REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER

FOR THE PERIOD
DECEMBER 1, 1981 — NOVEMBER 30, 1982

by
Francis T. Schaefer and Robert E. Fish

U.S. GEOLOGICAL SURVEY
Open-File Report 83—538
1982

UNITED STATES DEPARTMENT OF THE INTERIOR

JAMES G. WATT, Secretary

GEOLOGICAL SURVEY

Dallas L. Peck, Director

For additional information write to:

Chief Hydrologist
U.S. Geological Survey, WRD
433 National Center
Reston, Virginia 22092

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and

SPECIAL REPORT

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OFFICE OF THE DELAWARE RIVER MASTER

United States Geological Survey

433 National Center, Reston, Virginia 22092

March 4, 1983

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 twenty-ninth Annual Report of the River Master of the Delaware River for the year December 1, 1981 to November 30, 1982.

Combined contents of Pepacton, Cannonsville and Neversink Reser-

voirs of the City of New York in the Delaware River basin totaled 135 billion gallons as of December 1, 1981. This quantity was 25 billion gallons above the drought-warning rule curve for the reservoirs and represented a considerable improvement over the situation that existed one year earlier when total contents were just under 85 billion gallons, and when diversion and release rates had been severely restricted since October 18, 1980 to conserve the limited supplies. The restrictions were rescinded on May 18, 1981, when storage had remained more than 15 billion gallons above the drought-warning level for 5 consecutive days.

During December and January, storage increased moderately but still remained considerably below average for that time of year. February and March were more favorable, and by April 1, storage in the reservoirs was at 87 percent of capacity, so the outlook for the heavy draft summer season was relatively favorable. In fact, Cannonsville Reservoir started spilling on April 2, and on the same date the City suspended diversions from the reservoir. On April 21-29, storage in the three reservoirs was in excess of 273 billion gallons and Pepacton Reservoir also spilled from April 21 to May 9. With restrictions on diversions and releases in abeyance since May 1981, and with greatly improved water-supply conditions, the Delaware River Basin Commission on April 27 adopted Resolution No. 82-4 formally terminating the drought declaration of January 15, 1981. On May 11, in response to a request from this office, the City resumed diversions from Cannonsville to minimize the loss from the spilling. By May 16, all spilling stopped and reservoir contents totaled approximately 266 billion gallons, 98.2 percent of capacity.

The augmented conservation release rates for instream quality improvement, originally agreed to in 1977 by all the parties and approved by this office, were placed in effect on schedule April 1. The rates are 45 cubic feet per second (cfs) from both Cannonsville and Neversink Reservoirs, and 70 cfs from Pepacton Reservoir. Additionally, from June 15 to August 15 the Cannonsville release rate increases to 325 cfs for the benefit of recreational users and resources of the river. These releases compare with 23, 15, and 19 cfs from the respective reservoirs, that had been in effect during years prior to 1977 for the summer to fall period.

Storage continued at a comfortable level during May and June. Streamflow at the excess-release rate of 1,850 cfs at the gaging station on Delaware River at Montague, New Jersey, became effective on June 15, although directed releases to maintain this rate were not required until July 11. By August, with the daily diversion and release rates at customary summer levels, reservoir storage was declining at some 7 billion gallons a week, a fairly normal situation for the time of year.

In August, the Pennsylvania Department of Environmental Resources requested emergency approval from the Commission for the temporary drawdown of Beltzville Reservoir involving the release of a quantity amounting to 2,500 cfs-days. The request further proposed an equivalent reduction in flow required at Montague, except that the weekend flow be maintained at the presently stipulated rate of 1,850 cfs. In the interest of conserving storage, and with the consent of the parties, the Montague flow objective

was reduced by 100 cfs for short periods during September and October to compensate for the Beltzville release.

