REPORT OF

THE RIVER MASTER

OF THE DELAWARE RIVER

For the period
December 1, 1982 - November 30, 1983

by Francis T. Schaefer, Robert E. Fish, Robert W. Baebenroth
and William E. Harkness with a section on
water quality by Charles R. Wood

U.S. GEOLOGICAL SURVEY

Open-File Report 84-473

Reston, Virginia

1984

UNITED STATES DEPARTMENT OF THE INTERIOR

WILLIAM P. CLARK, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information write to:

Delaware River Master
U.S. Geological Survey, WRD
433 Naational Center
Reston, Virginia 22092

Copies of this report can be purchased from:

Open-file Services Section
Western Distribution Branch
U.S. Geological Survey
Box 25425, Federal Center
Denver, Colorado 80225
(Telephone: 303 234-5888)

CONTENTS

ILLUSTRATIONS

TABLES

Factors for Converting Inch-Pound Units to International System Units (SI)

Multiply inch-pound units	By	To obtain SI units
	LENGTH	
inches	25.4	millimeters (mm)
feet	0.3048	meters (m)
miles	1.609	kilometers (km)
	AREA	
square miles	2.590	square kilometers (km^2)
	VOLUME	
million gallons	3,785	cubic meters (m^3)
billion gallons	3.785	cubic hectometers (hm^3)
cfs-days	0.002447	cubic hectometers (hm^3)
	FLOW	
million gallons per day (mgd)	0.04381	cubic meters per second (m^3/s)
cubic feet per second (cfs)	0.02832	cubic meters per second (m^3/s)

Section I

RIVER MASTER LETTER OF TRANSMITTAL

and

SPECIAL REPORT

/

(no page 2)

OFFICE OF THE DELAWARE RIVER MASTER
United States Geological Survey
433 National Center, Reston, Virginia 22092

April 4, 1984

The Honorable
Warren E. Burger
Chief Justice of the Supreme Court
of the United States

The Honorable
Pierre S. duPont IV
Governor of Delaware

The Honorable
Thomas H. Kean
Governor of New Jersey

The Honorable
Mario M. Cuomo
Governor of New York

The Honorable
Richard L. Thornburgh
Governor of Pennsylvania

The Honorable
Edward I. Koch
Mayor of the City of New York

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

Dear Sirs:

For the record and in compliance with the provisions of the Amended Decree of the United States Supreme Court entered June 7, 1954, I am transmitting herewith the thirtieth Annual Report of the River Master of the Delaware River for the year December 1, 1982 to November 30, 1983.

As the report year began, the total quantity of water in storage in Pepacton, Cannonsville and Neversink Reservoirs of the City of New York in the Delaware River basin totaled 93 billion gallons. This quantity was 17 billion gallons below the drought-warning curve for the reservoirs and represented a considerable decrease from the situation that existed one year earlier when total contents were 135 billion gallons. Restrictions on diversions and release requirements had been instituted November 13, 1982, when the storage had remained below the 110 billion gallon drought-warning level, applicable during November and December, for 5 consecutive days. By letter on October 21, 1982, I had notified the River Master's Advisory Committee that with storage at 142.4 billion gallons and rapidly decreasing, and without above-average precipitation and increased runoff, total contents would reach the drought-warning level in mid-November. I stated that if this situation developed, the Montague flow objective would be reduced to 1,655 cubic feet per second (cfs), and that New York City diversions would be limited to 680 million gallons per day (mgd). New Jersey diversions would be limited to 85 mgd, which was not significant because the flow in the Delaware & Raritan Canal through which the water is diverted was averaging only about 60 mgd. These measures to conserve the water supply had been effected November 13, 1982 and were continued until December 7, 1982. By December 8, 1982 reservoir contents declined into the lower half of the drought-warning zone. Accordingly, the allowable diversion rate for New York City was reduced to 560 mgd and that for New Jersey to 70 mgd, and the releases were designed to maintain a reduced flow at Montague of 1,550 cfs. Additionally, the required conservation releases were continued at the reduced rates in effect prior to 1977.

From December to February, storage increased slowly but remained considerably below average for that time of year. In mid-March, in response to above-average precipitation, storage began to increase rapidly. Restrictions on diversions and release requirements were terminated March 28 when storage had increased to more than 15 billion gallons above the then applicable drought-warning level for 5 consecutive days. April precipitation of 8.90 inches was the greatest for the month in the record that dates from 1941. All three reservoirs were spilling before the month ended.

The augmented conservation release rates for instream-environmental improvement, originally agreed to in 1977 by all the parties and approved by this office, were resumed April 12, when storage had increased to more than 25 billion gallons above the then applicable drought-warning level for 15 consecutive days. The rates are 45 cfs from both Cannonsville and Neversink Reservoirs, and 70 cfs from Pepacton Reservoir from April 1 to October 31. From November 1 to March 31, the rates are reduced to 50 cfs from Pepacton, 33 cfs from Cannonsville and 25 cfs from Neversink Reservoirs. Additionally, from June 15 to August 15, the Cannonsville release rate is increased, when storage is adequate, to 325 cfs for the benefit of aquatic resources and recreational users of the river.

Storage continued at high levels during May, and by June 1, the combined contents were 272 billion gallons. Spill at Neversink terminated May 5 and at Pepacton May 18 as the City stepped up its diversions from these two reservoirs. Cannonsville continued to spill until June 19 and some additional water spilled at Pepacton June 3 to 10 (about 730 million gallons). Streamflow at the gaging station on Delaware River at Montague, New Jersey, was above the 1,750 cfs flow specified by the Amended Decree to June 14. The excess-release rate of 1,850 cfs for this year became effective June 15. During July to October, with the daily diversions at customary rates, with large releases, and low flow in the river, reservoir storage declined rapidly. It was necessary to order directed releases on a daily basis starting July 10 to maintain the required flow at Montague. This continued with very few interruptions until the end of the report year. The excess-release quantity was exhausted on September 22 and the Montague flow was then targeted at 1,750 cfs.

By October, it again became evident that unless favorable precipitation developed, storage in the reservoirs would decline into the drought-warning zone by early November. By letter dated October 27, 1983, I notified the Advisory Committee members and other interested parties that, if this condition occurred, the New York City diversions would be reduced by 15 percent to 680 mgd, and the releases would be reduced to a quantity designed to maintain the Montague flow at or near 1,655 cfs. Allowable diversions by New Jersey also would be reduced 15 percent.

The above restrictions were placed in effect November 9, and the conservation release requirements reverted to those in effect at the beginning of this report year.

During regular operations, diversions for water supply for New York City and releases designed to maintain the flow of the Delaware River at Montague were made as directed by this office and as provided in the Decree. Diversions by New York City from the Delaware River basin reservoirs did not exceed the limit specified by the Decree and did not exceed the limits imposed during the several periods of water-supply deficiency, except December 9-14, 1982 when the cumulative average daily diversion exceeded the reduced limit of 560 mgd by a maximum of 24 mgd on December 10. Diversions by the State of New Jersey did not exceed the limits prescribed in Section V of the Decree and did not exceed the other limitations effected during the year.

Current-meter measurements of the East Delaware Tunnel diversions were made by personnel of this office during November in conjunction with color-velocity measurements by the engineering staff of the New York City Bureau of Water Supply and a dye-dispersion measurement by U.S. Geological Survey hydrologists to verify the accuracy of the venturi flow-meter instruments. The results do not agree as closely as is desired. Further investigation is planned to identify the reasons for the difference.

During the report year, the River Master and staff participated in meetings of the Delaware River Basin Commission to assess the water supplies and to consider measures to ease the growing deficiences. Upon invitation of the representatives of parties to the Decree, the River Master, or his assistants, met frequently with those representatives as a member of the Flow Management Technical Advisory Committee. Discussions primarily centered on proposals for specific releases from reservoirs in the basin and other emergency measures to cope with severe droughts.

The U.S. Geological Survey continued the operation of its field office of the Delaware River Master at Milford, Pennsylvania. Robert E. Fish, Deputy Delaware River Master, continued in charge of the office, assisted by Robert W. Baebenroth and Beverly A. Roberts throughout the report year. Mr. Fish retired from Federal Service on December 30, 1983 and was replaced by William E. Harkness

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 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 the Montague gaging station, diversions by New Jersey, and chloride concentration in the river. The reports were made available to the State and City representatives on the Delaware River Master Advisory Committee and to other parties interested in the Delaware River operations. A special monthly summary of past hydrologic conditions, supplemented during the low-flow season by an "outlook" of the river flow for the forthcoming month, was made available to the representatives on the Advisory Committee.

Section II of the report describes in detail Delaware River operations during the report year. As shown on page 21 the City of New York diverted a total of 194.940 billion gallons from the basin during the report year ending November 30, 1983, and released 108.229 billion gallons from Pepacton, Cannonsville, and Neversink Reservoirs to the Delaware River during the same period. During the low-flow period from July 10 to November 23 (Montague dates), releases to the Delaware River from these reservoirs totaled 89.035 billion gallons. The graphs on plate 1 show that the New York City releases are a major factor in sustaining the flow at the Montague gaging station and the higher summer flows desired for downstream uses including recreation and maintenance of stream fisheries.

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

During the report year, Pennsylvania Power & Light Company was not required to make supplemental releases from Lake Wallenpaupack as provided in an agreement written in 1975 between the company and the City of New York with the approval of this office.

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

Delaware	Dr. Robert R. Jordan
New Jersey	Dirk C. Hofman
New York	Edward A. Karath
New York City	Joseph T. McGough, Jr.
Pennsylvania	R. Timothy Weston

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. Once again, it is gratifying to report that New York City complied with the terms of the Decree, with the temporary reductions of diversions and releases, and with the directives of the River Master, with the minor single deviation noted in Section II of this report.

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

Sincerely yours,

Francis T. Schaefer, P.E.
Delaware River Master

(no pages 8, 9)

Section II

REPORT OF DELAWARE RIVER OPERATIONS

OFFICE OF THE DELAWARE RIVER MASTER
United States Geological Survey
Milford, Pennsylvania 18337

March 23, 1984

Mr. Francis T. Schaefer, P.E.
Delaware River Master
U.S. Geological Survey
Reston, VA 22092

Dear Sir:

Transmitted herewith is my report on the hydrologic and hydraulic operations of the Delaware River basin as conducted by the Milford office under your direction during the year ending November 30, 1983. This report marks the thirtieth year of such activities since the inception of the Amended Decree of the United States Supreme Court, dated June 7, 1954.

Hydrologic conditions in the Delaware River basin varied from deficient to excessive to deficient during the year. The drought-warning status of late 1982 was continued to March 27, 1983. Despite the reservoirs filling and spilling in April, their storage declined to the drought-warning level by November 4, as defined by a recommendation of the parties to the Decree. Deficient runoff occurred in December, September and October; runoff in April, May and June was excessive. As a result of the deficiencies toward the end of the year, the rates of diversions and target flow for Montague were reduced November 9-30 to conserve water. Diversions from the basin to New York City and to New Jersey were below limits authorized in the Decree. Releases from the reservoirs were made as prescribed in the Decree or the temporary reductions due to water supply deficiencies. The hydrologic procedures developed previously were used to guide operations in this office.

This report was prepared by Robert E. Fish, the Deputy Delaware River Master until his retirement December 30, 1983. I have reviewed and edited the report with the able assistance of Robert W. Baebenroth and Beverly A. Roberts.

Sincerely yours,

William E. Harkness
Deputy Delaware River Master

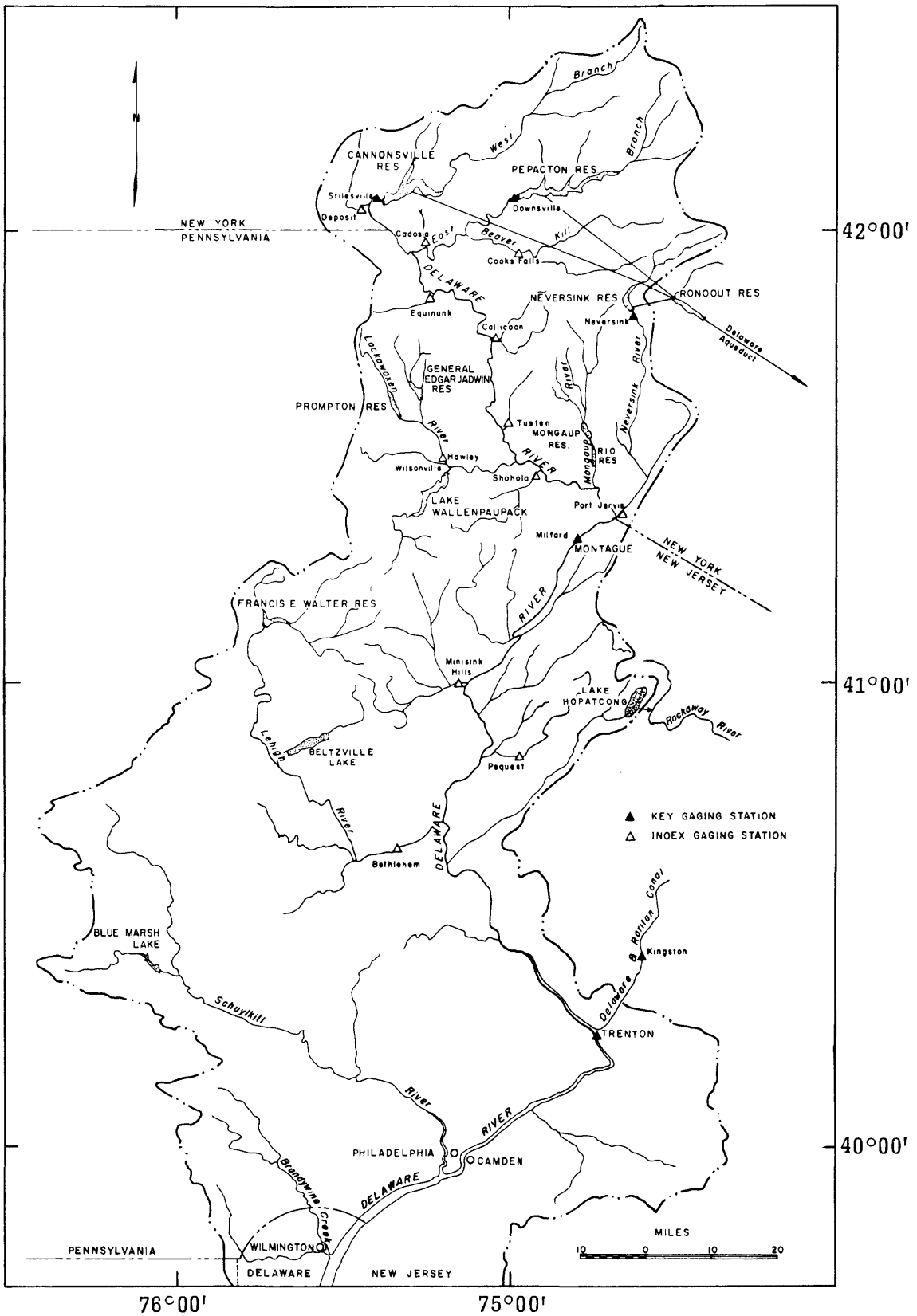


FIGURE 1.--Delaware River Basin Above Wilmington, Delaware.

Section II

REPORT OF DELAWARE RIVER OPERATIONS

Abstract

A Decree of the U.S. Supreme Court Court in 1954 established the position of Delaware River Master. The Decree authorizes diversions of water from the Delaware River basin and requires compensating releases from certain reservoirs of the City of New York to be made under the supervision and direction of the River Master. Reports to the Court, not less frequently than annually, were stipulated.

The 1983 report year, December 1, 1982 to November 30, 1983, was a year in which precipitation and runoff varied from below average to above average and back to below average in the Delaware River basin. For the year as a whole, precipitation and runoff were near average. Operations were under a status of drought warning December 1, 1982 to March 27, 1983 and November 9-30, 1983.

The annual flow of Delaware River at Montague, adjusted for change in reservoir storage and diversions was 2 percent above median. Diversions from the reservoirs of the City of New York were made within the terms of the Amended Decree during the year and to conform to a reduced rate of 680 mgd December 1-7, 1982, and November 9-30, 1983, and a reduced rate of 560 mgd December 8, 1982 to March 27, 1983, to conserve the water supply in the reservoirs during drought-warning status except December 9-14, 1983, when the cumulative daily average diversion exceeded the reduced rate by a maximum of 24 mgd. Additional conservation measures during the year included reductions in the design rate at Montague to 1,655 cfs December 1-7, 1982 and November 9-30, 1983, and to 1,550 cfs December 8 to March 27, 1983, during the drought-warning status. Minimum releases during the year conformed to those of the Memorandum of Agreement of June 27, 1977. 1/ Diversions by New Jersey through the Delaware & Raritan Canal were within prescribed limits of the Amended Decree and within the reductions adopted for December 1, 1982, to March 27, 1983, and November 9-30, 1983. The combined usable contents of Pepacton, Cannonsville, and Neversink Reservoirs on December 1, 1982, was 34.4 percent, and on November 30, 1983, the combined contents was 35.9 percent of capacity. The reservoirs reached a minimum combined storage of 33.3 percent of capacity December 16 and a maximum of 103.5 percent April 26.

1/ Schaefer, F.T., and Fish, R.E., Report of the River Master of the Delaware River, 1977, U.S. Geol. Survey.

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 reservoirs of the City of New York to the Delaware River to be made under the supervision and direction of the River Master. Restrictions on diversions and release requirements for drought-warning conditions were in use November 13, 1982 to March 27, 1983 and November 9-30, 1983. This report describes the operations December 1, 1982 to November 30, 1983.

Definitions of Terms and Procedures

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

Time of day. - Time of day is expressed in 24-hour eastern standard time, which included a 23-hour day April 25 and a 25-hour day October 31.

Rate of flow. - Mean discharge for any stated 24-hour period, in cubic feet per second (cfs) or million gallons per day (mgd).

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.

Releases from Pepacton and Neversink Reservoirs are usually made at constant rates for 24 hours; directed releases from Cannonsville Reservoir are usually made at two rates during a 24-hour period, and the quantity released is treated as an average rate for 24 hours. At times during 1982, the larger releases from Cannonsville Reservoir were made in steps by New York City in response to an understanding with New York State to effect the change in stage downstream over a longer period of time than would have been obtained from a single operation of release valves. Releases from Wallenpaupack and Mongaup powerplants are chiefly made as a result of peak-power demands and are treated as average rates for 24 hours.

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

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

Storage or contents. - Usable volume of water in a reservoir. Unless otherwise indicated, volume is computed on basis of level pool and above the point of maximum depletion. Reservoir contents were observed at 0900 daily.

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

Diversions. - The City of New York diverts water 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.

The State of New Jersey diverts water from the Delaware River through the Delaware & 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 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 excess quantity begins on June 15. The design rate for that period becomes effective at Montague on that date and continues in effect until the following March 15, or until the cumulative total of excess-release credits becomes equal to the seasonal quantity, whichever occurs first. An exception was made due to deficient precipitation and runoff. When the combined storage in Pepacton, Cannonsville and Neversink Reservoirs declined below the drought-warning level of the operation curves recommended by the parties to the Decree, the design rate at Montague was lowered from 1,850 to 1,655 cfs November 13 to December 7, 1982 and from 1,655 cfs to 1,550 cfs December 8, 1982 to March 27, 1983 to conserve water stored in these reservoirs.

Daily excess-release credits. - Daily credits and deficits during the seasonal period are equal to the algebraic difference between the daily mean discharge at Montague and 1,750 cfs; 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. Additionally, during the seasonal period, credits are also made for part or all of other prior releases from these reservoirs contributing to daily mean discharge at Montague between the excess-release rate and 1,750 cfs that may bring the total to the excess- release increment.

Precipitation

Precipitation observed on the basin above Montague for the 1983 report year was above normal, totaling 45.81 inches. Precipitations for March, April and November were excessive while those for December, July and September were deficient. The monthly precipitation during the report year is shown in the following table:

Precipitation, in inches
Delaware River basin above Montague, N.J.

Month	December 1940 to November 1982 Average	December 1982 to November 1983	
		Amount	Percentage of average
December	3.47	2.07	60
January	2.94	2.81	96
February	2.79	2.75	99
March	3.29	4.30	131
April	3.64	8.90	245
May	4.09	4.76	116
June	3.96	4.37	110
July	4.06	2.32	57
August	3.96	3.36	85
September	3.71	2.11	57
October	3.36	3.27	97
November	3.71	4.79	129
12 months	42.98	45.81	107

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

December to May is generally considered the normal time of year when surface- and ground-water reservoirs fill. During this period in 1982-83, precipitation of 25.59 inches was observed, which was 127 percent of the 42-year average. During June to November, precipitation of 20.22 inches was observed, which was 89 percent of the 42-year average. The maximum monthly precipitation listed during the year for any of the ten stations was 11.06 inches in April at Milford, Pa.; the minimum monthly precipitation observed was 1.28 inches in December at Hawley, Pa.

Acknowledgments

A part of the hydrologic data is presented as records of the U.S. Geological Survey gaging stations. These records were collected, computed, and furnished by the Offices of the U.S. Geological Survey at Albany, New York, Malvern, Pennsylvania, and Trenton, New Jersey in cooperation with the States of New York, New Jersey, and Pennsylvania, and the City of New York and are found in tables 1 to 7.

The River Master daily operation records were prepared by the Milford Office of the Delaware River Master from hydrologic data collected principally on a day-to-day basis. Data for these records were collected and computed by the Milford Office or were furnished by agencies, as follows: Data from Pepacton, Cannonsville and Neversink Reservoirs by the New York City Department of Environmental Protection, Bureau of Water Supply; from Lake Wallenpaupack by the Pennsylvania Power & Light Company; and from Mongaup Reservoir by Orange and Rockland Utilities, Inc.

OPERATIONS

December to May

During the first half of the report year, precipitation was above average and ranged from deficient to excessive. Precipitation during April was the highest April in the period of record. Pepacton, Cannonsville and Neversink Reservoirs reached their maximum combined storage of 103.5 percent of capacity April 26.

On December 1, 1982, Pepacton Reservoir contained 63.617 billion gallons of water in storage above the point of maximum depletion, or 45.4 percent of the reservoir's storage capacity of 140.190 billion gallons. Cannonsville Reservoir contained 16.816 billion gallons, or 17.6 percent of the reservoir's storage capacity of 95.706 billion gallons and Neversink Reservoir contained 12.822 billion gallons, or 36.7 percent of the reservoir's storage capacity of 34.941 billion gallons. The combined storage in the three reservoirs as of December 1 was 93.255 billion gallons, or 34.4 percent of their combined capacities. Daily storages in Pepacton, Cannonsville and Neversink Reservoirs are shown in tables 8, 9 and 10, respectively.

When the combined storage of Pepacton, Cannonsville and Neversink Reservoirs had declined below the drought-warning level of the operation curves recommended by the parties to the Decree, reductions in uses were instituted November 13, 1982 to conserve supplies in the reservoirs. The permissible diversion rate to the New York City Water-Supply system was reduced from 800 to 680 mgd and the design rate of flow of Delaware River at Montague, N.J. was changed from 1,850 to 1,655 cfs. Those rates were continued until December 7, 1982.

With the combined storage declining into the lower half of the drought-warning zone on December 8, diversions were reduced from 680 mgd to 560 mgd and the Montague design rate was lowered from 1,655 cfs to 1,550 cfs. These rates were maintained until March 28 when the combined storage had been more than 15 billion gallons above the drought-warning level for 5 consecutive days. On March 28, the diversion rate of 800 mgd and the Montague minimum basic design rate of 1,750 cfs were resumed.

During the winter and spring of 1982-83, part of the inflow to the three reservoirs was required for diversions and releases. Diversions to Rondout Reservoir during December 1 to May 31 totaled 65.433 billion gallons and averaged 360 mgd. The equivalent diversion rate June 1, 1982 to May 31, 1983 was 521 mgd. The diversions did not exceed the limit of 800 mgd specified by the Decree as shown in table 11.

There were 11 days during December 1 to May 31 when the anticipated discharge at Montague, exclusive of water released from the City reservoirs, fell below the design rate of 1,550 cfs and required releases to satisfy the rate for the lower half of the drought-warning zone (table 12). On the remaining days, New York City made releases for conservation purposes at rates set forth in the Memorandum of Agreement approved by the River Master, effective June 27, 1977, and extended May 22, 1979, and under the Interstate Water Management Recommendations of the Parties to the Decree. The Agreement and Recommendations set augmented conservation releases as follows:

Reservoir	Releases in cubic feet per second	
	April 1 to October 31	November 1 to March 31
Pepacton	70	50
Cannonsville	45 (except 325 June 15 to August 15)	33
Neversink	45	25

During December 1 to May 31, there were 6 days when the discharge at Montague was less than the prevailing design rates and 176 days when the discharge was above those rates. (See table 13.) On days when there were deficiencies in flow, such differences usually were attributable to difficulties in determining the uncontrolled flow because of conditions associated with the cold weather.

Inflow to the City's reservoirs during December through May generally exceeds draft rates and therefore increases storage. The average inflow to Pepacton, Cannonsville, and Neversink Reservoirs for these 6 months during the 42-year period, December 1940 to May 1982, was 303.7 billion gallons. During the corresponding six months of the current report year, inflow to the three reservoirs totaled 349.169 billion gallons. Loss chargeable to evaporation was considered to be insignificant and was not included in the computation. The excess of inflow over the demand increased water storage to these three reservoirs in 1983 to 271.058 billion gallons by May 31, an increase of 178.126 billion gallons from November 30, 1982.

June to November

Precipitation in June was above average as it was during the preceding 3 months, but the following 3 months accrued a deficiency of 4 inches below average. Diversions to Rondout Reservoir during June 1 to November 30 totaled 129.507 billion gallons. The equivalent diversion rate did not exceed the limit specified by the Decree and was 714 mgd on November 8. Upon direction by the River Master and under the Interstate Water Management Recommendations, diversions were limited to an average of 680 mgd beginning November 9 because reservoir storage declined below the drought-warning level. Diversions November 9-30 averaged 661 mgd. Releases were required to satisfy the Montague Formula on days when the anticipated discharge at Montague, exclusive of water released from the City reservoirs, fell below the design rate. Releases at augmented or at minimum conservation rates were made at other times from each reservoir by the City of New York.

