases required to meet the Montague target. There must be a positive cumulative credit from New York City Delaware Basin reservoir releases at any time special stream releases are made pursuant to this agreement.

   c. The credits from releases required for Montague targets may occur at the following rates:

When Trenton flow equals or exceeds	Allowed credit reduction in directed releases
3500 cfs	100 cfs
3300 cfs	50 cfs

   d. The term of this emergency program begins immediately and continues until one of the NYC Delaware reservoirs spills, or when all summer basic conservation releases are restored in accordance with Docket No. D-77-20 (Revision 3).

   e. The release rates under this program shall not exceed the summer basic conservation level as established in Docket No. D-77-20 (Revision 3). (15 cfs at Neversink, 19 cfs at Pepacton, 23 cfs at Cannonsville). The cumulative releases shall at no time exceed the credits established under "c" above.

f. The operation of this emergency program will be designed by NYSDEC upon a continuing showing of need for these extra releases; and will be coordinated with the River Master and New York City. DRBC will be informed of the River Master's directed release each day when it is computed. The River Master's office will maintain the ongoing accounting for credits and releases, embodied in this agreement.

g. For purposes of defining drought conditions as per the operation curves for NYC reservoirs embodied in DRBC Resolution 83-13, the usable storage in the NYC Delaware basin reservoirs shall be reduced by the cumulative unexpended credits.

h. The parties to this agreement will reconvene as needed by meeting or telephone call to reconsider these arrangements should any party request it.

i. This agreement will take effect immediately upon entry into drought warning and will continue until conditions described in "d" are met or modified by unanimous agreement of the Parties to the Decree or terminated by any one of these Parties, but in any case to be terminated automatically on June 15, 1998.

/S/ Robert R. Jordan	10/24/97		
/S/ Gerard L. Esposito	10/22/97	/S/ Steven Nieswand	10/22/97
State of Delaware	Date	State of New Jersey	Date
/S/ John Middelkoop	10/22/97	/S/ Irene B. Brooks	10/22/97
State of New York	Date	Commonwealth of Pennsylvania	Date

/S/ William N. Stasiuk 10/22/97
City of New York Date

Note: Original signatures are on file in the Delaware River Master Office.

AGREEMENT

The Parties to the U.S. Supreme Court Decree agreed on November 18, 1997 to modify the agreement reached on October 22, 1997, pursuant to the Delaware River Basin Commission Resolution No. 83-13, to consider modification of current diversions to New York City and New Jersey, releases from the New York City reservoirs, and target flows at the Montague and Trenton gaging stations.

The modified agreement is as follows:

1. Establishment of an emergency fisheries protection program designed to allow special stream releases designed by the NYSDEC within the terms specified by this Agreement as requested and specified in Section (d). The emergency program includes the following provisions:

   a. There will be no net loss of storage in the New York City Delaware River Basin Reservoirs.

   b. The maximum use of 3,000 cfs-days (cubic feet per second-days) will be made available through reductions in releases required to meet the Montague target.

   c. The credits from releases required for Montague targets may occur at the following rates:

When Trenton flow equals or exceeds	Allowed credit reduction in directed releases
3500 cfs	100 cfs
3300 cfs	50 cfs

   d. The term of this emergency program begins immediately and continues until one of the NYC Delaware reservoirs spills, or when all summer basic conservation releases are restored in accordance with Docket No. D-77-20 (Revision 3).

   e. The release rates under this program shall not exceed the summer basic conservation level as established in Docket No. D-77-20 (Revision 3). (15 cfs at Neversink, 19 cfs at Pepacton, 23 cfs at Cannonsville). Special stream releases will be suspended if the combined storage in the Delaware River Basin reservoirs declines below the midpoint of the drought-warning zone and will remain suspended until the storage increases above that level again.

f. The operation of this emergency program will be designed by NYSDEC upon a continuing showing of need for these extra releases; and will be coordinated with the River Master and New York City. DRBC will be informed of the River Master's directed release each day when it is computed. The River Master's office will maintain the ongoing accounting for credits and releases, embodied in this agreement.

g. For purposes of defining drought conditions as per the operation curves for NYC reservoirs embodied in DRBC Resolution 83-13, the usable storage in the NYC Delaware basin reservoirs shall be reduced by the cumulative unexpended credits.

h. The parties to this agreement will reconvene as needed by meeting or telephone call to reconsider these arrangements should any party request it.

i. This agreement will take effect immediately upon entry into drought warning and will continue until conditions described in "d" are met or modified by unanimous agreement of the Parties to the Decree or terminated by any one of these Parties, but in any case to be terminated automatically on June 15, 1998.

/S/	Stephanie J. Baxter	11/18/97			
/S/	Gerard L. Esposito	11/19/97	/S/	Steven Nieswand	11/19/97
State of Delaware		Date	State of New Jersey		Date
/S/	John Middelkoop	11/19/97	/S/	Irene B. Brooks	11/19/97
State of New York		Date	Commonwealth of Pennsylvania		Date

/S/	Mark D. Hoffer	11/19/97
City of New York		Date

Note: Original Signatures are on file in the Delaware River Master Office.

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