By letter on October 21, I notified the River Master's Advisory Committee that with storage rapidly decreasing and without above-average precipitation and increased runoff, total contents would reach the drought-warning level around mid-November. I stated that if this situation developed, the Montague flow objective would be reduced to 1,650 cfs or lower, depending upon the salt-front location, and that New York City diversions would be limited to 680 million gallons per day (mgd). New Jersey would have its diversion limited to 85 mgd, which would pose no problem. On November 10, representatives of the Decree parties, the Delaware River Basin Commission and this office met in Philadelphia to review the hydrologic situation. The recommendations proposed above were accepted with one minor modification and placed in effect by this office on November 13, five days after the storage declined below the drought-warning rule curve. The augmented conservation release rates were reduced to those in effect before 1977. These restrictions continued in effect through the end of the report year, November 30. On that date, storage was at approximately 34.3 percent of capacity, only 9 billion gallons more than that of November 30, 1980, the lowest for the date in many years.

During regular operations, it is reported that diversions for water supply for New York City and releases 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 limit of 680 mgd in effect November 13-30, except for November 26 when the average diversion increased to 681 mgd. Diversions by the State of New Jersey did not exceed the limits imposed in Section V of the Decree and did not exceed the limit of 85 mgd November 13-30.

Current-meter measurements of the East Delaware Tunnel diversions were made by personnel of this office during October in conjunction with color-velocity measurements by the engineering staff of the New York City Bureau of Water Supply to verify the accuracy of the venturi flow-meter instruments. As had been reported previously, the results do not agree as closely as is desired. Further investigation is planned to identify the reasons for the differences.

During the 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 deficiencies. Upon invitation of the representatives of parties to the Decree, the River Master, or his assistants, met frequently with those representatives as an observer to their "good faith" negotiations. The negotiations concerned proposals for specific releases from the City reservoirs for conservation purposes, definition of drought in the basin, emergency measures to cope with severe droughts, allocating future supplies and other items. The negotiations were still in

progress at the end of the report year.

The 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.

During the report year, the Milford office continued the weekly distribution of summary river data. These weekly reports contained preliminary data on releases from the New York City reservoirs to the Delaware River, diversions to 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 significant chloride concentrations 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 months was made available to the representatives on the Advisory Committee.

Section II of the accompanying report describes in detail Delaware River operations during the report year. As shown on page 24 the City of New York diverted a total of 209.871 billion gallons from the basin during the report year ending November 30, 1982, and released 123.931 billion gallons from Pepacton, Cannonsville, and Neversink Reservoirs to the Delaware River during the same period. During the low flows from July 11 to November 30 (Montague dates), releases to the Delaware River from these reservoirs totaled 98.819 billion gallons. The color graphs on plate 1 show the effect of these releases on the flow at the Montague gaging station. It is evident that the New York City releases are a major factor in sustaining the higher summer flows desired for recreational uses and maintaining stream fisheries.

Section III of the report describing water quality of the Delaware River estuary was prepared by Charles R. Wood, U.S. Geological Survey, Malvern, Pennsylvania, in collaboration with Mr. Fish. 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.

The Montague gaging station was a part of the pilot program to enable the Geological Survey to evaluate the potential benefits of realtime data to the water-user community by means of the National Environmental Satellite Service GOES satellite. By the conclusion of the program, the Montague stream-stage data had been transmitted October 15, 1980 to January 26, 1982.

During the year, the following individuals functioned as members of

the River Master Advisory Committee:

Delaware	Dr. Robert R. Jordan Thomas P. Eichler
New Jersey	Dirk C. Hofman
New York	Edward A. Karath
New York City	Francis X. McArdle Joseph J. McGough
Pennsylvania	R. Timothy Weston

The appreciation of the River Master and staff is expressed for the continued and 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 and with the resolutions regarding diversions and with the directives of the River Master with the single minor deviation noted earlier in this report.