During June 1-14, the flow required to be maintained in the Delaware River at Montague was the minimum basic rate of 1,750 cfs. The forecasted discharge, exclusive of releases from Pepacton, Cannonsville and Neversink Reservoirs, was greater than 1,750 cfs each day. During that period there was no day when the discharge at Montague was less than 1,750 cfs.

On June 15, the seasonal period began for release of excess quantity of water from the reservoirs, and the design rate at Montague was increased to 1,850 cfs. This rate was composed of the basic rate of 1,750 cfs plus 100 cfs of required excess releases.

As defined in the Decree, the quantity of excess water in the aggregate was 83 percent of the amount by which the estimated consumption during 1983 (limited to an increase of 7¼ billion gallons over actual consumption in any previous year) was less than New York City's estimate of safe yield during 1983, obtainable from all its sources without pumping and not to be less than 1,665 mgd. In releasing the excess quantity, the design rate at Montague was the minimum basic rate plus the excess quantity divided by 120 days. The City was not required to release at rates exceeding the capacity of the release works.

The New York City Department of Environmental Protection, Bureau of Water Supply, furnished the River Master with the following advance data for the 1983 calendar year:

1. The estimated continuous safe yield, from all the City's sources, obtainable without pumping, is 1,665 mgd, or a total during the calendar year 1983 of 1,665 x 365 days = 607.725 billion gallons.
2. The estimated consumption that the City must provide from all its sources of supply during the calendar year 1983 is 591.582 + 7.250 = 598.832 billion gallons.

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 billion gallons. The Montague design rate during the excess release period beginning June 15, 1983, was computed as:

$$1{,}750 + \frac{7.381 \text{ billion gallons} \times 1{,}547 \text{ cfs/bgd}}{120 \text{ days}} = 1{,}850 \text{ cfs}$$

Data on consumption of water by the City of New York for each calendar year, beginning in 1940, are shown in table 14.

The design rate of 1,850 cfs at Montague was required June 15 to September 22, when the excess-release quantity was expended. When the combined storage in the City reservoirs declined below the drought-warning level of the operation curves recommended by the parties to the Decree, the design rate at Montague was lowered from 1,750 to 1,655 cfs November 9-30, 1983 to conserve water in storage. Accordingly, directed releases from the City reservoirs were designed to maintain the rate of 1,850 cfs at Montague June 15 to September 22, a rate of 1,750 cfs September 23 to November 8 and a rate of 1,655 cfs November 9-30.

On the basis of advance estimates, releases from the reservoirs designed to maintain the prevailing rates at Montague were required 137 days, June 26 to November 23 (table 12). During those 137 days there were 66 days when the discharge at Montague was less than the prevailing design rate and 71 days when the discharge was above the prevailing design rate (table 13).

On days of directed releases when there were deficiences or excesses in flow, such differences were attributable to the uncontrolled flow, weather adjustment,or powerplant releases being other than those anticipated.

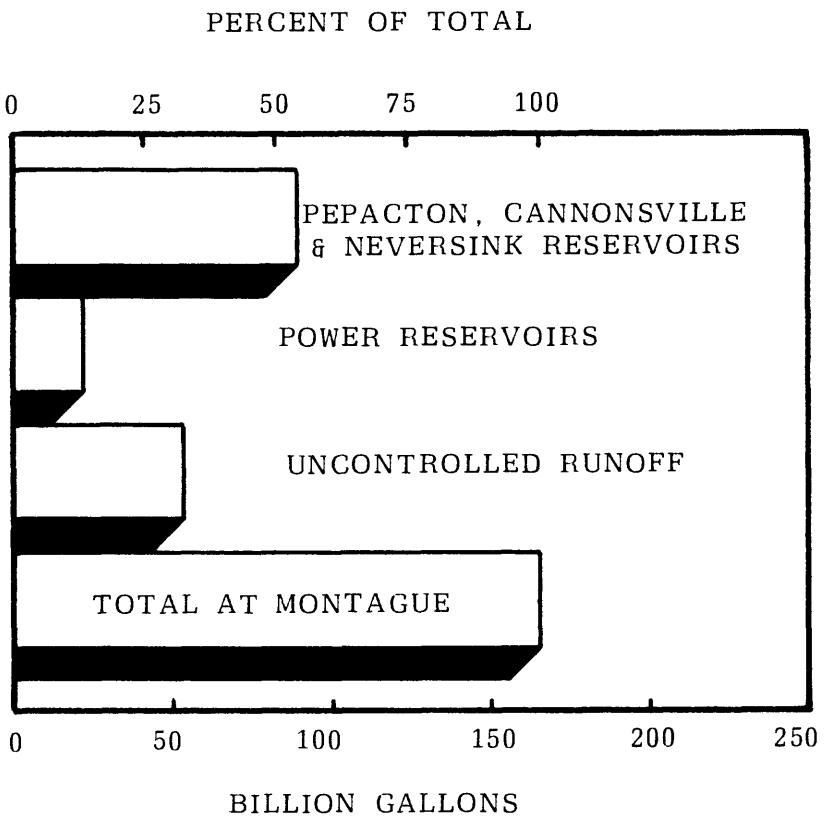
The hydrographs of plate 1, June 1 to November 30, show the total discharge at Montague; the part derived from uncontrolled runoff downstream from the reservoirs; the part contributed by the power reservoirs; and the part contributed by Pepacton, Cannonsville and Neversink Reservoirs. In analyzing the 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 was subject to all the errors in observations, transit times, and routing of the several components of flow. Because of these uncertainties, the computed hydrograph of uncontrolled runoff was somewhat ragged.

The table below summarizes diversions, releases and other contributions to the flow of the Delaware River at Montague July 10 to November 23. The diversions and releases from the City reservoirs were made under the provisions of the Montague Formula and direction of the River Master.

Diverted to Rondout Reservoir		152,868 cfs-days
Delaware River at Montague	Advance estimates (cfs-days)	Observed operations (cfs-days)
New York City releases (Pepacton, Cannonsville, Neversink)		
Directed	[a] 133,033	[b] 133,642
Other		4,095
Wallenpaupack & Mongaup power releases	31,511	34,602
Runoff from uncontrolled area	81,713	83,281
Flow at Montague		255,620

[a] Directed release as designed
[b] Actual release

The contributions to flow of the Delaware River at Montague during July 10 to November 23 are also shown in the graph below:



Summary

From December 1, 1982 to November 30, 1983, diversions to Rondout Reservoir totaled 194.940 billion gallons, and all releases from the New York City reservoirs to the Delaware River totaled 167,506 cfs-days (108.278 billion gallons).

During the year, maximum storage in Pepacton Reservoir was 142.771 billion gallons, or 101.8 percent of capacity, on April 27. Maximum storage in Cannonsville Reservoir was 102.627 billion gallons, or 107.2 percent of capacity, on April 26. Maximum storage in Neversink Reservoir was 35.309 billion gallons, or 101.1 percent of capacity, April 26. The maximum combined storage in the three reservoirs during the year was 280.371 billion gallons, or 103.5 percent of capacity, on April 26.

Minimum storage during the year in Pepacton Reservoir was 60.816 billion gallons, or 43.4 percent of capacity on December 16. The minimum storage in Cannonsville Reservoir was 16.410 billion gallons, or 17.1 percent of capacity on November 21. Minimum storage in Neversink Reservoir was 11.317 billion gallons, or 32.4 percent of capacity on December 16. Minimum combined storage in the three reservoirs was 90.268 billion gallons, or 33.3 percent of capacity December 16.

A resume' of the combined storage of the three reservoirs on the first day of the month June 1967 to December 1983 is shown in figure 3. Storage May 1 and June 1 was above the median and was below the median all other months. Storage was within the range between the highest and the lowest storage of earlier years, except for a new low March 1 and a new high May 1.

On November 30, Pepacton Reservoir contained 62.659 billion gallons or 44.7 percent of capacity. Cannonsville Reservoir contained 19.964 billion gallons, or 20.9 percent of capacity. Neversink Reservoir contained 14.564 billion gallons or 41.7 percent of capacity. Combined storage in the three reservoirs was 97.187 billion gallons, or 35.9 percent of their combined capacity. During the year, combined storage increased 4.255 billion gallons, or 1.6 percent of capacity.

SUPPLEMENTARY RELEASE FROM WALLENPAUPACK POWERPLANT

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

WATER BUDGET, DELAWARE RIVER AT MONTAGUE, N.J.

The data and computations of the water budget formed the basic operation records required to carry out the River Master's specific responsibilities with respect to the Montague Formula and the Commission Resolutions during the report year. The water budget was in two parts: (1) advance estimates of the daily average flow at Montague, exclusive of controlled releases from New York City's reservoirs (table 12) and (2) segregation of the daily average flow at Montague among its various source components (table 13). The time intervals required for water to travel from the various sources to Montague were taken into account.

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 Mongaup Reservoir on Mongaup River in the production of hydroelectric power.

3. Runoff from the uncontrolled area above Montague.

4. Controlled releases from Pepacton, Cannonsville and Neversink Reservoirs of the City of New York.

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

TIME OF TRANSIT

The following schedule of average times for the effective transit of water from the various sources of controlled supply to Montague was used for discharge routing during the 1983 report year except for December 14-20.

Source	Hours
Pepacton Reservoir	60
Cannonsville Reservoir	48
Neversink Reservoir	33
Lake Wallenpaupack	16
Mongaup Reservoir	12

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, e.g., 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 12 hours late. During the winter, the cold weather formed ice in the streams, which, together with the low streamflow, gradually increased the resistance to streamflow and lengthened the time of transit. Based upon the probable amount of ice in the streams and the experiences of several past winters, times of transit were lengthened to the following:

December 14-20

Source	Hours
Pepacton Reservoir	84
Cannonsville Reservoir	72
Neversink Reservoir	57

With warmer temperatures and stabilizing of the hydraulic conditions in the river, transit times from these reservoirs to Montague lessened, and transit times for average open-river conditions were resumed December 21.

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

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 operations converted to daily discharge; (5) advance estimates of power demand converted to daily discharge; (6) advance estimates of anticipated uncontrolled runoff at Montague; and (7) average times for routing of water from the several sources. Variable and usually minor errors of estimate occur in projecting data, but these data must be used in the daily design and direction of releases from New York City reservoirs.

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 13 on page 56. 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 ANTICIPATED FLOW AT MONTAGUE

The time of transit of water from Pepacton Reservoir to Montague was greater than that from any other reservoir above Montague; therefore, the time of daily directed releases to maintain prescribed rates of flow at Montague was based on time of transit from Pepacton 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 began at Pepacton at 1200, at Cannonsville at 2400, and at Neversink Reservoir at 1500 the following day.

The determination of the amount of release required from the City's reservoirs to maintain specified rates of flow at Montague was based on estimates of releases from Lake Wallenpaupack and Mongaup Reservoir and an estimate of the uncontrolled runoff at Montague. Taking into account the time of transit from these sources to Montague, this determination required that advance estimates of the following components be made on the morning of each day, including (1) the expected release of water from Lake Wallenpaupack for power production for a 24-hour period, beginning at 0800, 2 days later; (2) expected release of water from Mongaup Reservoir for power production for a 24-hour period 2 days later, beginning at 1200; and (3) expected uncontrolled runoff at Montague 3 days later. 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 12.

The electric power companies cooperated fully in furnishing advance estimates of powerplant release (table 12). Pennsylvania Power & Light Company committed itself to following its given schedules, within practicable limits, and was generally successful. As the hydroelectric plants were used chiefly for meeting peak-power demands of the system, advance estimates were subject to many modifying factors such as the influence of the vagaries of weather upon peak-power demand and unpredictable transmission and mechanical difficulties in electric-system operation. 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. Furthermore, it was impractical for the companies to estimate their probable operation on any period other than 24 hours. In the estimates for the Wallenpaupack plant, the time factor was of little concern, as power operations during periods of low flow was usually between 0800 and 2400, which fell within the 24-hour period beginning at 0800. In routing the Mongaup Reservoir release estimates, some error was introduced at times, as the power operation during periods of low flow was usually between 0700 and 2200 which spanned the 1200 to 1200 routing period.

For computation purposes during periods of low flow, the estimate of uncontrolled runoff at Montague 3 days in advance (or 4 days in part of the winter period) was treated as two items: (1) Present runoff and (2) estimated increase in runoff from precipitation. The present runoff was computed for 2,156 square miles of uncontrolled drainage area above Montague based on conditions over the drainage area as of 0800 on the morning the estimate was made. The estimated increase in runoff was computed from precipitation which was forecast to occur on the day the estimate was made and the 2 following days, with the exception that during the winter period, December 14-20, consideration was also given to forecasts for the fourth day and to temperatures. Estimated quantities for these items are shown in table 12.

During the winter period, the advance estimate of the uncontrolled runoff (present conditions) was based on nearby gaging stations and on the recession curve of the uncontrolled flow at Montague projected to the date, 3 (or 4) days hence, under design.

During open-river conditions, the advance estimate of uncontrolled runoff (present conditions) was based on discharges as of 0800 at gaging stations listed below.

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

The procedure for computing the advance estimate combined a routing and recession (as applicable) of the 0800 discharges of the Beaver Kill, Oquaga, Equinunk, Callicoon and Shohola Creeks and Tenmile, Lackawaxen, and Neversink Rivers gaging stations to Montague, with a computed yield from the remaining ungaged, uncontrolled drainage area. Releases from Neversink Reservoir were deducted from discharge of the Neversink River site. The yield from the remaining uncontrolled drainage area was estimated by using as indexes the 0800 discharges of Cadosia, Oquaga, Equinunk, and Callicoon Creeks, and Tenmile and Lackawaxen Rivers with routing and recession by individual gaging stations.

The advance estimate of increase in runoff from precipitation is shown in table 12 under the heading of "Weather Adjustment." The National Weather Service Office, Philadelphia, Pa., cooperated throughout the low-flow periods by furnishing quantitative forecasts of average precipitation over the drainage area above Montague and air temperatures for each day of the 3-day period, except during the winter period when forecasts were often provided for each day of a 4-day period. During the winter, the probable increase in runoff was estimated from the current state of snow and ice and from forecasted temperature and precipitation for the several days under consideration. During open-river conditions, runoff from the forecasted precipitation was estimated from previously established relationships.

The total anticipated flow at Montague, exclusive of releases from the City's reservoirs (table 12), was the sum of the forecasted releases from the power reservoirs, the estimated uncontrolled runoff under then current conditions, and the weather adjustment. The amount by which this computed flow was less than the prescribed Montague rate indicated the expected deficiency at Montague, which would have to be made up by corresponding releases from New York City reservoirs.

There were times when revised forecasts of weather or powerplant release in substantial amount became available before the completion of the required release from New York City reservoirs. At such times, the release required from New York City reservoirs was again computed on the basis of the revised information, and the release required was changed to the revised indicated deficiency. Usually this procedure resulted in a reduced release requirement from New York City reservoirs and the conservation of the water affected by the change. Only the final figures are shown in table 12.

When the estimates of anticipated flow at Montague, inclusive of New York City releases, were too high, insufficient water was released. When the estimates were too low, more water was released than necessary. Such deviations from the estimates were unavoidable, however cumulative deviations in the estimating procedure over a period of time were reduced by using an adjustment based on the amount by which the cumulative directed releases were greater or less than the cumulative releases actually required to maintain the prescribed rate of flow at Montague. The cumulative difference between directed and actually required releases was arbitrarily divided by minus 10 to spread the balancing adjustment over 10 days, but limited to a maximum of 100 cfs. The mechanics of determining the balancing adjustment was accomplished in columns 9 to 14, table 12. As the cumulative difference could be determined only after the actual flow at Montague was computed, the balancing adjustment was entered in column 7 four lines below its computation in columns 14. The balancing adjustment was applied June 30 to September 22 and was helpful in reducing cumulative errors and in conserving water.

DIVERSIONS TO NEW YORK CITY WATER SUPPLY

Table 11 shows diversions from Pepacton, Cannonsville and Neversink Reservoirs to the New York City water-supply system during the report year. The tabulation includes a running account of the average rates of the combined diversions from the reservoirs, computed as prescribed by Delaware River Basin Commission Resolution No. 82-21 et seq. December 1 to March 27, the equivalent rate as prescribed by the Decree March 28 to November 8 and the average rate directed by the River Master and under the Interstate Water Management Recommendations November 9-30. The tabulation shows that the maximum equivalent diversion rate of the Decree was not exceeded at any time. The average rate of the temporary reduction was exceeded December 9-14, by a maximum of 24 mgd on December 10, but was within the prescribed limit thereafter.

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:

Reservoir level	Pepacton Res.		Cannonsville Res.		Neversink Res.	
	Elev. (feet)	Contents (billion gallons)	Elev. (feet)	Contents (billion gallons)	Elev. (feet)	Contents (billion gallons)
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 8, 9 and 10 show storage in Pepacton, Cannonsville and Neversink Reservoirs, respectively, above "point of maximum depletion" or minimum full-operating level.

ANALYSIS OF FORECASTS

Forecasts of the flow at Montague based on the anticipated flow of the several components (exclusive of the release from the City's reservoirs) vary somewhat with those actually experienced on most days, even under the most favorable conditions. The daily variations are usually largely compensating. Forecasts in 1983 were compared with actual uncontrolled runoff and powerplant releases during July 10 to November 23, which included most of the days for which releases were directed for the excess-release rate or the minimum basic rate of the Montague Formula or the lesser temporary design rate.

Uncontrolled Runoff Forecasts

A comparison of the hydrographs on figure 2 of forecast uncontrolled runoff and the actual uncontrolled runoff indicated that the forecasting procedures were generally adequate. The forecast uncontrolled runoff included anticipated uncontrolled runoff under then-existing conditions plus the weather adjustment based on forecast precipitation. The total uncontrolled runoff during July 10 to November 23 (Montague dates) was 83,281 cfs-days. The forecast of uncontrolled runoff for those days was 81,713 cfs-days, or 1.9 percent less than actual runoff.

Powerplant Release Forecasts

During July 10 to November 23 (Montague dates), the total actual release from the powerplants was 34,602 cfs-days. The advance estimate of powerplant releases for those days were 31,511 cfs-days, or 8.9 percent less than actual releases.

Summary of Forecasts

The actual uncontrolled runoff plus actual powerplant releases during July 10 to November 23 (Montague dates) totaled 117,883 cfs-days, and the advance estimate was 113,224 cfs-days. The net cumulative difference between the estimate and the actual was 4.0 percent.

On the basis of the observed discharges at Montague, exact forecasting of releases required from the City's reservoirs during July 10 to November 23 would have totaled 132,083 cfs-days. The releases, as designed, totaled 133,975 cfs-days, or 1.4 percent more than for exact forecasting.

SUMMARY COMPARISONS OF RIVER MASTER OPERATION DATA AND OTHER STREAMFLOW RECORDS

It has been explained that the River Master operations are, in effect, day-to-day operations, for which it is necessary to use preliminary records of streamflow. The following summaries show comparison of records used in the River Master operations and Geological Survey records. In the comparison of releases approximating conservation rates only, data were used in units of million gallons per day and converted to cubic feet per second 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 Geological Survey gaging station on the East Branch Delaware River at Downsville, N.Y., is 0.5 mile downstream from Pepacton Reservoir dam. The discharge shown in table 1 includes releases and spillage from Pepacton Reservoir, a small amount of seepage, which enters the channel between the dam and gage site; and, during storms, a small amount of runoff, which originates between the dam and gage site. The drainage area at the dam is 372 square miles.

Releases were made at conservation or other rates by New York City during the year. For flows of approximately 8.0, 70 and 600 cfs at the gaging station, the venturi meter instruments indicated -25, +0.3 and +2.7 percent difference, respectively, in rates of release from the reservoir than those shown by the gaging-station records.

The Geological Survey gaging station on the West Branch Delaware River at Stilesville, N.Y., is 1.4 miles downstream from Cannonsville Dam. The discharge shown in table 2 includes releases and spillage from Cannonsville Reservoir and the runoff from 2 square miles of drainage area between the dam and the gage site. The drainage area at the dam is 454 square miles, and that at the gaging station is 456 square miles.

Releases were made in a range from conservation to high rates during the year. For conservation flows of approximately 20 cfs at the gaging station, the venturi meter instruments indicated 47 percent less water being released from the reservoir than those shown by the gaging-station records. The venturi indicated 10 percent more discharge than that shown by the gaging-station records at flows of approximately 350 cfs and 3.1 percent more discharge for flows in the 1,100 cfs range.

The Geological Survey gaging station on the Neversink River at Neversink, N.Y., is 1,650 feet downstream from Neversink Dam. The discharge shown in table 4 includes releases and spillage from Neversink Reservoir and, during storms, a small amount of runoff, which originates between the dam and gage site. The drainage area at the dam is 92.5 square miles and that at the gaging station is 92.6 square miles.

Releases were made at conservation or other low flows by New York City during the year. For flows of approximately 6, 45 and 65 cfs at the gaging station, the venturi meter instrument indicated -27, +11 and +15 percent difference, respectively, in rates of release from the reservoir than those shown by the gaging-station records.

At all three locations discussed above, there was good agreement between the data from the venturi meters and U.S. Geological Survey gaging stations at medium and high flow, but poor agreement at very low flows. At medium and high flows, the gaging station records show slightly less water and at low flows they show significantly more.

Releases from Lake Wallenpaupack

In the River Master operations December 1 to November 30, records of daily discharge through the Wallenpaupack powerplant were furnished by the Pennsylvania Power & Light Company. Daily discharges were computed on an 0800 to 0800-time basis.

The records of daily mean discharges for Wallenpaupack Creek at Wilsonville, Pa., published by the Geological Survey, were furnished by the Company. These discharges, shown in table 3, represent the flow through the turbines of the powerplant. The gates at the dam were opened to allow spillage from April 25-27, 1983. During this period 5,589 cfs-days was spilled from Lake Wallenpaupack.

During December 1982 through November 1983, the River Master's record based on computations by Pennsylvania Power & Light Company, indicated 0.01 percent less discharge than the Geological Survey record.

Delaware River at Montague, N.J.

The River Master's operation record indicated 0.6 percent more discharge for the year than the Geological Survey record, and daily records were generally in good agreement.

Diversion Tunnels

Records of diversions through the East Delaware, West Delaware, and Neversink Tunnels were furnished to the River Master's office by the City of New York. These records were obtained from calibrated instruments connected to venturi meters installed in the tunnel conduits. Current-meter measurements were made by the River Master's office to verify the accuracy of the reported diversions. The current-meter measurements were made in the outlet channels downstream from the tunnels.

East Delaware Tunnel

This tunnel discharges into Rondout Reservoir. The elevation of Rondout Reservoir was too high many months of the year to permit access to the outlet channel, which is used for measuring discharge from the tunnel by current meter. The results of 13 current-meter measurements showed on the average that the venturi-meter instruments gave higher figures by 8.1 percent for the totalizer, 10.0 percent for the manometer and 8.1 percent for the indicator needle.

A series of measurements of flows through the by-pass works was made November 14-16 to check the accuracy of the venturi-meter instruments. Measurements at flows of approximately 160, 400 and 560 mgd were made by the color-velocity method by personnel of New York City and by current-meter method by hydrologists from the River Master office. One determination by the dye-dispersion method was made by the Geological Survey at the highest rate. The results of one current-meter measurement and preliminary results of 2 color-velocity measurements at the 160-mgd flow showed respective higher figures of 6.0 and 3.8 percent for the venturi-meter totalizer. At the 400-mgd flow, 4 current-meter measurements and preliminary results of 2 color-velocity measurements showed respectively higher figures of 10.5 and 0.5 percent for the venturi-meter totalizer. At the 560-mgd flow, 4 current-meter measurements, preliminary results of 2 color-velocity measurements and 2 Geological Survey dye-dispersion measurements showed respective higher figures for the totalizer of 9.5, 2.9 and 7.0 percent. The differences between the current-meter method, color-velocity procedure and dye-dispersion procedure are under investigation.

The powerplant that used the water diverted through the tunnel operated most days of the year. On days when the powerplant was not in operation, there was a small amount of leakage through the wicket gates, which was not recorded on the totalizer. Results of a current-meter measurement March 4, 1982, indicated a rate of 10.9 cfs from cooling water and leakage.

Based upon measurements obtained this year and in previous years, the record of quantity of water diverted through the East Delaware Tunnel should be substantially correct.

West Delaware Tunnel

A comparison of five current-meter measurements with venturi measurements indicated that the venturi gave higher results by 14 percent for the totalizer, 17 percent for the manometer and 12 percent for the indicator needle. Inspections of the channel downstream from the outlet, when valves were closed, showed negligible leakage.

Neversink Tunnel

Results of the comparative data showed that the venturi measurements and four current-meter measurements agreed fairly well. The average difference between the two methods showed the venturi higher by 7.2 percent for the totalizer, 8.2 percent for the manometer, and 13 percent for the indicator needle.

The powerplant that used the water diverted through the Neversink Tunnel operated about 12 hours daily on most days of the year. Results of the current-meter measurement made February 26, 1982 at a time when the powerplant was not operating, indicated the rate of leakage to be 14.6 cfs. The leakage was not recorded on the totalizer instrument, which was used for reporting the quantity of water diverted. Flow in the form of leakage averaged approximately 7 cfs daily. It was concluded that the reported record of the quantity of water diverted through the Neversink Tunnel was substantially correct.

INVESTIGATION OF UNGAGED STREAMS

In an effort to delineate yields of small streams in the ungaged area tributary to the Delaware River, a cooperative program was continued with the respective Geological Survey Districts to develop discharge correlations between small streams and regularly gaged streams. The increased knowledge of the yields of these streams is an aid in the definition of characteristics of the ungaged areas.

DIVERSIONS BY NEW JERSEY

According to the terms of the Decree, the State of New Jersey may divert for use outside the Delaware River basin from the Delaware River or its tributaries in New Jersey, without compensating releases, a quantity of water not to exceed 100 mgd (154.7 cfs), as a monthly average, with the diversion on any day not to exceed 120 mgd (185.6 cfs). The diversion through the Delaware & Raritan Canal was recorded at the gaging station at Kingston, N.J. The gaging station is 6.6 miles beyond the Delaware-Raritan divide, and records include a slight amount of inflow from the Raritan River basin. November 10, 1982 the Delaware River Basin Commission, with the consent of the parties to the Decree, adopted Resolution No. 82-21 and subsequently extended its provisions as conservation measures. This resolution, et seq., reduced allowable diversions by New Jersey to an average of 85 mgd (131.5 cfs) December 1-7, 1982 and to an average of 70 mgd (108.3 cfs) December 8, 1982 to March 27, 1983. Allowable diversions were increased March 28, 1983 to those provided by the Decree. When drought warning status was declared November 9, 1983, the diversions were again reduced to 85 mgd and remained at that level through the end of the report year.

Summarized below are the discharges at the Kingston gaging station from Table 6. The summary table shows that the Decree limitations were not exceeded during the year December 1 to November 30. The table also shows the respective average rates of the above resolutions were not exceeded.

Month	Average discharge, cfs	Maximum daily discharge, cfs
December 1-7	98.4	103
December 8-31	102	108
January	98.6	104
February	97.0	102
March 1-27	95.4	101
March 28-31	93.8	99
April	91.6	104
May	72.7	80
June	62.2	75
July	18.7	61
August	24.2	64
September	26.3	44
October	61.5	83
November 1-8	74.4	90
November 9-30	109	117

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

At the beginning of the report year, conservation measures including reductions in allowable diversions from the basin and rates of flow of the Delaware River at Montague were in effect due to a drought-warning status having been declared November 13, 1982. With general improvement over drought and the filling of the reservoirs, the restrictions were lifted March 28. When reservoir storage again declined rapidly, similar reductions were imposed beginning November 9, 1983 and continued through the end of the report year.

Diversions from the Delaware River basin to the water-supply system of the City of New York were less than the 800 mgd authorized by the Decree. Diversions during the drought-warning periods also conformed to the permissible levels in effect for those periods except December 9-14 when the cumulative daily average diversion exceeded the 560 mgd reduced level by a maximum of 24 mgd on December 10, 1982. By December 15 the cumulative average was 560 mgd and remained below that level for the remainder of the period of reductions. Allowable and actual diversions are shown in the following table:

Effective dates	Allowable diversion Equivalent rate not to exceed (mgd)	Actual diversion (mgd)
Nov. 13 to Dec. 7, 1982	680	680
Dec. 8, 1982 to Mar. 27, 1983	560	382
Mar. 28 to May 31, 1983	800	286
June 1 to Nov. 8, 1983	800	714
Nov. 9-30, 1983	680	661

Under Compensating Releases of the Montague Formula, the City released water from its reservoirs at rates designed by the River Master to maintain the minimum basic rate of flow of 1,750 cfs at Montague March 28 to June 14 and September 23 to November 8; and at the excess-release rate of 1,850 cfs June 15 to September 22. Releases from the reservoirs, under the reduced rates, and in accordance with the design data of the River Master, were made to provide the following rates of flow at Montague, N.J.:

Dec. 1-7	1,655 cfs
Dec. 8 to Mar. 27	1,550 cfs
Nov. 9-30	1,655 cfs

Diversions from the Delaware River basin by the State of New Jersey were found to be less than the authorized monthly average of 100 mgd and less than the authorized maximum daily flow of 120 mgd under the Amended Decree. During the drought-warning periods allowable and actual diversions were:

Effective dates	Authorized under recommendations Average not to exceed (mgd)	Actual diversion (mgd)
Nov. 13, 1982 to Dec. 7	85	59
Dec. 8 to Mar. 27	70	63
Nov. 9-30	85	70

Table 1. - Daily discharge in cubic feet per second of East Branch Delaware River at Downsville, N.Y.

for the year ending November 30, 1983

Mean values (preliminary U.S. Geological Survey record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	8.3	8.6	8.6	8.9	7.5	3,090	74	68	81	72	66	408
2	8.0	8.6	8.9	8.9	7.5	3,270	74	81	81	72	70	195
3	8.0	8.6	10	8.0	7.7	2,910	70	111	79	72	70	197
4	8.3	8.6	9.5	6.9	7.5	2,800	147	133	79	88	70	354
5	8.3	8.6	9.5	6.9	7.5	2,210	330	106	90	98	71	602
6	8.6	8.6	9.5	6.9	7.5	1,770	374	74	103	98	71	604
7	24	8.6	9.5	7.2	11	1,540	330	74	103	85	70	602
8	40	8.3	9.2	6.9	19	1,450	229	70	103	72	70	600
9	40	8.3	9.2	6.9	18	1,400	154	65	90	74	70	599
10	40	8.3	9.2	7.2	19	1,050	103	65	77	74	70	302
11	38	8.6	9.2	7.2	19	757	81	68	77	74	70	360
12	37	8.6	9.2	7.2	45	608	79	85	77	68	69	605
13	38	8.3	9.2	7.2	72	484	77	103	77	70	69	605
14	43	8.3	8.9	7.2	68	297	88	106	77	72	69	487
15	48	8.3	8.9	7.2	68	219	100	103	77	72	68	166
16	30	8.3	8.9	7.2	77	224	108	111	72	72	68	258
17	8.9	8.3	8.9	7.2	77	147	98	106	74	72	68	544
18	8.6	8.3	8.9	7.2	77	90	98	90	77	72	169	476
19	8.3	8.3	9.2	7.5	74	85	98	74	72	72	287	473
20	8.3	8.3	8.9	7.5	74	79	81	79	70	72	419	279
21	8.3	8.3	8.9	7.7	77	74	65	79	72	72	612	69
22	8.3	8.3	8.9	7.7	74	72	66	81	72	72	606	6.5
23	8.6	8.9	9.2	7.5	72	77	85	81	72	72	572	6.4
24	8.6	8.9	8.9	7.2	72	72	100	81	77	72	575	6.6
25	8.6	8.6	8.9	7.2	643	77	103	81	72	72	608	6.7
26	8.9	8.6	8.9	7.2	3,740	77	100	81	72	72	602	5.3
27	8.6	8.6	8.9	7.5	4,090	77	100	81	72	72	604	5.3
28	8.9	8.6	8.9	7.7	3,930	77	90	81	72	72	601	5.5
29	8.6	8.6		7.5	3,850	77	72	81	72	68	597	5.6
30	8.6	8.6		7.5	3,660	77	68	81	72	66	597	5.4
31	8.6	8.6		7.5		77		81	72		603	
Total cfs-days	556.2	263.3	254.8	229.5	20,971.2	25,314	3,642	2,661	2,433	2,231	8,631	8,838.3
Mean cfs	17.9	8.49	9.10	7.40	699	817	121	85.8	78.5	74.4	278	295

Year total 76,025.3 cfs-days

Mean 208 cfs

Table 2. - Daily discharge in cubic feet per second of West Branch Delaware River at Stilesville, N.Y.

for the year ending November 30, 1983

Mean values (preliminary U.S. Geological Survey record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	16	18	19	21	15	4,520	1,230	335	718	866	1,210	678
2	16	18	20	21	15	4,600	1,170	335	770	1,170	925	1,000
3	16	18	33	21	17	4,390	1,080	335	858	1,240	1,130	1,040
4	15	18	29	21	16	4,120	1,060	335	999	984	1,240	1,070
5	15	18	24	22	15	3,670	1,030	335	1,230	726	1,270	750
6	15	18	22	21	15	3,070	953	335	1,170	638	1,240	704
7	48	18	22	23	16	2,500	1,010	325	868	539	1,270	633
8	159	18	21	22	19	2,130	971	335	870	492	1,270	624
9	104	18	21	22	17	2,090	993	353	873	821	1,330	646
10	166	18	21	24	21	1,880	713	335	962	807	1,370	401
11	277	19	20	26	21	1,650	648	335	1,050	823	1,400	643
12	320	18	21	25	32	1,460	586	335	709	682	1,200	293
13	454	18	20	24	51	1,310	665	335	320	990	550	127
14	512	18	20	19	51	1,170	635	335	389	1,190	496	102
15	438	18	20	15	55	1,110	475	944	467	1,070	838	81
16	302	18	20	15	79	1,250	402	919	865	1,250	945	34
17	27	18	21	15	69	1,210	405	349	957	1,120	1,150	33
18	17	17	21	15	62	1,090	390	484	1,080	965	1,270	77
19	17	17	21	15	379	999	383	335	1,100	620	1,050	34
20	17	17	21	15	1,420	950	376	335	1,120	679	910	32
21	17	17	21	17	1,970	931	337	335	1,190	595	700	34
22	17	17	21	17	2,090	885	335	598	1,140	342	643	33
23	17	19	21	16	2,370	908	335	925	1,230	687	374	32
24	17	19	21	16	3,340	898	335	360	1,250	925	272	33
25	17	19	21	15	6,200	845	440	515	1,250	534	383	37
26	21	19	21	15	7,100	829	335	349	1,270	447	363	34
27	20	19	21	15	6,310	1,050	335	330	1,200	672	378	34
28	21	19	21	17	5,530	1,080	345	330	849	871	399	35
29	20	18		15	4,940	1,070	337	814	665	942	449	36
30	19	19		15	4,740	1,120	335	1,130	955	1,260	524	35
31	19	19		15		1,200		635	909		626	
Total cfs-days	3,156	562	605	575	46,975	55,985	18,644	14,385	29,283	24,947	27,175	9,345
Mean cfs	102	18.1	21.6	18.5	1,566	1,806	621	464	945	832	877	312

Year total 231,637 cfs-days

Mean 635 cfs

Table 3. - Daily discharge, in cubic feet per second, of Wallenpaupack Creek at Wilsonville, Pa.

for the year ending November 30, 1983

Mean values (preliminary U.S. Geological Survey record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	0	0	482	703	938	1,590	441	953	284	0	0	0
2	0	0	421	701	939	1,600	444	921	0	0	0	0
3	0	250	478	816	715	1,640	470	1,100	0	0	30	0
4	0	250	478	694	922	1,650	0	604	0	0	0	0
5	0	242	0	0	942	1,650	0	571	0	0	0	0
6	98	229	0	0	950	1,650	386	590	0	844	0	0
7	0	222	685	620	938	0	980	535	0	655	0	0
8	0	0	690	726	946	0	1,410	590	0	248	0	0
9	9	0	697	713	943	1,060	1,430	0	0	299	0	0
10	469	234	738	712	715	1,100	1,430	0	5	0	0	0
11	0	235	740	675	1,110	1,110	1,430	586	486	0	0	0
12	0	237	0	0	1,680	663	1,420	604	0	512	0	0
13	0	308	0	0	1,680	674	1,340	601	0	0	0	0
14	6	238	746	811	1,690	0	350	593	2	0	0	0
15	0	0	718	856	1,590	0	247	578	0	0	0	0
16	0	0	688	912	351	349	554	0	0	0	0	0
17	7	477	663	902	1,420	0	357	0	0	0	0	0
18	0	451	792	890	652	0	0	755	0	0	0	0
19	0	476	0	0	1,580	0	0	736	611	585	0	0
20	0	453	0	0	1,620	674	363	713	0	635	0	0
21	0	484	6	1,270	1,480	0	588	749	0	776	0	0
22	0	0	708	1,830	1,630	0	586	705	0	490	0	0
23	9	0	807	1,830	1,660	229	591	0	231	0	0	0
24	0	471	701	1,820	1,590	0	578	0	414	0	61	0
25	0	383	716	1,830	2,700	0	0	606	0	0	5	0
26	0	467	0	719	4,140	52	0	0	0	0	0	0
27	8	474	0	721	3,670	945	589	0	0	0	0	0
28	0	474	707	948	1,660	0	5	611	0	12	0	0
29	0	0		945	1,660	0	0	550	544	0	0	0
30	7	0		968	1,590	0	928	0	513	0	0	459
31	0	472		947		195		0	355		0	
Total cfs-days	613	7,527	12,661	24,559	44,101	16,831	16,917	14,251	3,445	5,056	96	459
Mean cfs	19.8	243	452	792	1,470	543	564	460	111	169	3.10	15.3

Year total 146,516 cfs-days

Mean 401 cfs

Table 4. - Daily discharge in cubic feet per second of Neversink River at Neversink, N.Y.

for the year ending November 30, 1983

Mean values (preliminary U.S. Geological Survey record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	5.8	6.2	6.2	5.3	5.8	252	46	42	41	41	41	26
2	5.8	6.0	6.4	7.6	7.0	251	46	49	41	41	41	21
3	5.8	6.0	7.4	7.6	7.3	164	46	72	42	41	40	22
4	5.8	6.0	6.0	7.8	7.1	114	47	86	42	47	39	21
5	5.8	6.0	5.2	7.9	7.7	78	46	70	42	64	40	21
6	5.8	6.2	5.2	7.8	8.9	47	46	39	50	64	39	21
7	11	6.4	5.7	8.0	10	43	46	39	64	56	39	21
8	18	6.2	5.8	8.0	14	44	46	43	62	40	39	22
9	11	6.2	5.8	7.9	14	46	46	42	63	39	39	22
10	24	6.4	5.8	8.1	15	44	46	41	60	41	40	17
11	24	6.6	5.8	6.5	16	44	45	40	40	42	41	100
12	24	6.4	6.0	4.9	33	44	45	48	40	43	41	129
13	23	6.4	5.8	4.7	45	44	45	62	39	43	41	21
14	24	6.4	5.8	4.8	45	45	54	63	40	43	40	17
15	23	6.4	6.0	4.8	45	45	71	64	41	43	39	11
16	16	6.4	6.0	4.8	48	45	69	64	72	43	39	5.1
17	6.0	6.2	6.0	4.8	46	44	70	64	42	43	39	8.9
18	6.2	6.2	6.2	5.0	47	45	70	56	42	43	72	13
19	6.2	6.2	6.2	5.6	47	45	71	43	40	43	40	11
20	6.2	6.2	6.2	5.1	47	45	62	40	39	43	40	21
21	6.2	6.4	6.2	5.6	47	45	43	40	40	45	40	13
22	6.0	6.4	6.2	5.4	47	45	43	40	41	45	40	4.9
23	6.2	7.0	6.2	5.4	47	45	51	41	40	43	40	5.2
24	6.2	6.6	6.2	6.3	47	45	63	41	41	45	41	5.5
25	6.0	6.6	7.9	6.3	716	45	66	41	41	43	41	5.6
26	6.0	6.4	9.8	6.6	1,130	46	68	40	41	42	41	5.4
27	6.0	6.2	9.8	6.7	818	45	70	41	41	41	41	5.4
28	6.0	6.2	7.4	6.9	806	45	57	41	41	39	40	5.6
29	6.0	6.2		6.6	833	45	40	41	41	39	39	5.7
30	6.0	6.2		6.8	576	46	41	41	41	41	41	5.7
31	6.2	6.2		5.2		46		41	41		30	
Total cfs-days	324.2	195.4	179.2	194.8	5,582.8	2,027	1,605	1,515	1,391	1,326	1,263	613.0
Mean cfs	10.5	6.30	6.40	6.28	186	65.4	53.5	48.9	44.9	44.2	40.7	20.4

Year total 16,216.4 cfs-days Mean 44.4 cfs

Table 5. - Daily discharge in cubic feet per second of the Delaware River at Montague, N.J.

for the year ending November 30, 1983

Mean values (preliminary U.S. Geological Survey record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	2,680	3,410	3,750	3,780	7,150	20,600	7,990	4,860	1,810	1,940	1,810	1,670
2	2,580	2,980	3,530	4,630	6,560	19,900	7,410	4,010	1,890	1,500	1,840	1,720
3	2,230	2,790	10,100	6,900	7,310	20,600	6,510	3,620	1,570	1,400	1,730	1,730
4	2,000	2,710	23,500	7,010	9,460	19,400	7,020	3,400	1,790	1,670	1,540	1,740
5	1,830	2,460	14,400	6,260	9,020	17,800	8,390	2,830	1,780	1,640	1,660	1,730
6	1,740	2,530	10,000	5,740	7,880	15,000	7,190	2,870	2,040	1,600	1,780	1,730
7	1,780	2,510	8,140	6,470	7,210	11,700	9,360	2,770	1,990	2,570	1,930	1,780
8	1,590	2,220	7,640	8,680	7,410	9,730	9,830	2,540	2,010	2,300	1,760	1,740
9	1,480	1,760	6,880	9,430	9,700	10,600	8,310	2,420	1,860	1,860	1,700	1,650
10	1,490	1,660	6,000	9,400	11,200	10,700	7,400	1,720	1,840	1,700	1,680	1,660
11	1,710	2,580	5,530	10,700	20,600	9,400	6,550	1,420	1,890	1,690	1,710	1,890
12	1,060	4,050	5,180	10,600	16,800	8,300	5,990	1,920	3,020	1,730	1,980	1,980
13	1,270	3,760	3,900	8,910	13,300	7,360	5,610	2,140	2,980	2,200	1,890	2,020
14	1,310	3,100	4,100	8,200	11,300	6,390	4,560	2,180	2,210	1,230	1,750	1,880
15	1,420	2,700	4,800	8,240	10,100	5,540	3,930	2,120	1,590	1,260	1,420	1,620
16	2,270	2,100	4,600	7,670	45,300	7,340	3,610	2,130	1,370	1,670	1,190	1,760
17	4,850	2,200	4,540	7,080	56,500	7,580	3,790	2,010	1,450	1,690	1,450	1,850
18	5,210	2,800	4,310	6,660	30,100	6,400	3,670	1,760	1,650	1,630	1,480	1,550
19	3,450	2,500	4,250	9,240	22,500	5,620	3,300	2,470	1,720	1,430	1,890	1,890
20	3,140	2,400	3,520	10,700	19,400	5,210	3,330	2,410	2,450	2,300	1,920	1,860
21	3,100	2,600	3,380	11,400	17,900	5,710	3,340	2,240	1,790	2,240	1,830	2,050
22	2,820	2,600	3,500	16,900	17,400	4,880	3,430	2,510	1,640	2,910	1,920	2,980
23	2,550	2,200	4,420	14,400	17,600	5,760	3,080	2,290	2,180	2,570	1,830	3,070
24	2,340	4,900	5,140	11,700	19,600	6,200	2,820	1,630	2,090	1,580	2,030	2,430
25	2,330	8,200	5,040	10,200	37,000	5,520	2,600	2,090	2,340	1,210	2,020	3,440
26	2,570	7,280	4,440	8,390	41,800	5,030	1,880	2,340	1,830	1,420	1,760	6,560
27	6,100	5,840	3,020	7,240	35,100	5,820	1,720	1,660	1,900	1,430	1,820	5,890
28	5,820	5,140	3,100	9,690	27,500	6,530	2,530	1,480	1,810	1,090	1,730	5,190
29	5,730	4,350		10,500	23,900	5,530	7,290	1,950	1,770	1,450	1,640	6,280
30	5,100	3,530		9,180	21,900	6,290	6,610	1,850	2,020	1,610	1,620	8,380
31	4,160	3,450		7,910		8,400		1,470	1,990		1,620	
Total cfs-days	87,710	103,310	170,710	273,810	588,500	290,840	159,050	73,110	60,270	52,520	53,930	81,720
Mean cfs	2,829	3,333	6,097	8,833	19,620	9,382	5,302	2,358	1,944	1,751	1,740	2,724

Year total 1,995,480 cfs-days

Mean 5,467 cfs

Table 6. - Daily discharge in cubic feet per second of Delaware & Raritan Canal at Kingston, N.J.

for the year ending November 30, 1983

Mean values (preliminary U.S. Geological Survey record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	91	101	100	96	89	69	75	61	16	19	43	68
2	100	101	101	101	89	73	72	53	23	19	44	69
3	103	101	102	98	95	79	68	29	30	19	46	70
4	101	101	102	95	95	79	67	17	15	18	46	72
5	100	101	102	95	93	77	67	22	12	18	44	73
6	98	104	101	93	91	77	66	28	16	18	50	73
7	96	102	101	94	91	75	62	26	4.1	17	49	80
8	95	100	101	95	90	73	59	26	12	15	26	90
9	94	101	100	95	93	73	56	27	22	15	49	95
10	94	101	99	96	102	69	56	27	22	15	49	96
11	96	101	98	94	95	68	56	25	21	15	48	108
12	96	97	93	97	94	68	56	20	41	16	52	110
13	101	96	86	96	92	69	56	18	64	17	62	109
14	104	95	85	95	91	68	57	20	63	17	67	105
15	104	96	86	93	89	67	59	21	59	17	65	104
16	105	98	88	93	102	68	58	21	58	28	64	116
17	106	97	90	93	104	74	56	18	26	40	67	116
18	105	96	93	95	93	73	56	9.1	8.6	44	69	109
19	106	94	97	98	91	72	56	4.0	11	37	70	107
20	104	92	99	97	92	68	58	4.3	16	23	72	107
21	104	93	101	99	90	67	65	4.6	11	20	72	112
22	104	94	102	99	91	69	71	4.8	31	33	72	113
23	103	95	100	97	89	72	72	21	36	39	73	112
24	102	100	99	94	89	74	69	15	22	40	81	111
25	102	101	98	93	95	72	68	4.1	15	40	83	116
26	102	101	98	92	93	70	65	4.1	15	38	80	117
27	102	100	97	93	90	75	58	21	15	38	77	115
28	102	99	96	99	89	80	56	18	15.	38	74	108
29	108	99		95	81	78	62	3.8	15	38	74	106
30	106	99		92	69	78	63	4.0	18	38	71	108
31	102	100		89		80		4.2	19		68	
Total cfs-days	3,136	3,056	2,715	2,951	2,747	2,254	1,865	581.0	751.7	789	1,907	2,995
Mean cfs	101	98.6	97.0	95.2	91.6	72.7	62.2	18.7	24.2	26.3	61.5	99.8

Year total 25,747.7 cfs-days

Mean 70.5 cfs

Table 7. - Daily discharge in cubic feet per second of Delaware River at Trenton, N.J.

for the year ending November 30, 1983

Mean values (preliminary U.S. Geological Survey record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	6,520	8,530	9,490	10,000	20,000	35,800	17,500	12,100	3,880	3,510	2,810	3,560
2	6,920	7,480	9,820	15,200	18,000	33,000	16,100	10,400	3,510	3,640	3,100	3,500
3	7,010	6,870	18,000	15,900	22,700	32,100	14,600	8,940	3,700	3,490	3,300	3,500
4	6,320	6,390	41,600	17,400	25,100	32,000	14,800	8,100	3,710	2,980	3,280	3,670
5	5,820	6,220	44,200	16,900	23,600	30,300	19,400	7,580	3,350	2,790	3,090	3,710
6	5,500	6,260	30,100	15,400	21,600	27,500	18,700	7,020	3,580	2,970	3,010	3,900
7	5,300	6,390	23,500	14,500	19,400	23,600	18,300	6,210	3,720	2,970	2,940	3,690
8	5,130	6,280	20,500	16,000	18,800	19,800	22,400	5,990	3,870	2,900	2,990	3,410
9	4,960	5,900	18,300	19,400	25,600	17,900	20,400	5,600	3,670	3,810	3,190	3,380
10	4,630	5,320	15,700	21,900	38,200	18,100	17,400	5,280	3,540	3,470	3,110	3,450
11	4,330	9,080	13,200	24,000	51,800	17,800	15,400	4,790	3,580	3,120	3,010	4,130
12	4,350	9,390	10,500	26,600	49,400	16,100	13,700	4,260	5,610	3,040	3,170	4,690
13	4,340	9,550	10,100	24,500	39,500	14,700	12,600	3,950	6,810	3,280	3,560	5,430
14	3,590	9,240	10,700	20,700	31,900	13,300	11,600	4,320	6,160	3,440	4,150	4,910
15	3,380	8,130	10,500	18,500	26,500	12,300	10,300	4,400	5,540	3,590	3,860	4,990
16	4,280	7,580	11,000	17,700	75,000	11,600	9,090	4,390	4,430	2,740	3,840	8,950
17	9,030	6,830	11,200	16,300	129,000	14,800	8,360	4,340	3,670	2,470	3,640	11,100
18	10,400	6,020	11,100	15,900	91,800	15,100	8,900	4,120	3,230	2,870	2,920	8,570
19	11,300	6,320	11,300	26,300	66,500	12,800	8,680	4,040	3,200	3,140	3,340	7,260
20	9,240	6,100	11,100	31,900	55,900	11,900	10,300	4,710	3,320	2,960	4,010	6,120
21	8,350	5,160	9,980	37,000	47,700	12,300	10,600	5,250	3,420	2,880	4,430	7,790
22	7,880	5,640	10,300	44,300	39,100	13,100	9,780	4,660	3,890	4,600	4,100	10,400
23	7,380	5,980	11,400	41,300	35,400	16,200	8,910	4,740	3,300	5,070	3,980	9,980
24	6,960	13,400	13,400	33,400	36,500	16,600	7,940	4,930	3,160	4,920	7,300	9,630
25	6,790	15,500	14,200	26,900	53,400	15,300	7,120	4,920	3,640	4,180	9,260	12,500
26	6,600	18,200	13,700	22,700	74,400	14,000	6,710	4,410	3,490	3,250	7,030	17,800
27	6,820	15,800	12,000	19,700	71,800	18,000	6,120	4,500	3,580	2,690	5,480	17,300
28	8,600	13,300	10,100	30,300	60,700	15,200	5,480	4,170	3,210	2,930	4,770	15,700
29	10,700	11,800		29,700	46,700	15,100	8,230	3,520	3,420	2,970	4,470	20,800
30	10,000	10,700		26,700	39,600	16,200	12,700	3,350	3,560	2,620	4,180	21,300
31	9,680	9,750		23,200		16,800		4,230	3,500		3,620	
Total cfs-days	212,110	269,110	436,990	720,200	1,355,600	579,300	372,120	169,220	120,250	99,290	124,940	245,120
Mean cfs	6,842	8,681	15,610	23,230	45,190	18,690	12,400	5,459	3,879	3,310	4,030	8,171

Year total 4,704,250 cfs-days

Mean 12,890 cfs

Table 8. - Storage in Pepacton Reservoir, N.Y., for year ending November 30, 1983

(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.)

(River Master daily operation record; gage reading at 0900)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	63,617	63,378	64,849	77,588	106,164	142,342	139,326	135,964	122,224	108,121	93,991	75,241
2	63,546	63,426	64,934	77,869	106,660	142,379	139,638	135,602	121,899	107,654	93,542	74,663
3	63,426	63,414	65,714	78,248	107,204	142,229	139,969	135,203	121,488	107,204	93,052	74,111
4	63,282	63,354	68,158	78,614	107,863	142,229	140,338	134,805	121,009	106,708	92,606	73,550
5	63,138	63,222	69,398	78,939	108,460	141,969	140,598	134,408	120,531	106,196	92,116	72,821
6	62,983	63,126	70,155	79,359	108,992	141,691	140,653	134,013	120,055	105,701	91,688	71,995
7	62,827	62,994	70,804	79,851	109,478	141,543	140,653	133,599	119,597	105,209	91,217	71,186
8	62,612	62,899	71,352	80,548	110,128	141,432	140,524	133,150	119,087	104,701	90,746	70,371
9	62,351	62,863	71,661	81,499	110,974	141,524	140,394	132,738	118,564	104,224	90,292	69,575
10	62,161	62,803	71,931	82,385	111,711	141,265	140,283	132,291	118,091	103,736	89,826	68,744
11	61,971	62,815	72,072	83,429	113,618	141,061	140,190	131,863	117,636	103,295	89,330	68,333
12	61,734	62,851	72,304	84,496	115,443	140,950	140,080	131,399	117,232	102,806	88,909	67,622
13	61,462	62,851	72,730	85,443	116,378	140,839	139,969	130,954	116,830	102,305	88,519	66,856
14	61,192	62,767	73,094	86,237	117,383	140,616	139,749	130,422	116,362	101,836	88,201	66,081
15	60,921	62,719	73,433	87,009	118,142	140,486	139,620	129,961	115,859	101,320	87,696	65,665
16	60,816	62,683	73,771	87,782	120,310	140,524	139,454	129,554	115,409	100,807	87,223	65,262
17	61,544	62,624	74,085	88,562	123,980	140,412	139,454	129,060	114,911	100,311	86,766	64,607
18	61,817	62,517	74,413	89,330	126,447	140,301	139,307	128,603	114,479	99,862	86,265	63,893
19	61,995	62,375	74,729	90,380	128,321	140,153	139,160	128,128	114,080	99,363	85,726	63,258
20	62,078	62,232	74,991	92,354	129,944	140,061	138,958	127,670	113,585	98,891	85,089	62,588
21	62,149	62,126	75,268	94,126	131,310	140,006	138,737	127,198	113,140	98,384	84,314	62,292
22	62,173	62,043	75,533	96,628	132,345	139,877	138,517	126,796	112,662	98,214	83,485	62,149
23	62,161	62,090	75,905	98,445	133,635	139,785	138,242	126,290	112,185	97,786	82,635	61,971
24	62,114	62,624	76,223	99,831	135,258	139,730	137,950	125,870	111,711	97,329	81,885	61,710
25	62,066	63,318	76,555	100,947	139,197	139,638	137,530	125,419	111,187	96,857	81,071	61,758
26	62,315	63,761	76,850	101,773	142,435	139,473	137,092	124,986	110,729	96,370	80,234	61,995
27	62,564	64,063	77,118	102,571	142,771	139,381	136,672	124,500	110,274	95,871	79,414	62,043
28	62,815	64,329	77,360	103,468	142,640	139,271	136,399	124,032	109,819	95,388	78,600	62,066
29	63,042	64,486		104,335	142,640	139,123	136,599	123,567	109,430	94,935	77,775	62,256
30	63,234	64,643		105,034	142,547	139,068	136,345	123,119	109,008	94,426	76,904	62,659
31	63,354	64,764		105,653		139,031		122,653	108,572		76,091	
Change	-299	+1,410	+12,596	+28,293	+36,894	-3,516	-2,686	-13,692	-14,081	-14,146	-18,335	-13,432
Equiv. mgd	-9.65	+45.5	+449.9	+912.7	+1,230	-113.4	-89.5	-441.7	-454.2	-451.5	-591.5	-447.7
Equiv. cfs	-14.9	+70.4	+696	+1,412	+1,903	-175	-139	-683	-703	-729	-915	-693

Change for year -994 million gallons Equiv. for year 2.72 mgd Equiv. for year -4.21 cfs

Table 9. - Storage in Cannonsville Reservoir, N.Y., for year ending November 30, 1983

(Storage in millions of gallons above elevation 1,040.00 ft. Add 2,584 million gallons for total contents above sill of outlet tunnel, elevation 1,020.50 ft.)

(River Master daily operation record; gage reading at 0900)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	16,816	28,013	34,983	50,227	71,000	100,776	97,653	94,520	82,305	59,999	45,267	23,822
2	17,151	28,498	35,380	50,344	71,596	100,695	97,621	94,550	81,669	59,474	44,622	23,103
3	17,537	28,931	36,201	50,531	72,205	100,695	97,508	94,580	80,903	58,729	44,100	22,221
4	17,804	29,339	39,106	50,647	72,920	100,389	97,460	94,565	80,239	58,058	43,309	21,347
5	18,107	29,329	40,944	50,788	73,570	100,100	97,396	94,535	79,300	57,508	42,584	20,543
6	18,367	29,385	42,184	51,009	74,160	99,601	97,299	94,459	78,346	57,191	41,858	19,936
7	18,634	29,682	43,183	51,138	74,727	99,134	97,347	94,368	77,407	56,751	40,798	19,443
8	18,522	29,885	44,155	51,394	75,459	98,716	97,331	94,276	76,619	56,495	39,747	19,000
9	18,733	30,024	44,967	51,651	76,343	98,780	97,218	94,155	75,804	56,104	38,685	18,072
10	18,824	30,284	45,523	52,129	77,144	98,603	96,993	94,018	74,961	55,616	36,609	17,657
11	18,768	30,303	45,968	52,700	78,622	98,362	96,897	93,881	74,091	55,079	36,499	17,720
12	18,754	30,507	46,568	53,284	80,059	98,168	96,800	93,729	73,278	54,614	35,409	17,221
13	18,662	30,609	46,880	53,832	81,336	97,798	96,720	93,196	72,867	54,217	34,537	17,263
14	18,402	30,609	47,291	54,252	82,449	97,701	96,301	92,786	72,404	53,587	34,210	17,235
15	18,191	30,599	47,669	54,743	83,330	97,573	95,963	92,207	71,768	52,805	33,903	16,925
16	18,135	30,627	47,869	55,274	85,947	97,782	95,770	91,431	71,344	52,141	33,467	16,738
17	19,036	30,609	48,147	55,921	89,667	97,701	95,786	90,823	70,390	51,348	32,880	16,577
18	19,689	30,553	48,303	56,507	92,664	97,637	95,738	90,321	69,543	50,706	32,147	16,539
19	20,146	30,460	48,303	57,276	95,706	97,508	95,754	89,788	68,709	50,157	31,313	16,481
20	20,628	30,358	48,403	58,265	97,895	97,428	95,738	89,317	67,675	49,901	30,553	16,416
21	21,146	30,293	48,570	59,438	98,539	97,412	95,219	88,906	66,809	49,445	29,719	16,410
22	21,548	30,469	48,770	61,167	98,651	97,363	94,900	88,480	65,815	49,282	29,060	16,532
23	21,951	30,720	49,049	62,708	98,893	97,363	94,504	87,724	65,179	49,235	28,455	16,783
24	22,322	31,072	49,340	63,994	99,440	97,363	94,094	87,045	64,466	48,748	28,030	16,861
25	22,716	31,832	49,574	65,153	101,693	97,299	93,881	86,641	63,701	48,225	27,638	17,052
26	23,420	32,453	49,854	66,197	102,627	97,154	93,607	86,091	63,077	48,092	27,136	17,579
27	24,364	32,935	49,912	66,975	102,096	97,476	93,272	85,629	62,415	47,703	26,651	17,945
28	25,213	33,388	50,029	67,768	101,597	97,508	93,136	85,167	61,766	47,269	26,200	18,297
29	26,124	33,784		68,828	101,081	97,508	94,139	84,574	61,294	46,735	25,638	18,895
30	26,881	34,230		69,675	100,808	97,508	94,413	83,807	60,939	46,035	25,060	19,964
31	27,485	34,587		70,364		97,589		82,883	60,439		24,439	
Change	+11,069	+7,102	+15,442	+20,335	+30,444	-3,219	-3,176	-11,530	-22,444	-14,404	-21,596	-4,475
Equiv. mgd	+357.1	+229.1	+551.5	+656.0	+1,015	-103.8	-105.9	-371.9	-724.0	-480.1	-696.6	-149.2
Equiv. cfs	+552	+354	+853	+1,015	+1,570	-161	-164	-575	-1,120	-74.3	-1,078	-231

Change for year +3,548 Equiv. for year +9.72 Equiv. for year +15.0 cfs

Table 10. - Storage in Neversink Reservoir, N.Y. for year ending November 30, 1983

(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.)

(River Master daily operation record; gage reading at 0900)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	12,822	12,326	13,883	17,179	26,587	35,150	34,788	30,501	25,712	22,070	18,800	15,194
2	12,745	12,329	13,902	17,155	26,740	35,145	34,764	30,382	25,574	21,965	18,604	15,091
3	12,661	12,301	14,355	17,220	26,919	35,115	34,670	30,241	25,408	21,857	18,366	14,984
4	12,591	12,278	16,024	17,244	27,172	35,040	34,685	30,064	25,246	21,780	18,257	14,926
5	12,493	12,221	16,464	17,271	27,421	34,996	34,788	29,928	25,060	21,589	18,123	14,888
6	12,372	12,201	16,655	17,312	27,619	34,892	34,729	29,769	24,928	21,466	18,004	14,740
7	12,284	12,204	16,809	17,374	27,814	34,783	34,724	29,607	24,764	21,241	17,900	14,596
8	12,138	12,218	16,941	17,757	28,031	34,665	34,680	29,441	24,596	21,165	17,785	14,492
9	12,062	12,198	17,049	18,141	28,346	34,601	34,616	29,262	24,466	21,074	17,691	14,386
10	11,964	12,175	17,103	18,465	28,623	34,492	34,438	29,075	24,331	20,991	17,546	14,302
11	11,790	12,250	17,151	18,846	29,347	34,365	34,282	28,928	24,209	20,810	17,418	14,215
12	11,709	12,508	17,196	19,257	29,801	34,204	34,081	28,733	24,153	20,723	17,278	14,086
13	11,629	12,591	17,233	19,442	30,091	34,032	33,877	28,526	24,201	20,615	17,168	14,009
14	11,496	12,617	17,264	19,693	30,332	33,838	33,659	28,328	24,096	20,477	17,049	13,914
15	11,383	12,646	17,281	19,909	30,538	33,765	33,441	28,158	23,918	20,350	16,934	13,832
16	11,317	12,681	17,305	20,142	31,187	33,523	33,211	28,027	23,797	20,242	16,887	13,777
17	11,790	12,707	17,315	20,365	33,144	33,465	33,033	27,862	23,661	20,109	16,755	13,750
18	11,902	12,719	17,322	20,581	33,809	33,398	32,847	27,741	23,561	19,979	16,641	13,716
19	11,930	12,687	17,333	21,089	33,930	33,297	32,643	27,576	23,461	19,833	16,541	13,689
20	11,941	12,667	17,322	22,345	33,886	33,230	32,439	27,412	23,258	19,715	16,404	13,610
21	11,950	12,629	17,312	22,917	33,659	33,245	32,207	27,296	23,115	19,536	16,318	13,532
22	11,930	12,620	17,295	23,866	33,538	33,177	31,953	27,167	23,095	19,551	16,209	13,732
23	11,905	12,632	17,302	24,417	33,499	33,278	31,681	27,060	22,831	19,522	16,093	13,759
24	11,885	13,123	17,298	24,772	33,886	33,461	31,462	26,889	22,599	19,427	15,988	13,765
25	11,871	13,418	17,292	25,047	35,040	33,552	31,183	26,765	22,579	19,308	15,932	13,917
26	11,952	13,559	17,247	25,283	35,309	33,611	30,883	26,629	22,560	19,159	15,837	14,156
27	12,082	13,641	17,216	25,499	35,249	33,698	30,570	26,485	22,490	19,012	15,732	14,299
28	12,138	13,710	17,203	25,758	35,269	33,785	30,360	26,342	22,345	18,918	15,629	14,209
29	12,238	13,762		25,934	35,304	33,848	30,717	26,202	22,338	18,889	15,535	14,399
30	12,281	13,810		26,236	35,279	34,125	30,606	26,043	22,252	18,810	15,409	14,564
31	12,324	13,850		26,405		34,438		25,879	22,174		15,306	
Change	-539	+1,526	+3,353	+9,202	+8,874	-841	-3,832	-4,727	-3,705	-3,364	-3,504	-742
Equiv. mgd	-17.4	+49.2	+119.8	+296.8	+295.8	-27.1	-127.7	-152.5	-119.5	-112.1	-113.0	-24.7
Equiv. cfs	-26.9	+76.2	+185	+459	+458	-42.0	-198	-236	-185	-173	-175	-38.3

Change for year +1,701 million gallons Equiv. for year +4.66 mgd Equiv. for year +7.21 cfs

Table 11. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master daily operation record)

Date 1982	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average to date Nov.13-Dec.7 or Dec. 8-31	Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average Dec. 8, 1982 to date
Dec. 1	450	0	217	678	Jan. 1	401	0	124	541
2	449	0	198	676	2	401	0	129	540
3	449	0	182	674	3	401	0	138	540
4	448	0	211	674	4	399	218	123	547
5	448	0	215	673	5	402	275	139	557
6	452	0	206	672	6	416	70	89	557
7	451	191	213	680	7	344	0	89	553
8	401	0	155	556	8	300	0	91	548
9	401	0	172	564	9	300	0	91	543
10	401	0	222	584	10	301	218	92	545
11	401	0	146	575	11	302	219	98	547
12	400	0	134	567	12	299	219	81	549
13	400	0	153	564	13	298	219	91	550
14	400	0	175	566	14	299	219	91	552
15	400	0	117	560	15	299	219	85	553
16	400	0	108	554	16	299	219	86	555
17	400	0	143	553	17	304	219	96	556
18	400	0	132	551	18	301	219	85	557
19	400	0	140	550	19	301	219	86	558
20	400	0	134	549	20	299	219	122	560
21	400	0	134	548	21	300	37	85	557
22	399	0	137	547	22	300	0	90	554
23	400	0	137	546	23	300	0	83	550
24	400	0	132	546	24	300	0	91	547
25	401	0	141	545	25	301	0	88	543
26	401	0	118	544	26	299	0	97	540
27	400	0	136	544	27	299	0	80	537
28	401	0	122	543	28	299	0	84	534
29	401	0	142	543	29	299	0	84	531
30	401	0	116	541	30	300	0	90	529
31	401	0	134	541	31	301	0	89	526
Total	12,756	191	4,822		Total	9,964	3,008	2,987	

*Beginning November 13, 1982, average was computed by elapsed days in periods specified in Delaware River Basin Commission Resolutions agreed to by parties to the Decree.

Table 11. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master daily operation record)

Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average Dec. 8, 1982 to date	Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average to date Dec. 8 to Mar. 27 or Mar. 28 to date
Feb. 1	300	0	85	524	Mar. 1	0	168	100	444
2	301	0	88	521	2	0	170	103	442
3	300	0	77	519	3	0	171	99	440
4	300	0	100	517	4	0	170	102	438
5	300	0	76	515	5	0	171	98	437
6	301	0	80	512	6	0	170	99	435
7	300	0	89	510	7	0	253	0	433
8	300	0	91	509	8	0	283	0	431
9	298	0	93	507	9	0	283	0	429
10	300	0	90	505	10	0	284	0	428
11	189	0	97	502	11	0	283	0	426
12	0	0	94	495	12	0	284	0	425
13	0	0	95	490	13	0	284	0	423
14	0	0	96	484	14	0	284	0	422
15	0	161	99	481	15	0	284	0	420
16	0	171	95	478	16	0	283	0	419
17	0	170	98	475	17	0	174	0	417
18	0	170	96	472	18	0	171	0	414
19	0	170	96	469	19	0	171	0	412
20	0	170	97	466	20	0	38	0	408
21	0	170	97	464	21	0	0	0	404
22	0	170	84	461	22	0	0	0	400
23	0	170	96	459	23	0	0	0	397
24	0	170	86	456	24	0	0	0	393
25	0	171	111	454	25	0	0	0	389
26	0	171	89	451	26	0	0	0	386
27	0	171	84	449	27	0	0	0	382
28	0	167	78	447	28	0	0	0	0
					29	0	0	0	0
					30	0	0	0	0
					31	0	0	0	0
Total	3,189	2,372	2,557		Total	0	4,379	601	

*Average was computed by periods specified in Delaware River Basin Commission Resolutions agreed to by parties to the Decree.

Table 11. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master daily operation record)

Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average March 28, 1983 to date	Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average March 28, 1983 to date
Apr. 1	0	0	0	0	May 1	0	0	268	66
2	0	0	0	0	2	0	0	285	72
3	0	0	0	0	3	0	0	344	79
4	0	0	0	0	4	169	0	340	91
5	0	0	0	0	5	170	0	346	101
6	0	0	0	0	6	168	0	325	111
7	0	0	0	0	7	0	0	290	116
8	0	0	0	0	8	0	0	285	120
9	0	0	0	0	9	286	0	300	130
10	0	0	0	0	10	299	11	303	141
11	0	0	0	0	11	299	0	280	151
12	0	0	0	0	12	298	0	303	161
13	0	0	0	0	13	456	0	272	173
14	0	0	0	0	14	455	0	235	184
15	0	0	0	0	15	453	0	424	198
16	0	0	0	0	16	443	0	192	207
17	0	0	0	0	17	451	0	191	215
18	0	7	321	15	18	451	0	182	223
19	0	0	343	29	19	451	0	184	231
20	0	0	451	47	20	451	0	200	239
21	0	0	350	59	21	452	0	220	247
22	0	0	286	68	22	451	0	191	254
23	0	0	0	65	23	439	0	90	259
24	0	0	0	63	24	453	0	98	264
25	0	0	0	61	25	451	0	107	269
26	0	0	0	59	26	450	0	90	273
27	0	0	0	57	27	450	0	111	278
28	0	0	0	55	28	450	0	101	282
29	0	0	0	53	29	450	0	94	286
30	0	0	275	60	30	449	0	117	291
					31	0	0	0	286
Total	0	7	2,026		Total	9,795	11	6,768	

*Average was computed by periods specified in Delaware River Basin Commission Resolutions agreed to by parties to the Decree.

Table 11. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master daily operation record)

Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1983 to date	Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1983 to date
June 1	0	0	293	293	July 1	436	0	191	681
2	0	0	274	284	2	437	0	186	679
3	0	0	279	282	3	437	0	189	677
4	0	0	300	286	4	438	0	187	676
5	0	0	297	289	5	437	0	203	675
6	231	0	301	329	6	436	0	200	674
7	292	0	281	364	7	437	0	201	673
8	291	0	278	390	8	441	0	200	672
9	292	0	280	410	9	441	0	205	671
10	288	0	300	428	10	441	0	162	669
11	296	0	321	445	11	452	0	206	669
12	298	0	326	460	12	451	243	220	675
13	296	147	304	482	13	450	299	210	682
14	296	183	298	503	14	450	299	154	687
15	311	182	287	521	15	450	298	151	691
16	300	181	292	537	16	450	297	150	696
17	300	179	302	552	17	450	297	115	699
18	300	179	287	563	18	450	296	162	704
19	300	178	302	575	19	450	296	170	708
20	300	335	297	593	20	450	296	130	711
21	306	353	307	610	21	450	295	153	715
22	299	353	290	626	22	450	294	155	719
23	301	355	250	638	23	449	294	155	722
24	436	221	323	652	24	450	294	127	725
25	436	176	309	663	25	449	292	148	728
26	436	176	332	674	26	450	292	140	730
27	449	176	264	682	27	449	292	136	733
28	441	16	283	684	28	449	291	146	736
29	450	0	254	684	29	449	291	154	738
30	437	0	190	682	30	449	291	162	741
					31	450	290	162	744
Total	8,382	3,390	8,701			13,828	5,837	5,230	

Table 11. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master daily operation record)

Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1983 to date	Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1983 to date
Aug. 1	449	290	147	746	Sept. 1	450	0	92	747
2	449	289	158	748	2	449	0	95	745
3	450	290	153	751	3	450	0	60	743
4	472	289	184	754	4	450	0	165	741
5	443	289	126	755	5	450	0	90	739
6	445	289	140	757	6	450	0	195	738
7	445	289	140	759	7	451	0	52	736
8	452	288	106	760	8	449	6	71	734
9	451	288	106	761	9	452	0	72	732
10	450	287	101	762	10	452	0	163	731
11	450	288	103	763	11	452	0	61	728
12	449	286	0	763	12	444	0	98	727
13	448	285	152	765	13	449	0	107	725
14	450	284	148	766	14	450	0	105	723
15	451	286	106	767	15	449	0	89	722
16	451	286	97	768	16	450	0	105	720
17	450	286	100	769	17	451	0	115	719
18	450	286	101	770	18	451	0	123	717
19	450	286	197	772	19	451	0	107	716
20	450	285	133	773	20	451	0	162	715
21	450	285	0	773	21	449	0	92	714
22	450	75	248	773	22	448	0	57	712
23	451	0	208	771	23	447	0	86	710
24	450	0	0	767	24	449	0	105	709
25	449	0	0	764	25	449	0	132	708
26	452	0	105	761	26	451	0	130	707
27	452	0	153	760	27	456	0	77	705
28	453	0	6	756	28	451	0	9	703
29	447	0	98	754	29	454	61	58	702
30	447	0	103	752	30	451	0	12	700
31	450	0	109	750					
Total	13,956	6,106	3,528		Total	13,506	67	2,885	

Table 11. - Diversions to New York City water supply

Million gallons per day for 24-hour period beginning 0900 local time

(River Master daily operation record)

Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1983 to date	Date 1983	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average to date June 1 - Nov. 6 or Nov. 9-30
Oct. 1	451	0	201	700	Nov. 1	453	266	108	711
2	451	0	229	700	2	454	266	106	712
3	449	0	104	698	3	450	265	72	712
4	448	0	111	697	4	449	245	36	713
5	450	0	107	696	5	449	201	153	713
6	450	205	104	697	6	449	172	146	713
7	449	279	87	698	7	449	4	104	712
8	449	278	69	698	8	449	414	101	714
9	449	278	139	700	9	452	123	81	656
10	449	277	104	701	10	451	0	106	606
11	449	277	120	702	11	450	0	92	585
12	328	277	107	702	12	449	0	124	582
13	458	275	134	703	13	449	0	125	580
14	461	0	91	702	14	201	265	113	580
15	462	0	37	700	15	500	266	101	621
16	462	0	141	700	16	477	264	111	650
17	461	0	110	699	17	452	159	100	657
18	461	163	94	699	18	450	160	74	660
19	461	239	105	700	19	450	159	116	665
20	461	272	77	700	20	450	160	175	675
21	460	272	99	701	21	449	160	71	676
22	459	272	94	702	22	450	0	108	667
23	459	272	140	703	23	454	130	106	669
24	466	271	106	704	24	454	159	38	668
25	464	270	116	705	25	446	158	105	670
26	460	270	103	706	26	446	158	52	669
27	462	269	105	707	27	446	158	249	679
28	462	269	91	708	28	456	40	0	670
29	481	280	109	709	29	452	0	131	666
30	461	268	94	710	30	453	0	115	661
31	460	268	99	710					
Total	14,053	5,801	3,427		Total	13,339	4,352	3,119	

*Average of combined diversions under Section III A 3 of Amended Decree to November 8. Beginning November 9, average was computed by number of elapsed days under the Interstate Water Management Recommendations.

Table 12. - New York City Reservoir release design data

(River Master daily operation record)

Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases							Indicated deficiency	Balancing adjustment	Directed release	Computations for Balancing Adjustment					
Date of advance estimate	Powerplant release forecasts		Uncontrolled runoff		Date	Discharge				Directed release		Actual deficiency		Cumulative difference Col. 10 - Col. 12	Balancing adjustment
	Lake Wallenpaupack cfs	Mongaup Reservoirs cfs	Present conditions cfs	Weather adjustment cfs		cfs	cfs	cfs	cfs	Daily cfs	Cumulative cfs	Daily cfs	Cumulative cfs	cfs-days	cfs
1982-83	1	2	3	4		5	6	7	8	9	10	11	12	13	14
MONTAGUE DESIGN RATE = 1,655 CFS DECEMBER 1-7															
AND 1,550 CFS DECEMBER 8, 1982 TO MARCH 27, 1983															
December 1-7, estimated Montague discharge greater than 1,655 cfs															
December 8, estimated Montague discharge greater than 1,550 cfs															
Dec. 6	0	0	1,420	0	Dec. 9	1,420	130		130						
7	0	0	1,389	0	10	1,389	161		161						
8	0	0	1,380	0	11	1,380	170		170						
9	0	0	1,260	0	12	1,260	290		290						
	0	0	1,170	0	13	1,170	380		380						
10	0	0	1,170	0	14	1,170	380		380						
11	0	0	1,110	0	15	1,110	440		440						
12	0	0	960	0	16	960	590		590						
13	0	0	910	0	17	910	640		640						
14	0	0	870	116	18	986	564		564						
15	0	0	650	585	19	1,235	315		315						
December 20, 1982 to March 27, 1983, estimated Montague discharge greater than 1,550 cfs															
MONTAGUE DESIGN RATE = 1,750 CFS MARCH 28 TO JUNE 14															
March 28 to June 14, estimated Montague discharge greater than 1,750 cfs															
MONTAGUE DESIGN RATE = 1,850 CFS JUNE 15 TO SEPTEMBER 22															
June 15-25, estimated Montague discharge greater than 1,850 cfs															
June 23	0	302	1,250	0	June 26	1,552	298	-	298	298	298	500	500	-202	20
24	0	86	1,120	0	27	1,206	644	-	644	644	942	776	1,276	-334	33
25	588	300	944	199	28	2,031	0	-	0	0	942	0	1,276	-334	33
26	588	300	846	407	29	2,141	0	-	0	0	942	0	1,276	-334	33
27	588	302	781	417	30	2,088	0	20	0	0	942	0	1,276	-334	33
Total	1,764	1,290	17,230	1,724		22,008	5,002		5,002	942		1,276			

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 = Col. 6.
Col. 9 = Col. 8.

Col. 10 = Summation of Col. 9.
Col. 11 = 1,850 - (Col. 9 + Col. 10 from Table 13), when positive; otherwise Col. 11 = 0.
Col. 12 = Summation of Col. 11.
Col. 14 = Col. 13 divided by minus 10, limited to ±100.

Table 12. - New York City Reservoir release design data - continued

(River Master daily operation record)

Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases							Indicated deficiency	Balancing adjustment	Directed release	Computations for Balancing Adjustment					
	Powerplant release forecasts		Uncontrolled runoff							Directed release		Actual deficiency		Cumulative difference Col. 10 - Col. 12	Balancing adjustment
Date of advance estimate	Lake Wallenpaupack	Mongaup Reservoir	Present conditions	Weather adjustment	Date	Discharge				Daily	Cumulative	Daily	Cumulative		
	cfs	cfs	cfs	cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs-days	cfs
1983	1	2	3	4		5	6	7	8	9	10	11	12	13	14
June 28	588	302	1,304	2,792	July 1	4,986	0	33	0	0	942	0	1,276	-334	33
29	588	216	4,739	157	2	5,700	0	33	0	0	942	0	1,276	-334	33
30	940	0	2,849	112	3	3,901	0	33	0	0	942	0	1,276	-334	33
July 1	940	0	2,221	87	4	3,248	0	33	0	0	942	0	1,276	-334	33
2	588	108	1,866	33	5	2,595	0	33	0	0	942	0	1,276	-334	33
3	588	324	1,536	15	6	2,463	0	33	0	0	942	0	1,276	-334	33
4	588	324	1,381	61	7	2,354	0	33	0	0	942	0	1,276	-334	33
5	588	324	1,405	35	8	2,352	0	33	0	0	942	0	1,276	-334	33
6	588	324	1,271	0	9	2,183	0	33	0	0	942	0	1,276	-334	33
7	0	324	1,074	0	10	1,398	452	33	485	485	1,427	699	1,975	-548	55
8	0	324	1,014	39	11	1,377	473	33	506	506	1,933	929	2,904	-971	97
9	590	324	899	0	12	1,813	37	33	70	70	2,003	395	3,299	-1,296	100
10	590	324	796	0	13	1,710	140	33	173	173	2,176	174	3,473	-1,297	100
11	590	302	734	10	14	1,636	214	55	269	269	2,445	155	3,628	-1,183	100
12	590	324	698	0	15	1,612	238	97	335	335	2,780	254	3,882	-1,102	100
13	590	297	691	0	16	1,578	272	100	372	372	3,152	220	4,102	-950	95
14	0	162	632	0	17	794	1,056	100	1,156	1,156	4,308	1,009	5,111	-803	80
15	0	108	580	147	18	835	1,015	100	1,115	1,115	5,423	1,160	6,271	-848	85
16	709	324	740	136	19	1,909	0	100	41	41	5,464	0	6,271	-807	81
17	184	324	748	19	20	1,275	575	95	670	670	6,134	80	6,351	-217	22
18	709	378	621	0	21	1,708	142	80	222	222	6,356	80	6,431	-75	8
19	709	324	593	72	22	1,698	152	85	237	237	6,593	0	6,431	162	-16
20	709	324	571	130	23	1,734	116	81	197	197	6,790	0	6,431	359	-36
21	0	216	562	346	24	1,124	726	22	748	748	7,538	965	7,396	142	-14
22	0	108	673	0	25	781	1,069	8	1,077	1,077	8,615	868	8,264	351	-35
23	590	324	628	78	26	1,620	230	-16	214	214	8,829	0	8,264	565	-56
24	0	324	664	151	27	1,139	711	-36	675	675	9,504	873	9,137	367	-37
25	590	324	738	0	28	1,652	198	-14	184	184	9,688	832	9,969	-281	28
26	592	216	665	0	29	1,473	377	-35	342	342	10,030	372	10,341	-311	31
27	592	216	600	0	30	1,408	442	-56	386	386	10,416	462	10,803	-387	39
28	0	0	525	327	31	852	998	-37	961	961	11,377	1,342	12,145	-768	77
Total	14,330	7,813	34,018	4,747		60,908	9,633		10,435	10,435		10,869			

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 = 1,850 - Col. 5, when positive; otherwise Col. 6 = 0.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = 1,850 - Col. 5 + Col. 7, when positive; otherwise Col. 8 = 0.
Col. 9 = Col. 8.
Col. 10 = Summation of Col. 9.
Col. 11 = 1,850 - (Col. 9 + Col. 10 from Table 13), when positive; otherwise Col. 11 = 0.
Col. 12 = Summation of Col. 11.
Col. 14 = Col. 13 divided by minus 10, limited to ±100.

Table 12. - New York City Reservoir release design data - continued

(River Master daily operation record)

Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases							Indicated deficiency	Balancing adjustment	Directed release	Computations for Balancing Adjustment					
Date of advance estimate	Powerplant release forecasts		Uncontrolled runoff		Date	Discharge				Directed release		Actual deficiency		Cumulative difference Col. 10 - Col. 12	Balancing adjustment
	Lake Wallenpaupack	Mongaup Reservoir	Present conditions	Weather adjustment						Daily	Cumulative	Daily	Cumulative		
	cfs	cfs	cfs	cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs-days	cfs
1983	1	2	3	4		5	6	7	8	9	10	11	12	13	14
July 29	0	65	489	33	Aug. 1	587	1,263	28	1,291	1,291	12,668	1,337	13,482	-814	81
30	219	367	488	60	2	1,134	716	31	747	747	13,415	700	14,182	-767	77
31	0	324	471	217	3	1,012	838	39	877	877	14,292	1,177	15,359	-1,067	100
Aug. 1	0	324	480	209	4	1,013	837	77	914	914	15,206	1,011	16,370	-1,164	100
2	0	324	608	0	5	932	918	81	999	999	16,205	1,116	17,486	-1,281	100
3	0	216	534	8	6	758	1,092	77	1,169	1,169	17,374	1,007	18,493	-1,119	100
4	0	0	518	49	7	567	1,283	100	1,383	1,383	18,757	1,252	19,745	-988	99
5	0	65	496	11	8	572	1,278	100	1,378	1,378	20,135	1,227	20,972	-837	84
6	0	389	491	23	9	903	947	100	1,047	1,047	21,182	1,026	21,998	-816	82
7	0	389	487	5	10	881	969	100	1,069	1,069	22,251	1,085	23,083	-832	83
8	0	389	451	27	11	867	983	99	1,082	1,082	23,333	1,058	24,141	-808	81
9	0	389	440	0	12	829	1,021	84	1,105	1,105	24,438	0	24,141	297	-30
10	0	259	362	106	13	727	1,123	82	1,205	1,205	25,643	75	24,216	1,427	-100
11	0	0	367	753	14	1,120	730	83	813	813	26,456	403	24,619	1,837	-100
12	0	108	586	1,485	15	2,179	0	81	0	0	26,456	767	25,386	1,070	-100
13	0	389	884	0	16	1,273	577	-30	547	547	27,003	1,029	26,415	588	-59
14	0	347	746	0	17	1,093	757	-100	657	657	27,660	1,017	27,432	228	-23
15	0	0	699	0	18	699	1,151	-100	1,051	1,051	28,711	1,220	28,652	59	-6
16	0	0	661	0	19	661	1,189	-100	1,089	1,089	29,800	1,172	29,824	-24	2
17	0	0	559	6	20	565	1,285	-59	1,226	1,226	31,026	599	30,423	603	-60
18	0	0	572	7	21	579	1,271	-23	1,248	1,248	32,274	1,297	31,720	554	-55
19	0	0	567	26	22	593	1,257	-6	1,251	1,251	33,525	1,396	33,116	409	-41
20	0	0	505	3	23	508	1,342	2	1,344	1,344	34,869	1,010	34,126	743	-74
21	0	0	460	44	24	504	1,346	-60	1,286	1,286	36,155	965	35,091	1,064	-100
22	0	0	394	23	25	417	1,433	-55	1,378	1,378	37,533	809	35,900	1,633	-100
23	0	25	395	0	26	420	1,430	-41	1,389	1,389	38,922	1,307	37,207	1,715	-100
24	0	25	360	3	27	388	1,462	-74	1,388	1,388	40,310	1,246	38,453	1,857	-100
25	0	0	337	5	28	342	1,508	-100	1,408	1,408	41,718	1,327	39,780	1,938	-100
26	0	0	303	96	29	399	1,451	-100	1,351	1,351	43,069	1,391	41,171	1,898	-100
27	100	216	428	25	30	769	1,081	-100	981	981	44,050	784	41,955	2,095	-100
28	356	216	351	57	31	980	870	-100	770	770	44,820	615	42,570	2,250	-100
Total	675	4,826	15,489	3,281		24,271	33,408		33,443	33,443		30,425			

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 = 1,850 - Col. 5, when positive; otherwise Col. 6 = 0.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = 1,850 - Col. 5 + Col. 7 when positive; otherwise Col. 8 = 0.
Col. 9 = Col. 8.
Col. 10 = Summation of Col. 9.
Col. 11 = 1,850 - (Col. 9 + Col. 10 from Table 13), when positive; otherwise Col. 11 = 0.
Col. 12 = Summation of Col. 11.
Col. 14 = Col. 13 divided by minus 10, limited to ±100.

Table 12. - New York City Reservoir release design data -continued

(River Master daily operation record)

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 cfs	Powerplant release forecasts: Mongaup Reservoirs cfs	Uncontrolled runoff: Present conditions cfs	Uncontrolled runoff: Weather adjustment cfs	Date	Discharge cfs	Indicated deficiency cfs	Balancing adjustment cfs	Directed release cfs	Computations fnr Balancing Adjustment: Directed release: Daily cfs	Directed release: Cumulative cfs	Actual deficiency: Daily cfs	Actual deficiency: Cumulative cfs	Cumulative difference Col. 10 - Col. 12 cfs-days	Balancing adjustment cfs
1983	1	2	3	4		5	6	7	8	9	10	11	12	13	14
Aug. 29	0	216	380	27	Sept. 1	623	1,227	-100	1,127	1,127	45,947	1,023	43,593	2,354	-100
30	0	216	412	78	2	706	1,144	-100	1,044	1,044	46,991	1,358	44,951	2,040	-100
31	100	216	395	29	3	740	1,110	-100	1,010	1,010	48,001	1,435	46,386	1,615	-100
Sept. 1	0	0	402	0	4	402	1,448	-100	1,348	1,348	49,349	1,542	47,928	1,421	-100
2	0	0	374	0	5	374	1,476	-100	1,376	1,376	50,725	1,526	49,454	1,271	-100
3	0	259	345	0	6	604	1,246	-100	1,146	1,146	51,871	1,406	50,860	1,011	-100
4	0	518	314	3	7	835	1,015	-100	915	915	52,786	150	51,010	1,776	-100
5	0	518	317	71	8	906	944	-100	844	844	53,630	356	51,366	2,264	-100
6	202	518	292	40	9	1,052	798	-100	698	698	54,328	638	52,004	2,324	-100
7	297	518	275	9	10	1,099	751	-100	651	651	54,979	767	52,771	2,208	-100
8	0	518	265	0	11	783	1,067	-100	967	967	55,946	1,122	53,893	2,053	-100
9	0	518	265	22	12	805	1,045	-100	945	945	56,891	1,067	54,960	1,931	-100
10	0	518	256	14	13	788	1,062	-100	962	962	57,853	573	55,533	2,320	-100
11	100	518	271	42	14	931	919	-100	819	819	58,672	1,373	56,906	1,766	-100
12	0	259	268	63	15	590	1,260	-100	1,160	1,160	59,832	1,726	58,632	1,200	-100
13	0	108	269	23	16	400	1,450	-100	1,350	1,350	61,182	1,515	60,147	1,035	-100
14	0	259	280	0	17	539	1,311	-100	1,211	1,211	62,393	1,330	61,477	916	-92
15	0	0	275	68	18	343	1,507	-100	1,407	1,407	63,800	1,607	63,084	716	-72
16	0	108	252	41	19	401	1,449	-100	1,349	1,349	65,149	1,660	64,744	405	-40
17	0	367	271	1	20	639	1,211	-100	1,111	1,111	66,260	623	65,367	893	-89
18	357	518	275	6	21	1,156	694	-92	602	602	66,862	294	65,661	1,201	-100
19	0	518	273	135	22	926	924	-72	852	852	67,714	0	65,661	2,053	-100
MONTAGUE DESIGN RATE = 1,750 CFS SEPTEMBER 23 TO NOVEMBER 8															
20	0	518	277	246	23	1,041	709		709						
21	0	259	274	798	24	1,331	419		419						
22	0	0	847	0	25	847	903		903						
23	0	0	666	0	26	666	1,084		1,084						
24	0	518	636	0	27	1,154	596		596						
25	0	518	464	101	28	1,083	667		667						
26	0	518	395	25	29	938	812		812						
27	0	324	383	0	30	707	1,043		1,043						
Total	1,056	9,843	10,668	1,842		23,409	31,291		29,127	22,894		23,091			

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 = 1,850 - Col. 5, Sept. 1-22;
1,750 - Col. 5, Sept. 23-30.
Col. 7 = Col. 14 (4 days earlier); balancing adjustment not applicable after Sept. 22.
Col. 8 = Col. 6 + Col. 7, Sept. 1-22;
Col. 8 = Col. 6, Sept. 23-30.

Col. 9 = Col. 8.
Col. 10 = Summation of Col. 9.
Col. 11 = 1,850 - (Col. 9 + Col. 10 from Table 13) when positive; otherwise Col. 11 = 0.
Col. 12 = Summation of Col. 11.
Col. 14 = Col. 13 divided by minus 10, limited to ±100.

Table 12. - New York City Reservoir release design data - continued

(River Master daily operation record)

Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases							Indicated deficiency	Balancing adjustment	Directed release
Date of advance estimate	Powerplant release forecasts		Uncontrolled runoff		Date	Discharge			
	Lake Wallenpaupack	Mongaup Reservoir	Present conditions	Weather adjustment					
	cfs	cfs	cfs	cfs		cfs	cfs	cfs	cfs
1983	1	2	3	4		5	6	7	8
Sept. 28	0	281	361	0	Oct. 1	642	1,108		1,108
29	0	0	332	0	2	332	1,418		1,418
30	0	86	306	7	3	399	1,351		1,351
Oct. 1	0	346	330	11	4	687	1,063		1,063
2	0	173	277	0	5	450	1,300		1,300
3	0	0	274	69	6	343	1,407		1,407
4	0	0	269	64	7	333	1,417		1,417
5	0	0	288	63	8	351	1,399		1,399
6	0	0	331	0	9	331	1,419		1,419
7	0	0	329	0	10	329	1,421		1,421
8	0	0	303	-32	11	271	1,479		1,479
9	0	0	276	-50	12	226	1,524		1,524
10	0	0	250	-50	13	200	1,550		1,550
11	0	0	256	151	14	407	1,343		1,343
12	0	0	269	863	15	1,132	618		618
13	0	0	325	723	16	1,048	702		702
14	0	0	758	0	17	758	992		992
15	0	0	626	14	18	640	1,110		1,110
16	0	0	381	9	19	390	1,360		1,360
17	0	0	379	-42	20	337	1,413		1,413
18	0	0	351	-36	21	315	1,435		1,435
19	0	0	446	0	22	446	1,304		1,304
20	0	0	397	0	23	397	1,353		1,353
21	0	0	402	10	24	412	1,338		1,338
22	0	0	376	315	25	691	1,059		1,059
23	0	0	364	497	26	861	889		889
24	0	0	586	74	27	660	1,090		1,090
25	0	0	656	37	28	693	1,057		1,057
26	0	0	664	14	29	678	1,072		1,072
27	0	0	647	0	30	647	1,103		1,103
28	0	0	594	0	31	594	1,156		1,156
Total	0	886	12,403	2,711		16,000	38,250		38,250

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 with allowance for evaporation on some days.

Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,750 - Col. 5.
Col. 7 = Balancing adjustment not applicable.
Col. 8 = Col. 6.

Table 12. - New York City Reservoir release design data - continued

((River Master daily operation record)

Advance estimate of discharge of Delaware River at Montague exclusive of New York City reservoir releases							Indicated deficiency cfs	Balancing adjustment cfs	Directed release cfs
Date of advance estimate	Powerplant release forecasts: Lake Wallenpaupack cfs	Powerplant release forecasts: Mongaup Reservoir cfs	Uncontrolled runoff: Present conditions cfs	Uncontrolled runoff: Weather adjustment cfs	Date	Discharge cfs			
1983	1	2	3	4		5	6	7	8
Oct. 29	0	0	527	0	Nov. 1	527	1,223		1,223
30	0	0	427	0	2	427	1,323		1,323
31	0	0	391	0	3	391	1,359		1,359
Nov. 1	0	0	348	126	4	474	1,276		1,276
2	0	0	328	113	5	441	1,309		1,309
3	0	0	327	85	6	412	1,338		1,338
4	0	0	346	37	7	383	1,367		1,367
5	0	0	373	0	8	373	1,377		1,377
MONTAGUE DESIGN RATE = 1,655 CFS NOVEMBER 9-30									
6	0	0	342	0	9	342	1,313		1,313
7	0	0	351	0	10	351	1,304		1,304
8	0	0	323	0	11	323	1,332		1,332
9	0	0	294	407	12	701	954		954
10	0	0	288	338	13	626	1,029		1,029
11	0	0	512	260	14	772	883		883
12	0	0	844	0	15	844	811		811
13	0	0	823	89	16	912	743		743
14	0	0	773	486	17	1,259	396		396
15	0	0	695	2,331	18	3,026	0		0
16	0	0	985	73	19	1,058	597		597
17	0	0	981	64	20	1,045	610		610
18	0	0	1,051	42	21	1,093	562		562
19	0	0	1,017	130	22	1,147	508		508
20	0	0	959	532	23	1,491	164		164
November 24-30, estimated Montague discharge greater than 1,655 cfs									
Total	0	0	13,305	5,113		18,418	21,778		21,778

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 = 1,750 - Col. 5, Nov. 1-8;
1,655 - Col. 5, Nov. 9-23.
Col. 7 - Balancing adjustment not applicable.
Col. 8 = Col. 6.

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow						
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total	
Date	Amount								Directed	Other				
1982	1	2	3	4		5	6		7	8	9	10	11	
Nov. 28	0	8	9	5	Nov. 30	0	0	Dec. 1	0	22	0	2,588	2,610	
29	0	6	9	5	Dec. 1	0	0	2	0	20	0	2,570	2,590	
30	0	6	9	5	2	0	0	3	0	20	0	2,220	2,240	
Dec. 1	0	6	9	5	3	0	0	4	0	20	0	1,990	2,010	
2	0	6	9	5	4	0	0	5	0	20	0	1,820	1,840	
3	0	6	9	5	5	0	0	6	0	20	0	1,720	1,740	
4	0	6	9	5	6	98	0	7	0	20	98	1,652	1,770	
5	0	6	9	5	7	0	0	8	0	20	0	1,580	1,600	
6	130	6	94	25	8	0	0	9	125	0	0	1,355	1,480	
7	161	51	105	5	9	9	0	10	161	0	9	1,290	1,460	
8	170	51	105	26	10	469	0	11	182	0	469	1,029	1,680	
9	290	51	217	26	11	0	0	12	294	0	0	776	1,070	
	380				12	0	0	13			0	1,260	1,260	
10	380	51	303	26	13	0	0	14	380	0	0	910	1,290	
11	440	51	367	26	14	6	0	15	444	0	6	950	1,400	
12	590	53	515	26	15	0	0	16	594	0	0	1,606	2,200	
13	640	51	571	26	16	0	86	17	648	0	86	4,006	4,740	
14	564	48	493	23	17	7	173	18	564	0	180	4,496	5,240	
15	315	50	260	5	18	0	0	19	315	0	0	3,155	3,470	
16 & 17	0	14	18	10	19	0	49	20	0	42	49	3,029	3,120	
18	0	6	9	5	20	0	270	21	0	20	270	2,790	3,080	
19	0	6	11	5	21	0	248	22	0	22	248	2,520	2,790	
20	0	6	11	5	22	0	238	23	0	22	238	2,270	2,530	
21	0	6	9	5	23	9	173	24	0	20	182	2,118	2,320	
22	0	6	9	5	24	0	0	25	0	20	0	2,340	2,360	
23	0	6	9	5	25	0	0	26	0	20	0	2,610	2,630	
24	0	6	9	5	26	0	70	27	0	20	70	6,080	6,170	
25	0	6	9	5	27	8	248	28	0	20	256	5,634	5,910	
26	0	6	9	5	28	0	270	29	0	20	270	5,450	5,740	
27	0	6	9	5	29	0	227	30	0	20	227	4,893	5,140	
28	0	6	9	5	30	7	140	31	0	20	147	4,043	4,210	
Total	4,060	593	3,223	319		613	2,192		3,707	428	2,805	80,750	87,690	

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 1200 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 Dec. 9-19.
Col. 8 = Col. 2 + Col. 3 + Col. 4 Dec. 1-8, 20-31.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.

Note: Computational time of transit from New York reservoirs to Montague was increased 24 hours Dec. 14-20 (Montague dates); some data adjusted to preserve budget balance.

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow						
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total	
Date	Amount								Directed	Other				
1982/83	1	2	3	4		5	6		7	8	9	10	11	
Dec. 29	0	6	9	5	Dec. 31	0	0	Jan. 1	0	20	0	3,430	3,450	
30	0	6	9	5	Jan. 1	0	0	2	0	20	0	3,000	3,020	
31	0	6	9	5	2	0	76	3	0	20	76	2,754	2,850	
Jan. 1	0	6	9	5	3	250	189	4	0	20	439	2,301	2,760	
2	0	6	9	5	4	250	211	5	0	20	461	2,019	2,500	
3	0	6	9	5	5	242	189	6	0	20	431	2,159	2,610	
4	0	6	9	5	6	229	146	7	0	20	375	2,155	2,550	
5	0	6	9	5	7	222	65	8	0	20	287	1,973	2,280	
6	0	6	9	5	8	0	0	9	0	20	0	1,770	1,790	
7	0	6	9	5	9	0	38	10	0	20	38	1,632	1,690	
8	0	6	9	5	10	234	194	11	0	20	428	2,172	2,620	
9	0	6	9	5	11	235	189	12	0	20	424	3,676	4,120	
10	0	6	9	5	12	237	211	13	0	20	448	3,342	3,810	
11	0	6	9	5	13	308	205	14	0	20	513	2,567	3,100	
12	0	6	9	5	14	238	130	15	0	20	368	2,312	2,700	
13	0	6	9	5	15	0	0	16	0	20	0	2,080	2,100	
14	0	6	9	5	16	3	65	17	0	20	68	2,112	2,200	
15	0	6	9	5	17	474	238	18	0	20	712	2,068	2,800	
16	0	6	9	5	18	451	216	19	0	20	667	1,813	2,500	
17	0	6	9	5	19	476	221	20	0	20	697	1,683	2,400	
18	0	6	9	5	20	453	248	21	0	20	701	1,879	2,600	
19	0	6	9	5	21	484	135	22	0	20	619	1,961	2,600	
20	0	6	9	5	22	0	0	23	0	20	0	2,180	2,200	
21	0	6	9	5	23	0	65	24	0	20	65	4,815	4,900	
22	0	6	9	5	24	471	65	25	0	20	536	7,644	8,200	
23	0	6	9	5	25	393	200	26	0	20	593	6,647	7,260	
24	0	6	11	5	26	477	178	27	0	22	655	5,173	5,850	
25	0	6	11	5	27	471	162	28	0	22	633	4,435	5,090	
26	0	6	11	5	28	467	97	29	0	22	564	3,774	4,360	
27	0	6	11	5	29	0	0	30	0	22	0	3,518	3,540	
28	0	6	11	5	30	0	65	31	0	22	65	3,363	3,450	
Total	0	186	289	155		7,065	3,798		0	630	10,863	92,407	103,900	

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 1200 of date shown.

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

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague							
								Segregation of flow							
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total		
Date	Amount								Directed	Other					
1983	1	2	3	4		5	6		7	8	9	10	11		
Jan. 29	0	6	11	5	Jan. 31	472	178	Feb. 1	0	22	650	3,068	3,740		
30	0	6	11	5	Feb. 1	482	211	2	0	22	693	2,775	3.490		
31	0	6	11	5	2	421	389	3	0	22	810	9,468	10,300		
Feb. 1	0	6	11	5	3	478	389	4	0	22	867	22,711	23,600		
2	0	6	11	5	4	478	400	5	0	22	878	13,900	14,800		
3	0	6	11	5	5	0	389	6	0	22	389	9,689	10,100		
4	0	6	11	5	6	0	389	7	0	22	389	7,739	8,150		
5	0	6	11	5	7	685	389	8	0	22	1,074	6,464	7,560		
6	0	6	11	5	8	690	389	9	0	22	1,079	5,679	6,780		
7	0	6	11	5	9	697	389	10	0	22	1,086	4,802	5,910		
8	0	6	11	5	10	738	389	11	0	22	1,127	3,991	5,140		
9	0	6	11	5	11	740	389	12	0	22	1,129	3,989	5,140		
10	0	6	12	5	12	0	389	13	0	23	389	3,488	3,900		
11	0	6	12	5	13	0	389	14	0	23	389	3,688	4,100		
12	0	6	12	5	14	746	389	15	0	23	1,135	3,642	4,800		
13	0	6	12	5	15	718	389	16	0	23	1,107	3,470	4,600		
14	0	6	12	5	16	688	389	17	0	23	1,077	3,430	4,530		
15	0	6	12	5	17	666	378	18	0	23	1,044	3,173	4,240		
16	0	6	12	5	18	789	389	19	0	23	1,178	2,969	4,170		
17	0	6	12	5	19	0	389	20	0	23	389	3,098	3,510		
18	0	6	12	5	20	0	389	21	0	23	389	2,948	3,360		
19	0	6	12	5	21	6	367	22	0	23	373	3,024	3,420		
20	0	6	12	5	22	708	194	23	0	23	902	3,385	4,310		
21	0	6	12	5	23	807	421	24	0	23	1,228	3,809	5,060		
22	0	6	12	5	24	701	416	25	0	23	1,117	3,840	4,980		
23	0	6	12	5	25	716	194	26	0	23	910	3,287	4,220		
24	0	6	12	5	26	0	0	27	0	23	0	2,977	3,000		
25	0	6	12	5	27	0	70	28	0	23	70	2,907	3,000		
Total	0	168	324	140		12,426	9,442		0	632	21,868	147,410	169,910		

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 1200 of date shown.

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

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague						
								Segregation of flow						
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallen-paupack	Mongaup Reservoir	Date	Controlled releases			Computed uncon-trolled	Total	
									N.Y.C. reservoirs		Power-plants			
Date	Amount								Directed	Other				
1983	1	2	3	4		5	6		7	8	9	10	11	
Feb. 26	0	6	12	5	Feb. 28	707	211	Mar. 1	0	23	918	2,829	3,770	
27	0	6	12	3	Mar. 1	703	227	2	0	21	930	3,639	4,590	
28	0	6	12	5	2	707	211	3	0	23	918	5,959	6,900	
Mar. 1	0	6	12	5	3	811	243	4	0	23	1,054	5,943	7,020	
2	0	6	12	5	4	693	167	5	0	23	860	5,427	6,310	
3	0	6	12	5	5	0	0	6	0	23	0	5,717	5,740	
4	0	6	12	5	6	0	81	7	0	23	81	6,266	6,370	
5	0	6	12	5	7	620	405	8	0	23	1,025	7,642	8,690	
6	0	6	12	5	8	726	410	0	0	23	1,136	8,301	9,460	
7	0	6	12	5	9	713	400	10	0	23	1,113	8,254	9,390	
8	0	6	12	5	10	712	405	11	0	23	1,117	9,660	10,800	
9	0	6	12	5	11	675	389	12	0	23	1,064	9,713	10,800	
10	0	6	12	5	12	0	162	13	0	23	162	8,785	8,970	
11	0	6	12	5	13	3	86	14	0	23	89	8,168	8,280	
12	0	6	12	5	14	868	248	15	0	23	1,116	7,071	8,210	
13	0	6	8	5	15	853	227	16	0	19	1,080	6,591	7,690	
14	0	6	8	5	16	912	243	17	0	19	1,155	5,906	7,080	
15	0	6	8	5	17	898	227	18	0	19	1,125	5,516	6,660	
16	0	6	8	5	18	836	248	19	0	19	1,084	8,067	9,170	
17	0	6	8	5	19	0	383	20	0	19	383	10,398	10,800	
18	0	6	8	5	20	56	421	21	0	19	477	11,004	11,500	
19	0	6	8	5	21	1,825	524	22	0	19	2,349	14,832	17,200	
20	0	6	8	5	22	1,825	518	23	0	19	2,343	12,538	14,900	
21	0	6	8	5	23	1,831	497	24	0	19	2,328	9,653	12,000	
22	0	6	8	5	24	1,822	518	25	0	19	2,340	7,941	10,300	
23	0	6	8	5	25	1,223	518	26	0	19	1,741	6,670	8,430	
24	0	6	8	5	26	722	518	27	0	19	1,240	5,971	7,230	
25	0	6	8	5	27	830	502	28	0	19	1,332	8,299	9,650	
26	0	6	8	5	28	946	513	29	0	19	1,459	9,122	10,600	
27	0	6	8	5	29	951	518	30	0	19	1,469	7,742	9,230	
28	0	6	8	5	30	966	518	31	0	19	1,484	6,427	7,930	
Total	0	186	308	153		24,434	10,538		0	647	34,972	240,051	275,670	

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 1200 of date shown.

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

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin

and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow						
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Powerplants	Computed uncontrolled	Total	
Date	Amount								Directed	Other				
1983	1	2	3	4		5	6		7	8	9	10	11	
Mar. 29	0	6	8	5	Mar.31	937	518	Apr. 1	0	19	1,455	5,666	7,140	
30	0	6	8	5	Apr. 1	944	518	2	0	19	1,462	5,089	6,570	
31	0	6	8	5	2	825	518	3	0	19	1,343	5,868	7,230	
Apr. 1	0	6	8	5	3	827	518	4	0	19	1,345	8,156	9,520	
2	0	6	8	5	4	926	518	5	0	19	1,444	7,707	9,170	
3	0	6	8	5	5	940	518	6	0	19	1,458	6,423	7,900	
4	0	6	8	5	6	953	518	7	0	19	1,471	5,890	7,380	
5	0	6	8	5	7	931	518	8	0	19	1,449	6,002	7,470	
6	0	6	8	15	8	948	518	9	0	29	1,466	8,325	9,820	
7	0	19	8	15	9	826	518	10	0	42	1,344	10,014	11,400	
8	0	19	8	15	10	838	518	11	0	42	1,356	19,402	20,800	
9	0	19	8	15	11	1,489	518	12	0	42	2,007	15,151	17,200	
10	0	19	8	23	12	1,670	518	13	0	50	2,188	11,562	13,800	
11	0	26	28	45	13	1,697	518	14	0	99	2,215	9,286	11,600	
12	0	70	43	46	14	1,688	518	15	0	159	2,206	7,835	10,200	
13	0	70	43	46	15	1,077	518	16	0	159	1,595	42,846	44,600	
14	0	65	43	46	16	885	491	17	0	154	1,376	54,870	56,400	
15	0	70	43	46	17	1,104	518	18	0	159	1,622	28,319	30,100	
16	0	70	43	46	18	967	497	19	0	159	1,464	20,977	22,600	
17	0	70	45	46	19	1,589	470	20	0	161	2,059	17,380	19,600	
18	0	71	45	46	20	1,617	470	21	0	162	2,087	15,951	18,200	
19	0	68	45	46	21	1,466	513	22	0	159	1,979	15,662	17,800	
20	0	73	45	46	22	1,659	508	23	0	164	2,167	15,469	17,800	
21	0	73	45	46	23	1,590	464	24	0	164	2,054	17,182	19,400	
22	0	68	45	47	24	1,657	497	25	0	160	2,154	33,386	35,700	
23	0	69	45	46	25	1,640	529	26	0	160	2,169	39,771	42,100	
24	0	70	45	46	26	1,631	497	27	0	161	2,128	33,111	35,400	
25	0	70	45	46	27	1,645	508	28	0	161	2,153	25,586	27,900	
26	0	70	57	46	28	1,659	497	29	0	173	2,156	21,871	24,200	
27	0	70	53	46	29	1,659	475	30	0	169	2,134	19,597	21,900	
Total	0	1,273	862	905		38,284	15,222		0	3,040	53,506	534,354	590,900	

Col. 2 - 24 hours beginning 1200 of date shown, except 23 hours Apr. 23.
Col. 3 - 24 hours ending 2400 one day later, except 23 hours Apr. 23.
Col. 4 - 24 hours beginning 1500 one day later, except 23 hours Apr. 22.
Col. 5 - 24 hours beginning 0800 of date shown, except 23 hours Apr. 23.
Col. 6 - 24 hours beginning 1200 of date shown, except 23 hours Apr. 23.

Col. 8 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown, except 23 hours Apr. 24.

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow					
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total
Date	Amount								Directed	Other			
1983	1	2	3	4		5	6		7	8	9	10	11
Apr. 28	0	70	45	46	Apr. 30	1,539	427	May 1	0	161	1,966	18,673	20,800
29	0	70	45	46	May 1	1,588	459	2	0	161	2,047	17,692	19,900
30	0	70	45	46	2	1,654	497	3	0	161	2,151	18,588	20,900
May 1	0	70	85	46	3	1,632	535	4	0	201	2,167	17,232	19,600
2	0	70	45	46	4	1,650	475	5	0	161	2,125	16,014	18,300
3	0	70	53	46	5	1,652	394	6	0	169	2,046	13,485	15,700
4	0	70	45	45	6	1,093	0	7	0	160	1,093	10,947	12,200
5	0	70	45	45	7	0	0	8	0	160	0	9,690	9,850
6	0	70	45	45	8	129	65	9	0	160	194	10,146	10,500
7	0	70	45	45	9	1,066	324	10	0	160	1,390	9,450	11,000
8	0	70	45	45	10	1,095	346	11	0	160	1,441	7,989	9,590
9	0	70	45	45	11	1,019	324	12	0	160	1,343	6,927	8,430
10	0	70	45	45	12	684	346	13	0	160	1,030	6,310	7,500
11	0	70	45	45	13	615	340	14	0	160	955	5,485	6,600
12	0	70	45	45	14	0	335	15	0	160	335	5,165	5,660
13	0	68	45	45	15	0	259	16	0	158	259	6,803	7,220
14	0	71	45	45	16	349	524	17	0	161	873	6,656	7,690
15	0	68	45	45	17	0	518	18	0	158	518	5,864	6,540
16	0	70	45	45	18	0	486	19	0	160	486	5,064	5,710
17	0	70	45	46	19	0	508	20	0	161	508	4,631	5,300
18	0	70	45	46	20	674	508	21	0	161	1,182	4,427	5,770
19	0	71	45	46	21	0	502	22	0	162	502	4,316	4,980
20	0	71	45	46	22	0	518	23	0	162	518	5,090	5,770
21	0	67	45	46	23	229	475	24	0	158	704	5,418	6,280
22	0	67	45	46	24	0	502	25	0	158	502	4,970	5,630
23	0	71	45	46	25	0	427	26	0	162	427	4,521	5,110
24	0	70	45	46	26	108	464	27	0	161	572	5,147	5,880
25	0	70	45	46	27	889	286	28	0	161	1,175	5,264	6,600
26	0	70	45	46	28	0	259	29	0	161	259	5,180	5,600
27	0	70	45	46	29	0	281	30	0	161	281	5,808	6,250
28	0	71	45	46	30	0	302	31	0	162	302	7,906	8,370
Total	0	2,165	1,443	1,413		17,665	11,686		0	5,021	29,351	260,858	295,230

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 1200 of date shown.

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

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin

and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague							
								Segregation of flow						Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases			Computed uncontrolled	Total		
									N.Y.C. reservoirs		Powerplants				
Date	Amount								Directed	Other				Daily	Cumulative
1983	1	2	3	4		5	6		7	8	9	10	11	12	13
May 29	0	71	45	46	May 31	195	216	June 1	0	162	411	7,487	8,060		
30	0	71	45	46	June 1	441	308	2	0	162	749	6,589	7,500		
31	0	73	45	46	2	444	238	3	0	164	682	5,754	6,600		
June 1	0	68	45	46	3	470	232	4	0	159	702	6,219	7,080		
2	0	68	45	46	4	0	238	5	0	159	238	8,033	8,430		
3	0	67	45	46	5	0	259	6	0	158	259	6,903	7,320		
4	0	73	45	46	6	417	475	7	0	164	892	8,304	9,360		
5	0	73	45	46	7	1,403	486	8	0	164	1,889	7,867	9,920		
6	0	71	45	46	8	1,430	486	9	0	162	1,916	6,292	8,370		
7	0	73	45	46	9	1,432	513	10	0	164	1,945	5,391	7,500		
8	0	73	209	46	10	1,432	502	11	0	328	1,934	4,338	6,600		
9	0	71	45	46	11	1,423	491	12	0	162	1,914	3,974	6,050		
10	0	73	45	46	12	1,439	497	13	0	164	1,936	3,560	5,660		
11	0	73	45	46	13	854	513	14	0	164	1,367	3,029	4,560		
12	0	70	201	46	14	350	470	15	0	317	820	2,833	3,970		
13	0	70	368	74	15	247	502	16	0	512	749	2,339	3,600		
14	0	94	368	70	16	554	464	17	0	532	1,018	2,240	3,790		
15	0	102	371	73	17	357	448	18	0	546	805	2,369	3,720		
16	0	108	368	76	18	0	486	19	0	552	486	2,302	3,340		
17	0	99	370	76	19	0	475	20	0	545	475	2,320	3,340		
18	0	99	370	76	20	363	86	21	0	545	449	2,406	3,400		
19	0	99	370	43	21	588	367	22	0	512	955	1,983	3,450		
20	0	70	370	43	22	586	319	23	0	483	905	1,732	3,120		
21	0	70	370	46	23	591	286	24	0	486	877	1,467	2,830		
22	0	73	370	68	24	578	275	25	0	511	853	1,276	2,640		
23	298	99	370	71	25	0	232	26	298	242	232	1,118	1,890	140	140
24	644	99	476	71	26	0	76	27	646	0	76	998	1,720	-30	110
25	0	102	368	73	27	589	162	28	0	543	751	1,236	2,530	0	110
26	0	102	370	74	28	5	70	29	0	546	75	6,649	7,270	0	110
27	0	99	370	45	29	0	81	30	0	514	81	6,005	6,600	0	110
Total	942	2,453	6,644	1,669		16,188	10,253		944	9,822	26,441	123,013	160,220		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 June 1-25, 28-30.
= Col. 2 + Col. 3 + Col. 4 - Col. 1 June 26.
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 - 1,750 cfs, computed algebraically, but not greater than Col. 7; except an additional of that part or all of Col. 8, contributing to Col. 11 for quantities between 1,750 and 1,850 cfs that may bring total to excess-release increment.
Col. 13 - Season limit of cumulative credit June 15, 1983 to Mar. 14, 1984 = 11,418 cfs-days.

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague Segregation of flow							
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallen-paupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncon-trolled	Total	Excess release credits	
Date	Amount								Directed	Other				Daily	Cumulative
1983	1	2	3	4		5	6		7	8	9	10	11	12	13
June 28	0	71	370	45	June 30	928	178	July 1	0	486	1,106	3,268	4,860	0	110
29	0	74	370	46	July 1	981	270	2	0	490	1,251	2,299	4,040	0	110
30	0	70	370	48	2	894	211	3	0	488	1,105	2,077	3,670	0	110
July 1	0	71	370	71	3	1,098	162	4	0	512	1,260	1,658	3,430	0	110
2	0	99	370	97	4	604	97	5	0	566	701	1,593	2,860	0	110
3	0	119	370	97	5	571	270	6	0	586	841	1,483	2,910	0	110
4	0	125	370	46	6	590	324	7	0	541	914	1,355	2,810	0	110
5	0	74	370	43	7	535	319	8	0	487	854	1,229	2,570	0	110
6	0	71	362	48	8	590	297	9	0	481	887	1,082	2,450	0	110
7	485	71	367	51	9	0	200	10	489	0	200	951	1,640	-110	0
8	506	71	388	50	10	0	0	11	509	0	0	921	1,430	-320	-320
9	70	67	370	48	11	586	86	12	70	415	672	783	1,940	100	-220
10	173	70	368	46	12	604	324	13	173	311	928	748	2,160	173	-47
11	269	71	370	74	13	601	324	14	269	246	925	770	2,210	269	222
12	335	101	370	73	14	593	324	15	335	209	917	679	2,140	335	557
13	372	97	370	73	15	578	259	16	372	168	837	793	2,170	372	929
14	1,156	104	999	76	16	0	0	17	1,179	0	0	841	2,020	270	1,199
15	1,115	99	947	74	17	0	65	18	1,120	0	65	625	1,810	60	1,259
16	41	101	367	74	18	755	518	19	41	501	1,273	675	2,490	41	1,300
17	670	102	517	51	19	736	302	20	670	0	1,038	732	2,440	670	1,970
18	222	76	364	50	20	713	259	21	222	268	972	798	2,260	222	2,192
19	237	70	364	46	21	749	259	22	237	243	1,008	1,072	2,560	237	2,429
20	197	70	365	48	22	705	173	23	197	286	878	979	2,340	197	2,626
21	748	67	640	48	23	0	0	24	755	0	0	885	1,640	-110	2,516
22	1,077	70	978	50	24	0	22	25	1,098	0	22	960	2,080	330	2,846
23	214	70	365	48	25	606	243	26	214	269	849	1,038	2,370	214	3,060
24	675	70	565	48	26	0	211	27	683	0	211	766	1,660	-90	2,970
25	184	70	364	48	27	0	184	28	184	298	184	834	1,500	-250	2,720
26	342	70	364	48	28	611	189	29	342	140	800	678	1,960	210	2,930
27	386	70	364	48	29	550	194	30	386	96	744	644	1,870	120	3,050
28	961	70	854	48	30	0	0	31	972	0	0	508	1,480	-270	2,780
Total	10,435	2,501	14,342	1,761		15,178	6,264		10,517	8,087	21,442	33,724	73,770		

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 1200 of date shown.
Col. 7 = Col. 2+ Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 July 1-9.
= Col. 2 + Col. 3 + Col. 4 - Col. 1 July 12-16, 19, 21-23, 26, 28-30.
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 - 1,750 cfs, computed algebraically, but not greater than Col. 7; except an addition of that part or all of Col. 8 contributing to Col. 11 for quantities between 1,750 and 1,850 cfs that may bring total to excess-release increment.
Col. 13 - Season limit of cumulative credit beginning June 15, 1983 = 11,418 cfs-days.

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague						
								Segregation of flow					Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases			Computed uncontrolled	Total	
									N.Y.C. reservoirs		Powerplants			
Date	Amount								Directed	Other				
1983	1	2	3	4		5	6		7	8	9	10	11	12	13
July 29	1,291	70	1,179	48	July 31	0	38	Aug. 1	1,297	0	38	475	1,810	60	2,840
30	747	68	634	48	Aug. 1	284	194	2	750	0	478	672	1,900	150	2,990
31	877	68	761	48	2	0	65	3	877	0	65	608	1,550	-200	2,790
Aug. 1	914	70	803	48	3	0	173	4	921	0	173	666	1,760	10	2,800
2	999	70	888	48	4	0	232	5	1,006	0	232	502	1,740	-10	2,790
3	1,169	70	1,047	50	5	0	259	6	1,167	0	259	584	2,010	260	3,050
4	1,383	68	1,264	50	6	0	65	7	1,382	0	65	533	1,980	230	3,280
5	1,378	101	1,210	76	7	0	259	8	1,387	0	259	364	2,010	260	3,540
6	1,047	102	880	74	8	0	335	9	1,056	0	335	489	1,880	130	3,670
7	1,069	102	900	73	9	0	324	10	1,075	0	324	441	1,840	90	3,760
8	1,082	101	914	73	10	5	335	11	1,088	0	340	452	1,880	130	3,890
9	1,105	71	996	46	11	486	308	12	1,113	0	794	1,133	3,040	1,105	4,995
10	1,205	71	1,088	46	12	0	351	13	1,205	0	351	1,424	2,980	1,205	6,200
11	813	71	696	46	13	0	0	14	813	0	0	1,447	2,260	510	6,710
12	0	71	350	46	14	2	43	15	0	467	45	1,038	1,550	-200	6,510
13	547	71	432	46	15	0	43	16	549	0	43	778	1,370	-380	6,130
14	657	71	501	85	16	0	97	17	657	0	97	736	1,490	-260	5,870
15	1,051	68	937	45	17	0	43	18	1,050	0	43	587	1,680	-70	5,800
16	1,089	65	976	51	18	0	22	19	1,092	0	22	656	1,770	20	5,820
17	1,226	79	1,114	46	19	611	130	20	1,239	0	741	510	2,490	740	6,560
18	1,248	77	1,134	46	20	0	0	21	1,257	0	0	553	1,810	60	6,620
19	1,251	71	1,139	46	21	0	22	22	1,256	0	22	432	1,710	-40	6,580
20	1,344	73	1,231	46	22	0	508	23	1,350	0	508	332	2,190	440	7,020
21	1,286	73	1,166	46	23	231	151	24	1,285	0	382	503	2,170	420	7,440
22	1,378	73	1,270	46	24	414	275	25	1,389	0	689	352	2,430	680	8,120
23	1,389	73	1,278	46	25	0	135	26	1,397	0	135	408	1,940	190	8,310
24	1,388	73	1,275	48	26	0	178	27	1,396	0	178	426	2,000	250	8,560
25	1,408	73	1,296	48	27	0	0	28	1,417	0	0	523	1,940	190	8,750
26	1,351	73	1,230	48	28	0	32	29	1,351	0	32	427	1,810	60	8,810
27	981	73	863	48	29	544	0	30	984	0	544	522	2,050	300	9,110
28	770	73	674	48	30	513	248	31	795	0	761	474	2,030	280	9,390
Total	33,443	2,333	30,126	1,609		3,090	4,865		33,601	467	7,955	19,047	61,070		

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 1200 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 Aug. 15
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 - 1,750 cfs, computed algebraically, but not greater than Col. 7.
Col. 13 - Season limit of cumulative credit beginning June 15, 1983 = 11,418 cfs-days.

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague						
								Segregation of flow					Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases			Computed uncontrolled	Total	
									N.Y.C. reservoirs		Powerplants			
Date	Amount								Directed	Other				Daily	Cumulative
1983	1	2	3	4		5	6		7	8	9	10	11	12	13
Aug. 29	1,127	73	1,012	48	Aug. 31	355	0	Sept. 1	1,133	0	355	472	1,960	210	9,600
30	1,044	73	927	48	Sept. 1	0	0	2	1,048	0	0	492	1,540	-210	9,390
31	1,010	73	894	48	2	0	0	3	1,015	0	0	415	1,430	-320	9,070
Sept. 1	1,348	73	1,211	48	3	0	0	4	1,332	0	0	308	1,640	-110	8,960
2	1,376	73	1,265	48	4	0	0	5	1,386	0	0	324	1,710	-40	8,920
3	1,146	73	1,010	73	5	0	297	6	1,156	0	297	147	1,600	-150	8,770
4	915	108	749	73	6	844	454	7	930	0	1,298	402	2,630	880	9,650
5	844	102	681	73	7	655	508	8	856	0	1,163	331	2,350	600	10,250
6	698	102	548	48	8	248	437	9	698	0	685	527	1,910	160	10,410
7	651	74	548	45	9	299	475	10	667	0	774	309	1,750	0	10,410
8	967	77	859	46	10	0	518	11	982	0	518	210	1,710	-40	10,370
9	945	77	832	48	11	0	518	12	957	0	518	265	1,740	-10	10,360
10	962	74	849	50	12	512	432	13	973	0	944	333	2,250	500	10,860
11	819	74	701	48	13	0	0	14	823	0	0	477	1,300	-450	10,410
12	1,160	70	1,046	50	14	0	0	15	1,166	0	0	124	1,290	-460	9,950
13	1,350	74	1,230	51	15	0	259	16	1,355	0	259	76	1,690	-60	9,890
14	1,211	74	1,095	51	16	0	259	17	1,220	0	259	261	1,740	-10	9,880
15	1,407	74	1,292	51	17	0	0	18	1,417	0	0	243	1,660	-90	9,790
16	1,349	74	1,145	51	18	0	49	19	1,270	0	49	141	1,460	-290	9,500
17	1,111	74	998	51	19	585	486	20	1,123	0	1,071	156	2,350	600	10,100
18	602	74	619	51	20	635	410	21	602	142	1,045	511	2,300	550	10,650
19	852	73	735	51	21	776	481	22	859	0	1,257	844	2,960	768	11,418
20	709	73	597	51	22	490	481	23	721	0	971	908	2,600		
21	419	74	299	46	23	0	259	24	419	0	259	972	1,650		
22	903	74	803	50	24	0	0	25	927	0	0	323	1,250		
23	1,084	74	973	50	25	0	32	26	1,097	0	32	311	1,440		
24	596	73	481	46	26	0	297	27	600	0	297	563	1,460		
25	667	74	549	46	27	0	324	28	669	0	324	117	1,110		
26	812	74	701	46	28	12	356	29	821	0	368	271	1,460		
27	1,043	74	927	46	29	0	340	30	1,047	0	340	253	1,640		
Total	29,127	2,303	25,576	1,532		5,411	7,672		29,269	142	13,083	11,086	53,580		

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 1200 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. 1 Sept. 21.
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 - 1,750 cfs, computed algebraically, but not greater than Col. 7.
Col. 13 - Season limit of cumulative credit beginning June 15, 1983 = 11,418 cfs-days; expired September 22.

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin

and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague							
								Segregation of flow						Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases			Computed uncontrolled	Total		
									N.Y.C. reservoirs		Powerplants				
Date	Amount								Directed	Other				Daily	Cumulative
1983	1	2	3	4		5	6		7	8	9	10	11	12	13
Sept.28	1,108	74	993	46	Sept. 30	0	238	Oct. 1	1,113	0	238	409	1,760		
29	1,418	68	1,303	46	Oct. 1	0	0	2	1,417	0	0	373	1,790		
30	1,351	71	1,242	46	2	0	43	3	1,359	0	43	308	1,710		
Oct. 1	1,063	70	953	46	3	30	43	4	1,069	0	73	358	1,500		
2	1,300	76	1,187	46	4	0	0	5	1,309	0	0	321	1,630		
3	1,407	74	1,290	46	5	0	22	6	1,410	0	22	328	1,760		
4	1,417	73	1,299	46	6	0	216	7	1,418	0	216	276	1,910		
5	1,399	74	1,281	46	7	0	0	8	1,401	0	0	309	1,710		
6	1,419	73	1,306	46	8	0	0	9	1,425	0	0	265	1,690		
7	1,421	73	1,309	46	9	0	0	10	1,428	0	0	212	1,640		
8	1,479	73	1,364	46	10	0	32	11	1,483	0	32	165	1,680		
9	1,524	73	1,409	46	11	0	194	12	1,528	0	194	218	1,940		
10	1,550	73	1,439	46	12	0	0	13	1,558	0	0	322	1,880		
11	1,343	71	1,230	46	13	0	0	14	1,347	0	0	393	1,740		
12	618	71	501	46	14	0	0	15	618	0	0	782	1,400		
13	702	71	589	46	15	0	0	16	706	0	0	464	1,170		
14	992	71	885	46	16	0	0	17	1,002	0	0	438	1,440		
15	1,110	71	998	46	17	0	0	18	1,115	0	0	375	1,490		
16	1,360	71	1,202	87	18	0	0	19	1,360	0	0	500	1,860		
17	1,413	71	1,303	48	19	0	0	20	1,422	0	0	488	1,910		
18	1,435	311	1,086	48	20	0	0	21	1,445	0	0	395	1,840		
19	1,304	308	956	48	21	0	157	22	1,312	0	157	421	1,890		
20	1,353	586	724	46	22	0	0	23	1,356	0	0	464	1,820		
21	1,338	622	673	46	23	0	0	24	1,341	0	0	669	2,010		
22	1,059	619	402	48	24	61	0	25	1,069	0	61	900	2,030		
23	889	563	295	48	25	5	0	26	906	0	5	859	1,770		
24	1,090	620	425	48	26	0	0	27	1,093	0	0	727	1,820		
25	1,057	620	394	46	27	0	0	28	1,060	0	0	680	1,740		
26	1,072	617	415	46	28	0	0	29	1,078	0	0	552	1,630		
27	1,103	620	442	48	29	0	0	30	1,110	0	0	500	1,610		
28	1,156	617	492	49	30	0	0	31	1,158	0	0	452	1,610		
Total	38,250	7,545	29,387	1,484		96	945		38,416	0	1,041	13,923	53,380		

Col. 2 - 24 hours beginning 1200 of date shown, except 25 hours Oct. 29.
Col. 3 - 24 hours ending 2400 one day later, except 25 hours Oct. 29.
Col. 4 - 24 hours beginning 1500 one day later, except 25 hours Oct. 28.
Col. 5 - 24 hours beginning 0800 of date shown, except 25 hours Oct. 29.
Col. 6 - 24 hours beginning 1200 of date shown, except 25 hours Oct. 29.

Col. 7 = Col. 2 + Col. 3 + Col. 4.
Col. 9 = Col. 5 + Col. 6.
Col.10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col.11 - 24 hours of calendar day shown, except 25 hours Oct. 30.

Table 13. - Controlled releases from reservoirs in the upper Delaware River basin and segregation of flow of Delaware River at Montague, N.J.

(River Master daily operation record)

Mean cubic feet per second for 24 hours

Controlled releases from New York City reservoirs					Controlled releases from power reservoirs			Delaware River at Montague						
								Segregation of flow					Excess release credits	
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases			Computed uncontrolled	Total	
									N.Y.C. reservoirs		Powerplants			
Date	Amount								Directed	Other				Daily	Cumulative
1983	1	2	3	4		5	6		7	8	9	10	11		
Oct. 29	1,223	616	563	37	Oct.31	0	0	Nov. 1	1,216	0	0	424	1,640		
30	1,323	616	662	39	Nov. 1	0	0	2	1,317	0	0	373	1,690		
31	1,359	614	715	25	2	0	0	3	1,354	0	0	356	1,710		
Nov. 1	1,276	195	1,046	28	3	0	0	4	1,269	0	0	451	1,720		
2	1,309	198	1,077	28	4	0	0	5	1,303	0	0	417	1,720		
3	1,338	198	1,109	28	5	0	0	6	1,335	0	0	385	1,720		
4	1,367	575	770	28	6	0	0	7	1,373	0	0	387	1,760		
5	1,377	622	735	28	7	0	0	8	1,385	0	0	355	1,740		
6	1,313	620	668	28	8	0	0	9	1,316	0	0	344	1,660		
7	1,304	619	662	28	9	0	0	10	1,309	0	0	331	1,640		
8	1,332	617	687	28	10	0	0	11	1,332	0	0	598	1,930		
9	954	603	348	5	11	0	0	12	956	0	0	1,054	2,010		
10	1,029	74	738	268	12	0	0	13	1,080	0	0	970	2,050		
11	883	619	235	29	13	0	0	14	883	0	0	997	1,880		
12	811	620	169	28	14	0	0	15	817	0	0	793	1,610		
13	743	617	104	22	15	0	0	16	743	0	0	977	1,720		
14	396	368	25	5	16	0	0	17	398	0	0	1,442	1,840		
15	0	6	25	5	17	0	0	18	0	36	0	1,514	1,550		
16	597	549	25	28	18	0	0	19	602	0	0	1,288	1,890		
17	610	529	76	5	19	0	0	20	610	0	0	1,270	1,880		
18	562	517	25	25	20	0	0	21	567	0	0	1,473	2,040		
19	508	463	25	20	21	0	0	22	508	0	0	2,452	2,960		
20	164	136	25	5	22	0	0	23	166	0	0	2,894	3,060		
21	0	8	25	5	23	0	0	24	0	38	0	2,412	2,450		
22	0	8	25	5	24	0	0	25	0	38	0	3,372	3,410		
23	0	8	25	5	25	0	0	26	0	38	0	6,502	6,540		
24	0	8	25	5	26	0	0	27	0	38	0	5,842	5,880		
25	0	6	26	5	27	0	43	28	0	37	43	5,110	5,190		
26	0	6	26	5	28	0	130	29	0	37	130	6,053	6,220		
27	0	6	25	5	29	0	0	30	0	36	0	8,304	8,340		
Total	21,778	10,641	10,691	805		0	173		21,839	298	173	59,140	81,450		

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 1200 of date shown.

Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to Col. 1.
Col. 8 = Col. 2 + Col. 3 + Col. 4 Nov. 18, 24-30.
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 14. - NEW YORK CITY CONSUMPTION OF WATER - 1940 to 1983

Year	Consumption in City proper Mgd	Gallons per capita per day	Furnished to outside communities mgd	Total mgd	Annual billion gallons
1940	922.7	124	21.6	944.3	345.614
41	964.2	130	24.8	989.0	360.985
42	906.7	124	21.5	928.2	338.793
43	942.7	133	21.5	964.2	351.933
44	1,004.9	144	26.5	1,031.4	377.492
1945	1,056.2	146	22.0	1,078.2	393.543
46	1,117.1	146	24.1	1,141.2	416.538
47	1,159.0	149	30.4	1,189.4	434.131
48	1,172.3	150	31.5	1,203.8	440.591
49	1,166.9	149	36.2	1,203.1	439.132
1950	953.3	121	29.1	982.4	358.576
51	1,041.9	131	28.1	1,070.0	390.550
52	1,087.0	136	32.7	1,119.7	409.810
53	1,093.9	135	44.6	1,138.5	415.552
54	1,063.4	131	46.3	1,109.7	405.040
1955	1,109.9	136	45.3	1,155.2	421.648
56	1,111.3	136.2	48.9	1,160.2	424.633
57	1,169.0	143	57.2	1,226.2	447.563
58	1,152.9	140.8	49.6	1,202.5	438.912
59	1,204.3	146.8	60.3	1,264.6	461.579
1960	1,199.4	153.9	58.9	1,258.3	460.529
61	1,221.0	156.0	64.0	1,285.0	469.022
62	1,207.6	153.5	68.8	1,276.4	465.896
63	1,218.0	154.1	76.7	1,294.7	472.582
64	1,189.2	149.8	79.4	1,268.6	464.295
1965	1,052.1	131.9	71.2	1,123.3	409.995
66	1,044.9	130.4	73.2	1,118.1	408.128
67	1,135.3	141.0	71.0	1,206.3	440.302
68	1,242.0	153.6	78.2	1,320.2	483.175
69	1,328.7	163.5	80.1	1,408.8	514.229
1970	1,400.3	177.9	90.4	1,490.7	544.116
71	1,423.6	180.0	87.9	1,511.5	551.695
72	1,412.4	178.3	83.0	1,495.4	547.340
73	1,448.9	182.7	95.4	1,544.3	563.681
74	1,441.8	181.5	96.3	1,538.1	561.409
1975	1,415.0	177.9	92.1	1,507.1	550.093
76	1,435.0	180.1	95.8	1,530.8	560.264
77	1,483.0	185.9	104.7	1,587.7	579.510
78	1,479.4	185.1	103.0	1,582.4	577.566
79	1,513.0	189.0	104.6	1,617.6	590.426
1980	1,506.3	187.9	110.0	1,616.3	591.582
81	1,309.5	185.2*	100.0	1,409.5	514.475
82	1,383.0	195.6*	104.8	1,487.8	543.060
83	1,424.2	201.4*	112.6	1,536.8	561.010

Data furnished by
New York City
Department of Environmental Protection
Bureau of Water Supply

*Provisional

PLATE 1.— COMPONENTS OF FLOW, DELAWARE RIVER AT MONTAGUE, N.J. 1983

JUNE | JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER

	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
N.Y.C.	6.96 BG	12.03 BG	22.02 BG	19.01 BG	24.83 BG	14.31 BG
POWER	17.09 BG	13.86 BG	5.14 BG	8.46 BG	0.67 BG	0.11 BG
UNCONT.	79.52 BG	21.80 BG	12.31 BG	7.17 BG	9.00 BG	38.23 BG
TOTAL	103.57 BG	47.69 BG	39.47 BG	34.64 BG	34.50 BG	52.65 BG

N.Y.C. RESERVOIRS
POWER RESERVOIRS
UNCONTROLLED RUNOFF

EXCESS RELEASE RATE 1,850 CFS

MINIMUM BASIC RATE 1,750 CFS

DESIGN RATE 1,655 CFS

DISCHARGE, IN THOUSAND CUBIC FEET PER SECOND

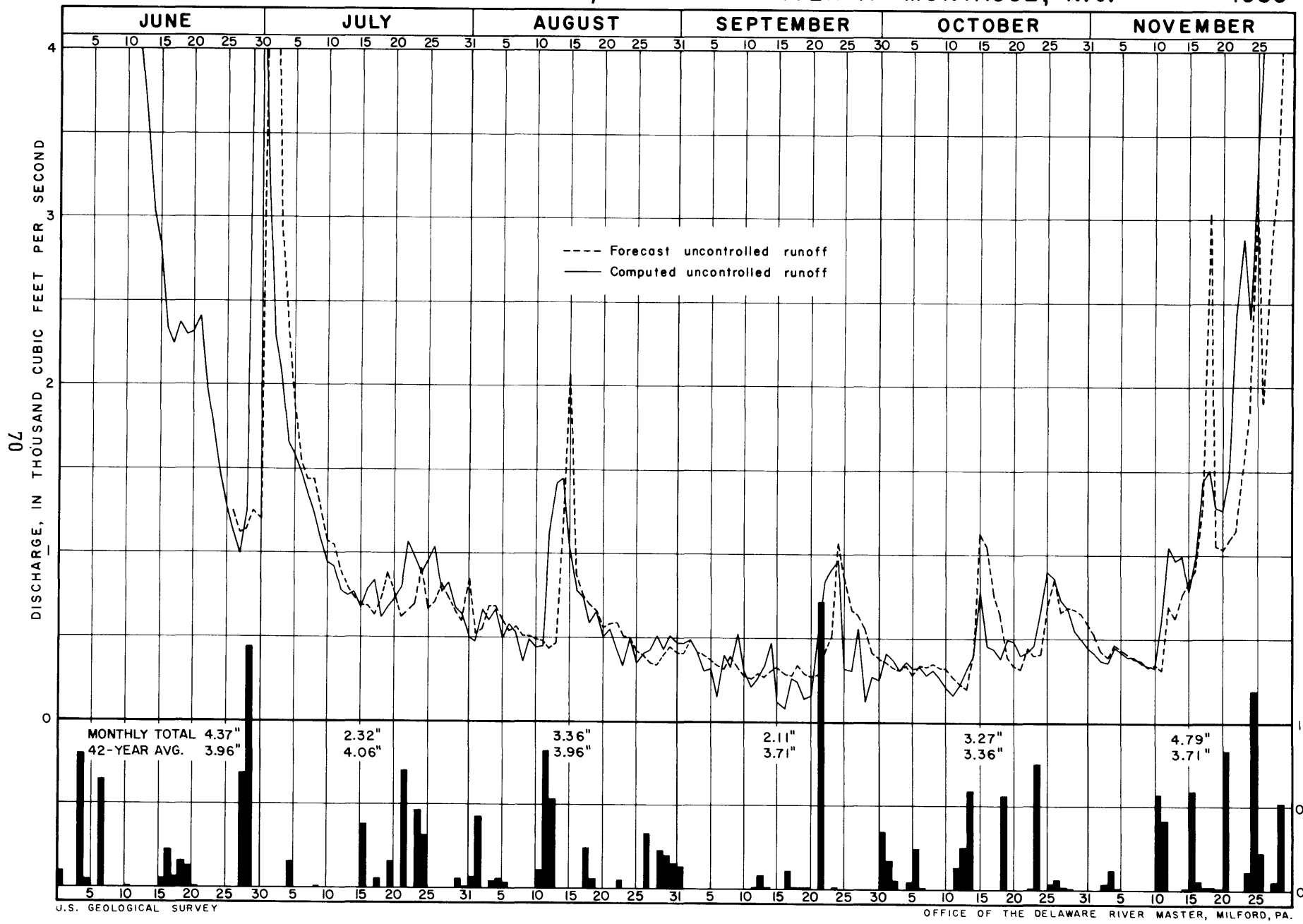
PRECIPITATION, IN INCHES

	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
MONTHLY TOTAL	4.37"	2.32"	3.36"	2.11"	3.27"	4.79"
42-YEAR AVG.	3.96"	4.06"	3.96"	3.71"	3.36"	3.71"

U.S. GEOLOGICAL SURVEY

OFFICE OF THE DELAWARE RIVER MASTER, MILFORD, PA.

FIGURE 2—UNCONTROLLED COMPONENT, DELAWARE RIVER AT MONTAGUE, N.J. 1983



U.S. GEOLOGICAL SURVEY

OFFICE OF THE DELAWARE RIVER MASTER, MILFORD, PA.

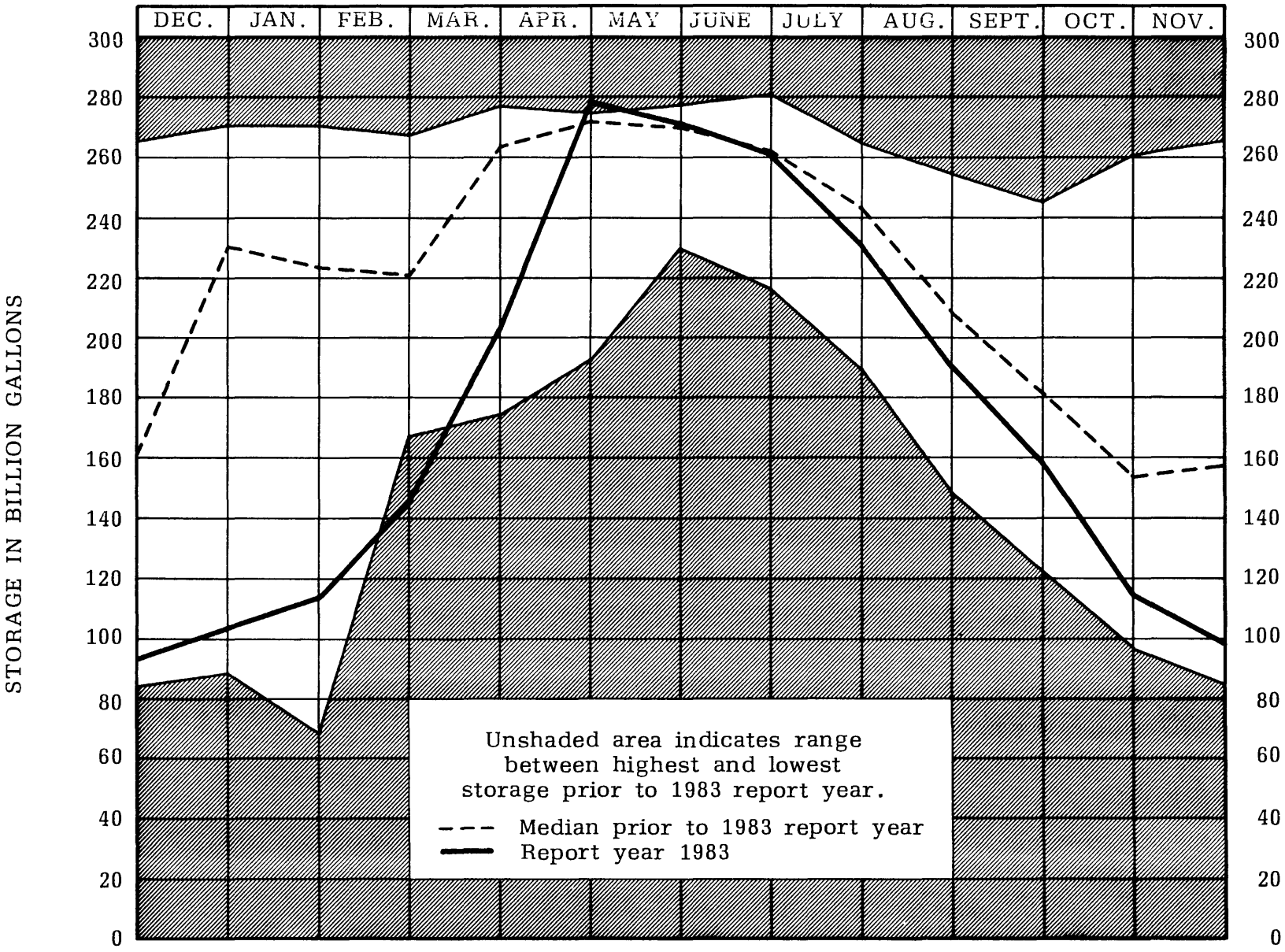


Figure 3. - Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs on first day of month, June 1967 to December 1983

(no page 72)

Section III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

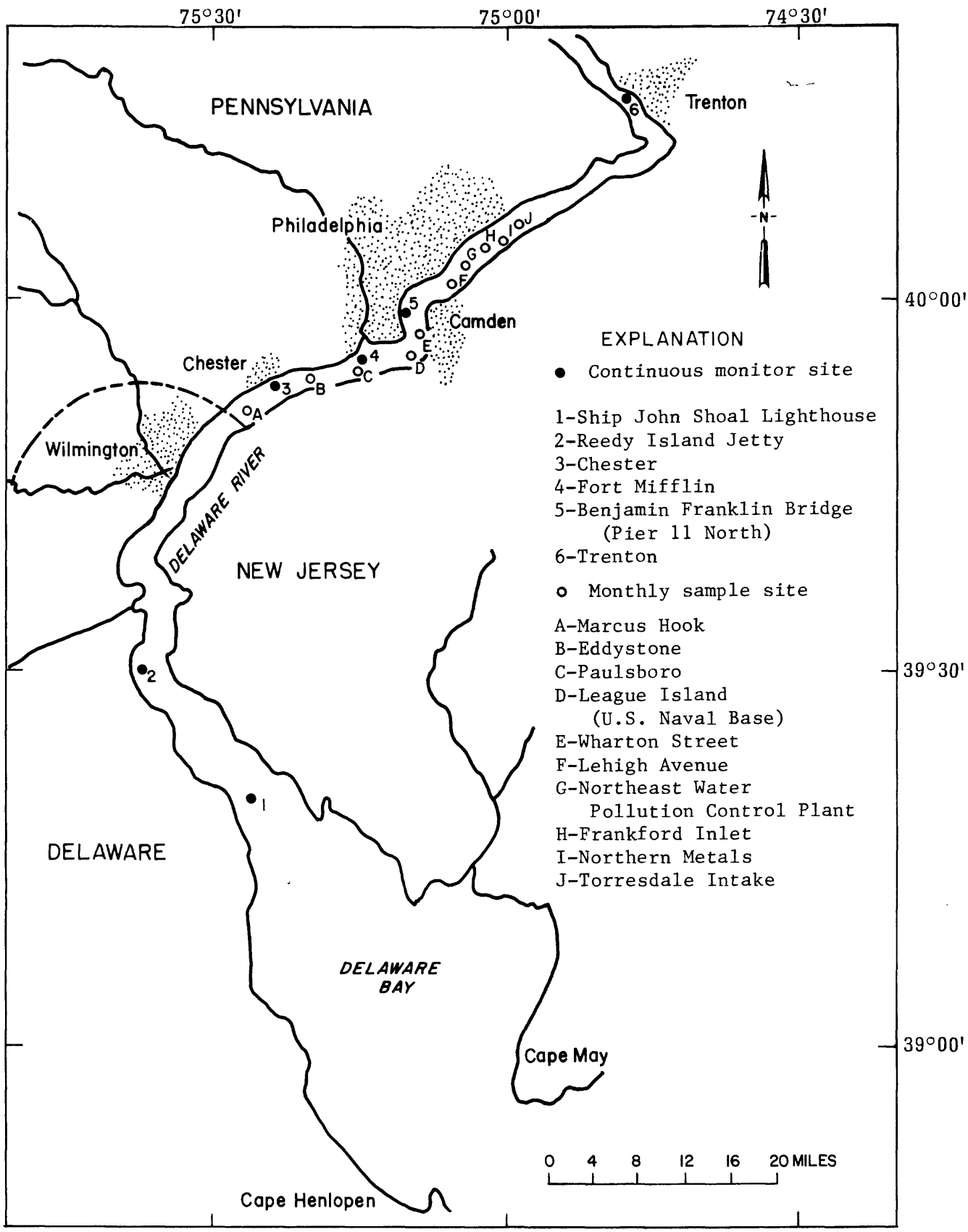


FIGURE 4.--Delaware River Estuary.

Section III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

By Charles R. Wood

INTRODUCTION

This section describes the water-quality monitoring program carried out by the U.S. Geological Survey in the Delaware Estuary during the 1983 report year. Also presented here are some of the data that were obtained by this program and a brief discussion of the significance of the data.

WATER-QUALITY MONITORING PROGRAM

Water quality of the Delaware River and Estuary was monitored between Trenton, N.J., and Ship John Shoal Lighthouse, N.J. Data were acquired continuously by electronic instruments at six monitor sites, one at Trenton, just upstream of the head of tidewater and at five sites in the estuary (fig. 4). The monitors at Chester, Pa., Fort Mifflin, Pa. and Benjamin Franklin Bridge were not operated from early December 1982 through the end of March. At Ship John Shoal Lighthouse and Fort Mifflin, the water was monitored for two parameters: Temperature and specific conductance. At the remaining sites, the water was monitored for four parameters: Temperature, specific conductance, dissolved oxygen, and pH.

Additional data were obtained monthly at ten sites between Torresdale, Pa., and Marcus, Hook, Pa. At each of these sites, samples of water were collected at three points of the cross-section. These samples were analyzed for temperature, chloride, alkalinity, biochemical oxygen demand, specific conductance, dissolved oxygen, and pH.

Data obtained from the continuous monitoring sites were processed by computer and stored for future reference by the U.S. Geological Survey. They were also distributed regularly to cooperators and published annually by the U.S. Geological Survey in "Water Resources Data for Pennsylvania, Volume 1, Delaware River Basin". Data from the monthly sites were processed and stored by the City of Philadelphia Water Department.

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

ESTUARINE WATER-QUALITY DATA DURING 1983

The following is a summary and discussion of the data that were collected during the 1983 report year. Additional information can be found in the tables at the end of this section.

Streamflow

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

Based on streamflow records for the Delaware River at Trenton, mean monthly streamflow was lowest for the year during September (3,310 cfs) and highest for the year during April (45,190 cfs) (see table 7). The mean monthly streamflow was above the respective median for the period of record February through July, and below the median for the rest of the year.

Temperature

The significance of water temperature in regard to water quality in the estuary lies in its influence on various physical, chemical, and biological properties of the water. In general, increases in water temperature have deleterious effects on water quality by lowering the saturation level of dissolved oxygen and increasing biological activities.

The primary factors involved in controlling water temperature in the estuary are climatic; however, various uses of the water by man can also have significant effects.

Based on records from Benjamin Franklin Bridge (Pier 11 North) Philadelphia, Pa., mean monthly temperatures April to November 1982 were below normal (based on the period 1962 to 1982) April through July and November and above normal August through October (see fig. 5).

Specific Conductance and Chloride

Specific conductance is the ability of a solution to conduct electricity. Basically, it can be used to measure the amount of ionized material in solution and relates approximately to dissolved-solids content.

Specific conductance values in bodies of water usually reflect the geochemistry of the drainage basin; however, pollution and the intrusion of oceanic salts can also have considerable effects. Increasing streamflows reduce the concentration of dissolved solids, thus lowering specific conductance and chloride levels. Conversely, decreasing flows have the opposite effects.

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

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

Chloride concentration was not measured directly at Fort Mifflin, Pa., and Reedy Island Jetty, Del., but a correlation between specific conductance and chloride concentration has been developed based on analyses of water samples taken in the estuary. Chloride concentrations at those sites presented in tables 15 and 17 were derived from that relationship. The relationship is less reliable when chloride concentrations are lower than 30 mg/L because other ionized materials may be present in amounts large enough to affect the conductance-chloride relationship. Therefore, chloride concentrations derived from specific conductance are not given when the relationship indicates chloride concentrations of less than 30 mg/L. Chloride concentrations at Chester, Pa., were furnished by Scott Paper Company.

At Fort Mifflin, the maximum daily chloride concentration equaled or exceeded 50 mg/L 29 percent of the time (see table 15). The maximum was 168 mg/L on October 12. At Chester, the maximum daily chloride concentrations exceeded 50 mg/L on all days in December; a few days in January, July 16, and July 21 to November 24 and exceeded 250 mg/L August 23, August 30, September 22, September 25, October 27, and November 1 to 11, 14 and 15 with a maximum of 825 mg/L on October 11 (see table 16). The maximum daily chloride concentration in the estuary at Chester was greater than 50 mg/L 44 percent of the time and greater than 250 mg/L 20 percent of the time (see table 16). Chloride concentrations in excess of 250 mg/L were recorded on all but 22 days at Reedy Island Jetty (see table 17) with concentrations in the range of 2,000 to 9,000 mg/L being common. The maximum at this site was 9,520 mg/L on November 15.

Dissolved Oxygen

Dissolved oxygen is necessary in water for the respiration of aquatic organisms. It also plays a significant role in chemical reactions in aquatic environments. The major sources of dissolved oxygen in water are diffusion from the air and photosynthesis in aquatic plants. Dissolved-oxygen levels are limited by temperature, salinity, and the partial pressure of atmospheric oxygen.

Dissolved-oxygen levels in the estuary tend to be highest near Trenton and to decrease with distance downstream to a point near or somewhat downstream from the Benjamin Franklin Bridge where minimum values are usually reached.

During the past year, mean dissolved-oxygen concentration at the Benjamin Franklin Bridge was below 5 mg/L June 15 to November 16 (see table 18). The minimum daily mean was 0.5 on July 20 - 22, August 26, and September 1. No data are available for Chester from March 24 to June 29 due to water from a heat exchanger reaching the intake for the water quality monitor. At Chester, the mean dissolved-oxygen concentration was below 5 mg/L on many days from June 30 through September 14 (see table 19). The lowest daily mean was 2.4 mg/L on July 3 to 5. The minimum hourly value was 1.8 mg/L on July 2 and 6. At Reedy Island Jetty, the minimum hourly value was 4.8 mg/L on June 29 and September 7.

Figure 6 shows the frequency of hourly dissolved-oxygen concentration at Benjamin Franklin Bridge (Pier 11 North) and Chester during the critical summer period, July through September. During this period, the dissolved-oxygen concentration was below 4 mg/L 99 percent of the time at the Benjamin Franklin Bridge. Dissolved-oxygen concentrations were similar at the Benjamin Franklin Bridge in the 1982 and 1983 report years. Dissolved-oxygen concentration was below 4 mg/L only 16 percent of the time at Chester in 1983 as compared with 60 percent of the time in 1982. The bimodal distribution of dissolved oxygen present at Chester in 1982 was absent in 1983. This suggests that a local source of contamination was eliminated.

Hydrogen-Ion Concentration (pH)

Hydrogen-ion concentration (pH) is fundamentally an indication of acidity or alkalinity. Decreasing values of pH below 7 indicate increasing acidity, whereas increasing values above 7 indicate increasing alkalinity. In natural waters, pH generally range from 6.0 to 8.5. The main factors controlling the pH of a body of water are usually the geochemistry of the drainage basin and external influences such as pollution. Photosynthetic activity can also have a considerable influence on pH values. Increased photosynthetic activity (algal bloom) produces higher pH values. All pH values at Benjamin Franklin Bridge, Chester, and Reedy Island Jetty were within the range of 6.1 to 8.3. pH in the estuary tends to be lowest near Trenton, N.J., and to increase downstream.

Table 15.- Chloride concentrations, Delaware River at Fort Mifflin, Pa.

Daily maximum and minimum chloride concentrations in milligrams per liter

December 1, 1982 to November 30, 1983

Day	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	37	*					*	*	40	*	35	*	*	*	43	*	43	*	85	47	–	–	47	35
2	37	*					35	*	*	*	35	*	35	*	40	*	42	30	80	47	–	–	48	35
3	30	*					35	*	31	*	31	*	*	*	33	*	47	31	59	45	–	–	48	38
4	*	*					31	*	*	*	*	*	45	*	30	*	53	31	57	45	–	–	48	35
5	*	*					*	*	*	*	38	*	85	*	31	*	55	33	57	45	–	–	52	35
6	–	*					*	*	*	*	*	*	47	*	31	*	48	35	57	43	–	–	53	40
7	–	–					*	*	*	*	30	*	59	*	*	*	48	37	60	47	134	53	53	40
8	–	–					*	*	*	*	33	*	*	*	57	*	47	37	77	47	157	48	94	42
9	–	–					*	*	*	*	37	*	*	*	43	*	48	37	122	48	148	57	52	40
10	–	–					–	–	*	*	42	*	*	*	*	*	45	37	139	45	159	55	59	40
11	–	–					–	–	*	*	35	*	*	*	59	*	47	37	131	45	157	60	53	42
12	–	–					–	–	*	*	33	*	55	*	*	*	100	37	137	47	168	77	59	35
13	–	–					–	–	*	*	40	*	35	*	30	*	59	38	137	59	165	74	57	35
14	–	–					–	–	*	*	55	*	33	*	55	*	77	40	134	53	111	74	53	38
15	–	–					–	–	*	*	38	*	35	*	57	*	53	38	139	53	134	59	48	38
16	–	–					–	–	*	*	37	*	31	*	60	30	57	37	134	48	128	57	80	30
17	–	–					–	–	*	*	31	*	*	*	60	*	53	38	91	45	117	57	74	*
18	–	–					–	–	*	*	37	*	*	*	55	*	55	40	94	45	100	48	37	*
19	–	–					–	–	*	*	35	*	*	*	52	*	74	42	94	*	105	48	31	*
20	–	–					–	–	*	*	42	*	*	*	37	*	55	40	85	45	108	57	31	*
21	–	–					–	–	*	*	108	*	*	*	59	*	53	42	102	45	111	53	–	–
22	–	–					–	–	*	*	37	*	42	*	74	*	52	40	88	45	117	48	–	–
23	–	–					*	*	*	*	31	*	30	*	31	*	50	42	74	45	148	55	43	*
24	–	–					*	*	*	*	*	*	*	*	–	–	53	42	59	45	108	43	30	*
25	–	–					*	*	*	*	*	*	*	*	–	–	57	42	88	45	80	45	*	*
26	–	–					*	*	*	*	*	*	*	*	–	–	53	43	82	45	74	45	*	*
27	–	–					*	*	45	*	48	*	*	*	–	–	52	42	80	47	57	35	*	*
28	–	–					*	*	42	*	*	*	31	*	–	–	50	42	91	47	52	35	*	*
29	–	–					*	*	*	*	*	*	94	*	35	*	52	42	85	47	43	33	30	*
30	–	–					31	*	*	*	*	*	42	*	37	*	53	42	125	45	45	31	*	*
31	–	–					*	*	–	–	*	*	–	–	42	30	57	45	–	–	47	33	–	–

* Less than 30 mg/L

Table 16.-Chloride concentrations, Delaware River at Chester, Pa.1/

Daily maximum and minimum chloride concentrations in milligrams per liter

December 1, 1982 to November 30, 1983

Day	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	165	60	55	40	40	33	40	35							--	--	78	47	310	100	460	165	253	100
2	130	60	50	38	43	33	37	32							--	--	74	43	300	105	480	170	267	95
3	122	58	45	38	41	33	38	30							--	--	88	45	300	105	484	190	264	120
4	135	62	45	38	39	30	40	32							--	--	102	50	320	110	460	205	284	136
5	92	53	45	35	41	29	37	29							--	--	120	52	352	120	525	200	400	130
6	92	58	45	38	35	25	34	30							--	--	160	53	388	133	470	210	420	140
7	73	48	55	40	35	26	40	30							--	--	158	60	371	150	440	214	325	146
8	75	45	50	37	35	26	35	29							--	--	190	63	356	165	500	220	366	130
9	78	45	50	37	36	30	35	31							--	--	192	63	405	151	580	220	350	144
10	112	53	55	40	34	28	36	30							34	30	195	70	410	155	750	215	500	136
11	112	53	46	35	45	30	36	28							38	30	250	95	450	178	825	260	380	135
12	104	45	43	35	32	28	30	26							42	33	210	73	370	190	797	300	175	97
13	130	50	42	37	32	27	29	25							45	34	186	80	350	185	624	270	250	95
14	110	50	45	37	31	27	31	25							40	32	170	80	350	173	550	256	296	110
15	89	50	50	30	31	25	28	19							42	34	170	78	450	184	450	175	270	126
16	114	60	42	35	34	28	33	25							57	38	145	80	410	188	500	220	220	90
17	75	50	40	35	38	28	31	25							42	37	140	74	450	194	520	250	90	58
18	81	50	39	32	39	30	30	27							44	36	180	76	425	186	510	220	70	49
19	84	50	45	33	40	33	30	25							--	--	195	82	390	187	470	220	70	45
20	85	54	39	34	37	34	28	23							--	--	180	80	410	200	600	220	70	45
21	90	48	39	36	37	32	35	24							52	39	205	78	335	200	580	245	75	44
22	68	45	39	35	46	33	30	20							52	38	205	85	270	123	650	280	60	44
23	60	46	40	38	44	33	25	19							55	38	270	85	240	130	640	220	50	35
24	51	46	40	34	40	32	28	18							84	40	235	105	241	125	506	188	55	37
25	55	45	41	25	40	32	26	19							82	41	220	98	288	140	480	198	45	32
26	--	--	45	38	37	33	26	21							75	44	241	105	286	137	400	170	45	30
27	60	40	43	37	38	32	24	20							78	40	235	105	295	139	280	140	36	30
28	64	41	44	35	38	32	24	20							75	42	227	105	440	140	220	130	35	26
29	65	35	42	35	--	--	--	--							73	44	249	110	420	160	197	94	33	26
30	57	40	41	35	--	--	--	--							70	45	275	105	500	160	240	96	34	26
31	52	38	39	34	--	--	--	--							80	45	265	104	--	--	210	115	--	--

1/Collection and analysis by Scott Paper Company

Table 17.- Chloride concentrations, Delaware River at Reedy Island Jetty, Del.

Daily maximum and minimum chloride concentrations in milligrams per liter

December 1, 1982 to November 30, 1983

Day	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	6500	3510	–	–	5370	2590	4480	1820	659	137	38	*	985	52	2570	693	5160	2340	–	–	7560	4090	–	–
2	6400	3220	–	–	5450	2990	5250	1870	1190	137	38	*	1050	45	2350	681	5250	2270	–	–	7650	4300	–	–
3	6000	3290	–	–	5910	2640	4560	1440	2240	148	*	*	1920	91	2170	614	5310	2250	–	–	7830	4320	–	–
4	5900	3040	–	–	3820	2150	3690	1360	456	80	*	*	2450	262	6000	648	5550	2250	–	–	7750	4440	–	–
5	5750	3020	–	–	2570	1240	3670	1220	467	45	*	*	1940	228	3090	749	5920	2250	–	–	7530	4400	–	–
6	5120	3180	–	–	3120	1150	–	–	895	91	228	*	2290	389	3640	771	6000	2350	6500	3510	7700	4480	–	–
7	–	–	–	–	4090	1170	2210	985	1580	102	1360	*	2060	355	4480	794	5920	2530	6900	3600	7530	4350	4520	3050
8	–	–	–	–	3880	952	3950	1440	1790	217	1200	38	2550	355	5030	1160	5960	2620	6750	3620	7470	4440	6950	3640
9	–	–	–	–	4320	1020	4140	1710	2110	310	985	*	2310	332	5030	1340	6250	2760	6350	3620	7470	4520	6800	4200
10	–	–	–	–	4600	1850	4800	1570	2100	310	1800	31	2420	389	4750	1500	5940	2840	6400	3690	7750	4750	7890	4480
11	–	–	–	–	5980	2490	5220	1520	1190	182	1760	38	2520	411	5280	1680	6450	2990	6280	3670	6880	4600	6920	4140
12	–	–	–	–	6970	2450	5280	2060	262	125	1730	102	2240	377	5090	1830	6250	3020	6400	3690	6880	4520	5450	3850
13	–	–	–	–	6880	2760	–	–	239	114	2250	148	2200	400	5120	1930	6280	3020	6400	3820	6250	4090	6800	3800
14	–	–	–	–	5910	2870	5400	1580	194	59	2210	205	2500	445	4800	1960	6280	3220	6880	4030	6900	4800	8130	4520
15	–	–	–	–	6450	2800	4520	1540	217	45	1990	251	2490	501	5060	2130	6280	3200	6940	4140	6830	4480	9520	5120
16	–	–	–	–	5550	3650	4440	1500	182	31	1500	251	2240	512	5030	2220	5970	3120	6900	4140	7530	4400	8220	5060
17	–	–	–	–	–	–	4140	1550	80	*	1650	217	2170	524	5280	2350	5980	3160	–	–	7920	4600	6850	4200
18	–	–	–	–	–	–	4560	2180	59	*	1580	205	2060	569	5280	2420	5960	3020	–	–	7130	4520	–	–
19	–	–	–	–	–	–	5220	1580	80	31	1130	239	2170	591	5340	2460	6600	2910	6920	4060	7530	4650	6830	3150
20	–	–	–	–	–	–	3080	918	332	31	985	228	2130	580	5400	2480	6500	3050	6950	3880	7560	5120	6970	3600
21	–	–	–	–	–	–	–	–	850	45	738	217	1760	524	5750	2480	6900	3060	7000	4030	7400	5120	6600	3360
22	–	–	–	–	4520	2320	–	–	749	31	918	159	2030	467	5930	2450	6940	3190	5910	3290	7130	5160	5190	2670
23	–	–	–	–	5950	2360	569	321	411	31	760	114	1860	445	6820	2560	6940	3440	5940	3290	7700	5250	5970	2520
24	–	–	–	–	5960	2210	1660	332	501	*	839	102	1920	434	6800	2940	6970	3360	5910	3180	6450	5190	5970	2390
25	–	–	–	–	5900	2280	2800	377	80	*	952	91	1850	771	6600	2760	6600	3600	6300	3360	–	–	4700	2240
26	–	–	–	–	5160	1990	3640	422	59	*	3130	91	–	–	6600	2840	6750	3600	5970	3620	–	–	2840	1050
27	–	–	–	–	5450	1780	3110	422	*	*	659	91	1790	591	6300	2900	6320	3440	6600	3670	–	–	3110	940
28	–	–	5980	3130	4380	1640	2320	389	*	*	985	80	2520	614	6380	3060	5960	3190	6880	3600	–	–	4350	1010
29	–	–	7860	2950	–	–	1430	148	*	*	783	80	2700	738	5940	2800	–	–	7400	4030	–	–	4320	1430
30	–	–	6820	3050	–	–	591	125	*	*	524	80	3110	738	5280	2320	–	–	7800	4560	–	–	2210	895
31	–	–	5980	2830	–	–	422	137	–	–	490	59	–	–	4800	2100	–	–	–	–			–	–

* Less than 30 mg/L

Table 18.-Dissolved oxygen, Delaware River at Benjamin Franklin Bridge at Philadelphia, Pa.

Daily mean dissolved oxygen in milligrams per liter

December 1, 1982 to November 30, 1983

Day	December Mean	January Mean	February Mean	March Mean	April Mean	May Mean	June Mean	July Mean	August Mean	September Mean	October Mean	November Mean
1	6.4			---	---	10.0	---	2.4	2.6	1.1	1.9	3.4
2	6.2			---	---	9.6	---	2.7	2.3	1.1	1.5	3.0
3	6.1			---	---	9.2	---	2.9	2.1	1.3	1.4	2.7
4	6.1			---	---	8.7	---	2.8	2.0	1.4	1.3	2.4
5	6.3			---	---	8.2	---	2.7	1.8	1.5	1.2	2.3
6	6.1			---	---	8.2	---	2.7	1.5	1.5	1.2	2.4
7	6.3			---	---	8.5	---	3.0	1.6	1.3	1.2	2.6
8	6.3			---	---	8.4	---	3.1	1.8	1.3	1.3	2.6
9	6.2			---	---	8.6	---	3.3	1.8	1.4	1.3	2.5
10	---			---	---	8.3	---	3.3	1.9	1.6	1.7	2.5
11	---			---	---	8.0	---	3.1	1.8	1.7	1.8	2.3
12	---			---	---	7.8	---	2.7	1.0	1.6	---	3.4
13	---			---	---	7.6	---	2.4	1.0	1.0	---	4.0
14	---			---	---	7.9	5.1	2.1	1.4	.9	1.3	3.8
15	---			---	9.8	7.7	4.3	1.8	1.5	1.0	1.4	3.9
16	---			---	9.9	7.4	3.9	1.7	1.5	1.2	1.5	4.3
17	---			9.6	10.0	6.9	3.5	1.7	1.5	1.2	1.5	5.6
18	---			9.5	10.4	7.0	2.9	1.6	1.4	1.2	1.2	6.4
19	---			9.2	10.8	6.9	2.8	1.2	1.4	1.3	1.3	6.2
20	---			9.4	10.7	6.7	2.6	.8	1.6	1.4	1.4	6.0
21	---			9.2	10.7	6.8	2.4	.7	1.9	1.6	1.8	5.9
22	---			9.0	11.0	7.0	2.3	.9	2.0	1.5	1.9	6.2
23	---			---	10.9	6.7	2.0	1.1	1.8	1.7	1.9	6.3
24	---			---	10.7	6.3	1.7	1.4	1.3	1.8	2.0	5.9
25	---			---	12.1	5.6	1.5	1.6	1.1	2.0	2.2	6.3
26	---			---	11.5	5.1	1.8	1.4	1.1	1.9	2.2	7.4
27	---			---	10.8	5.2	2.0	1.5	1.2	1.6	2.6	7.6
28	---			---	10.7	---	2.0	1.8	1.3	1.7	3.0	7.7
29	---			---	10.4	---	1.9	2.3	1.2	1.7	3.6	7.6
30	---			---	10.3	---	1.8	2.5	1.1	2.1	3.8	8.3
31	---			---	---	---	---	2.6	1.0	---	3.6	---

Table 19.-Dissolved oxygen, Delaware River at Chester, Pa.

Daily mean dissolved oxygen in milligrams per liter

December 1, 1982 to November 30, 1983

Day	December Mean	January Mean	February Mean	March Mean	April Mean	May Mean	June Mean	July Mean	August Mean	September Mean	October Mean	November Mean
1	5.7			---				3.5	4.5	3.9	6.2	5.4
2	5.4			10.4				2.8	4.1	4.2	6.1	5.4
3	5.2			10.2				2.4	3.7	4.9	5.9	5.4
4	5.2			9.8				2.4	4.0	5.0	5.7	5.3
5	4.8			9.6				2.4	4.0	4.8	5.5	5.3
6	4.8			9.4				2.7	3.8	4.7	5.5	5.5
7	5.0			9.2				3.7	3.9	4.7	5.3	5.6
8	---			9.8				4.5	4.0	4.5	5.2	5.5
9	---			9.9				4.9	4.3	4.5	5.0	5.2
10	---			9.6				5.0	4.7	4.7	5.3	5.3
11	---			9.2				5.1	5.2	4.7	5.9	5.7
12	---			9.4				5.0	5.0	4.7	6.5	5.7
13	---			9.8				5.2	4.8	4.6	6.1	6.0
14	---			9.7				5.3	5.2	4.5	5.7	6.1
15	---			9.7				5.6	5.3	5.2	5.2	6.4
16	---			9.6				6.0	5.2	5.9	5.3	6.4
17	---			9.6				6.3	5.5	6.3	5.2	6.3
18	---			9.8				6.5	5.4	6.2	5.0	6.5
19	---			9.5				6.5	4.8	6.3	4.9	6.3
20	---			9.2				6.2	5.1	6.3	5.3	5.7
21	---			9.4				5.4	5.1	6.7	5.7	5.8
22	---			9.8				5.1	5.3	6.2	5.8	5.7
23	---			---				5.5	5.1	5.6	5.8	5.6
24	---			---				5.7	4.7	5.2	5.7	5.6
25	---			---				5.7	4.6	5.4	5.6	5.6
26	---			---				5.7	4.5	5.3	5.3	6.0
27	---			---				5.8	4.9	5.2	5.1	6.0
28	---			---				6.0	4.7	5.2	5.4	6.1
29	---			---				---	4.7	5.7	5.6	6.3
30	---			---				5.6	4.2	6.3	5.6	6.8
31	---			---				5.1	4.0	---	5.6	---

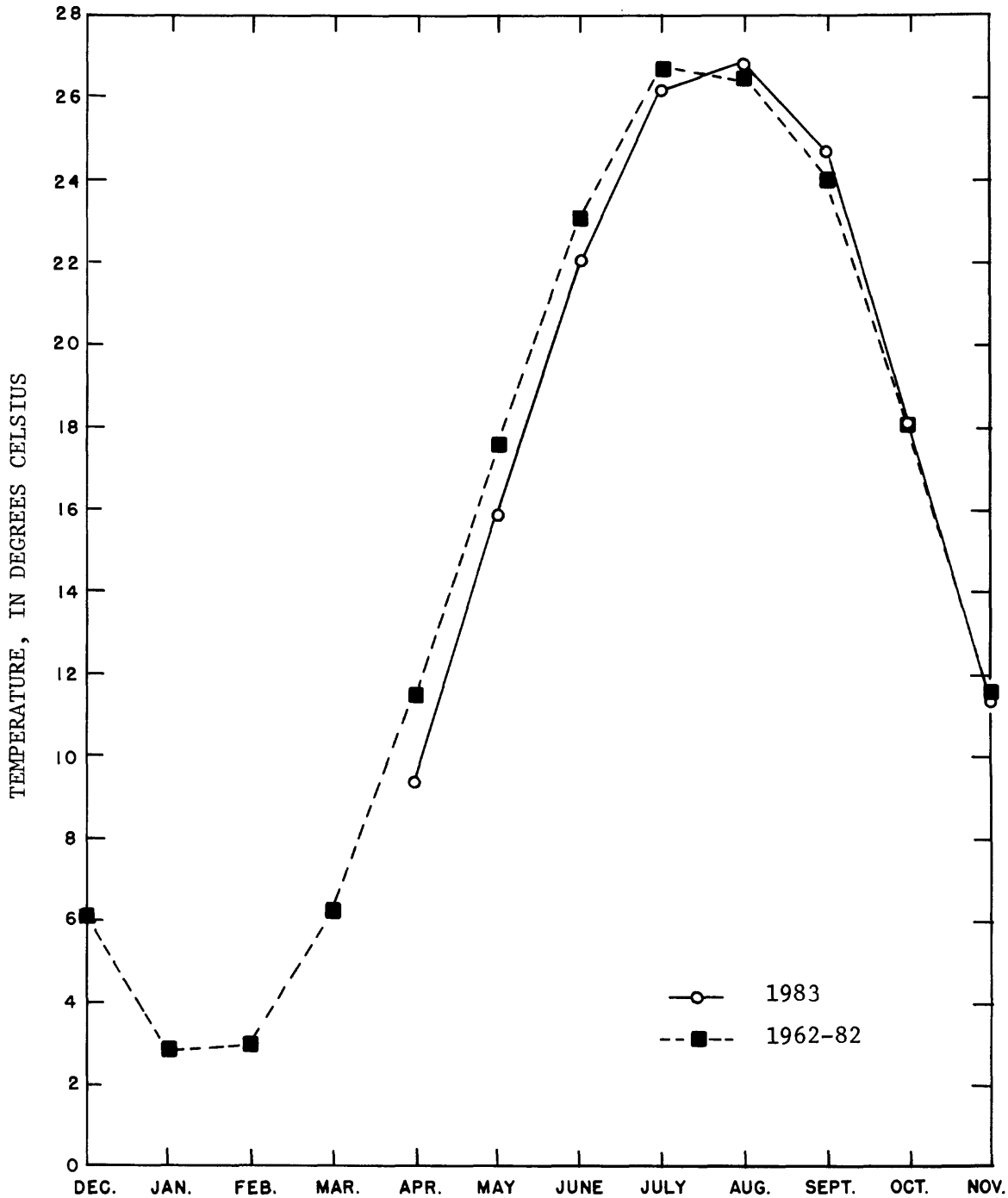


FIGURE 5.--Mean monthly temperatures of Delaware River at Benjamin Franklin Bridge, Philadelphia, Pennsylvania.

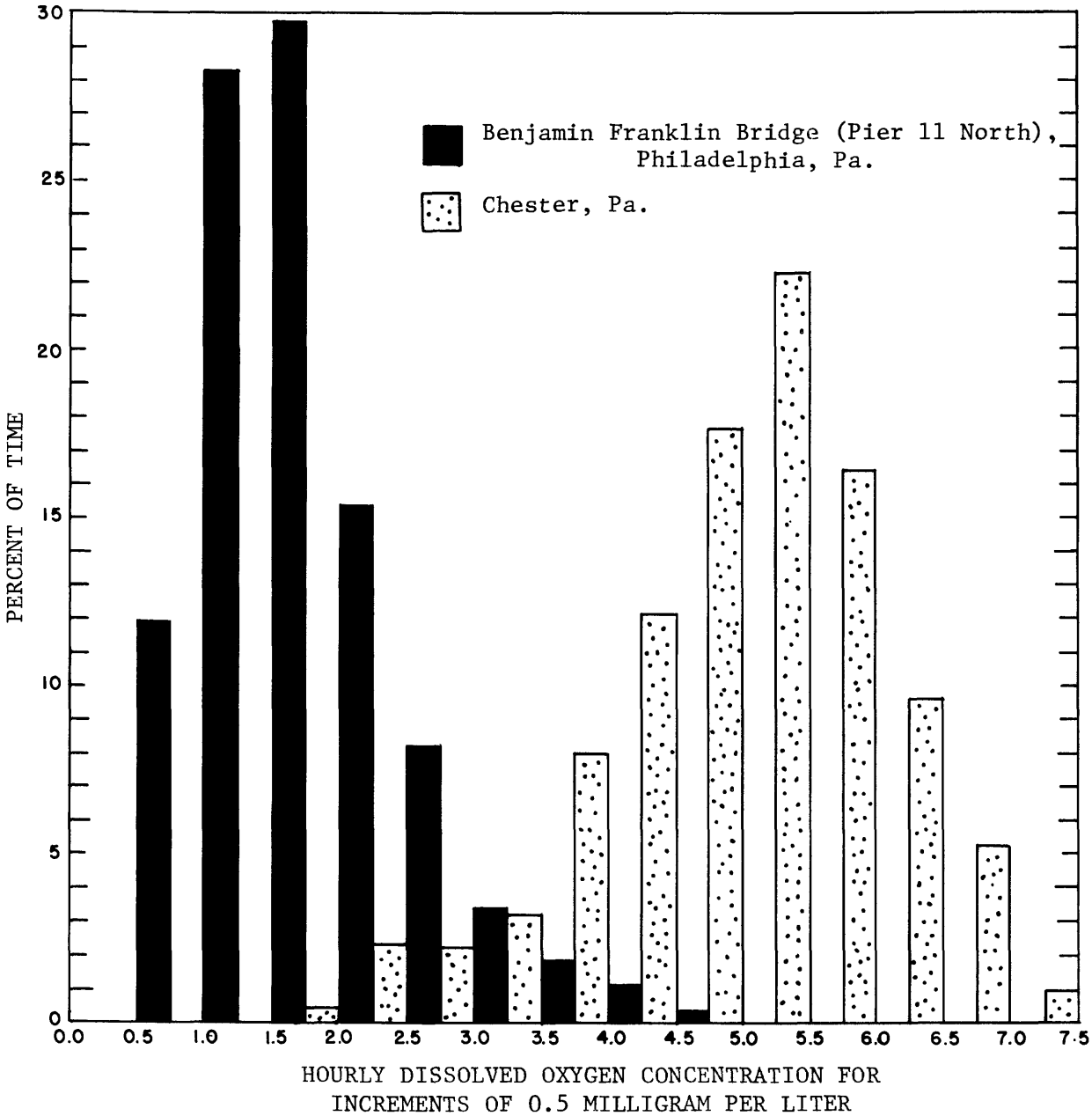


FIGURE 6.--Frequency of dissolved oxygen concentrations at two stations in the Dlaware River July, Augurst, and September 1983.