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

Sincerely yours,

Francis T. Schaefer

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

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Section II

REPORT OF DELAWARE RIVER OPERATIONS

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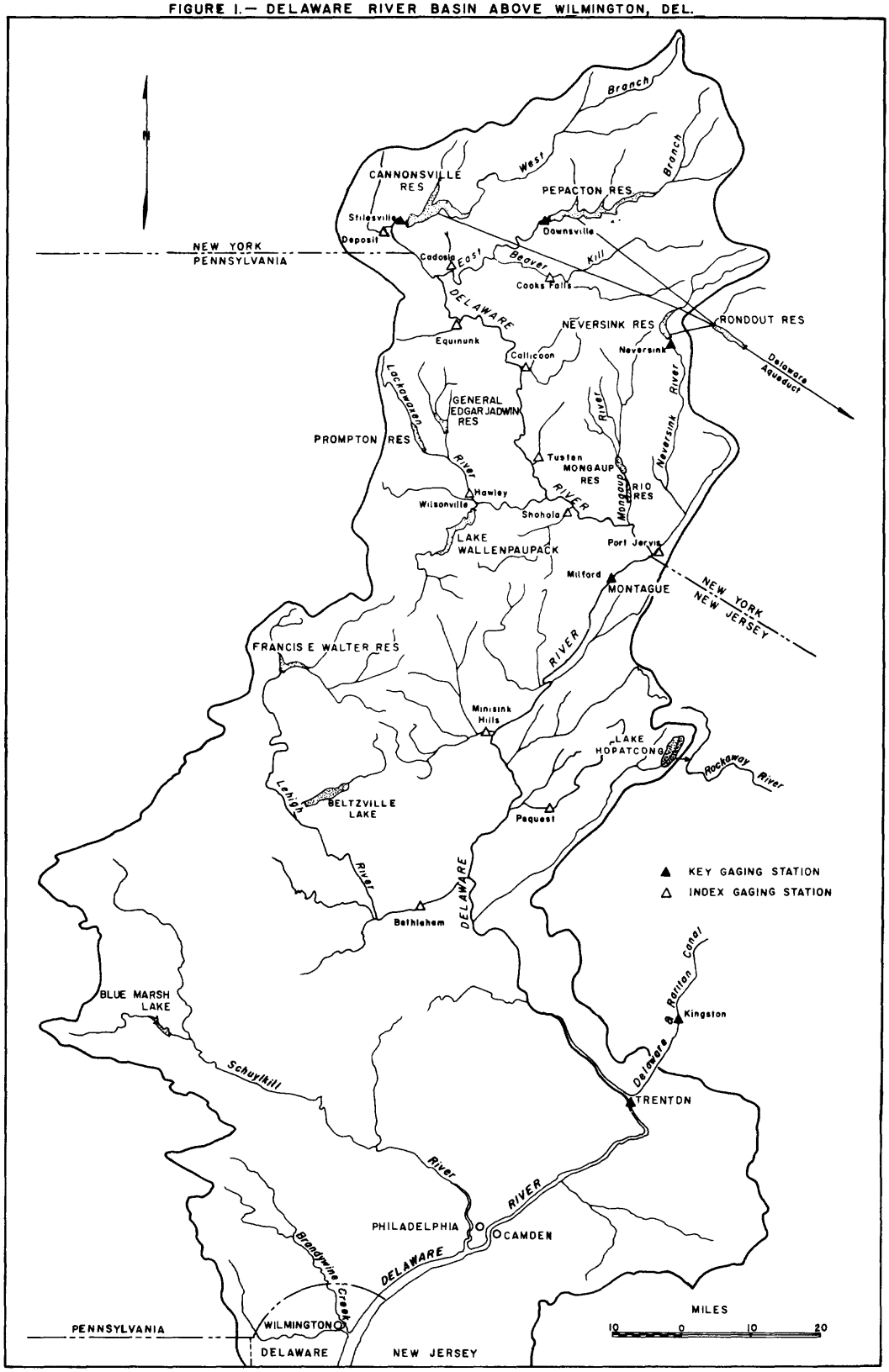
FIGURE 1.— DELAWARE RIVER BASIN ABOVE WILMINGTON, DEL.



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OFFICE OF THE DELAWARE RIVER MASTER

United States Geological Survey

Milford, Pennsylvania 18337

February 15, 1983

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

Dear Sir:

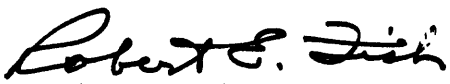
Transmitted herewith is my report on the hydrologic and hydraulic operations of the Delaware River basin as conducted by the Milford office under your direction during the year ending November 30, 1982. This report marks the twenty-ninth year of such activities since the inception of the Amended Decree of the United States Supreme Court, dated June 7, 1954.

Hydrologic conditions in the Delaware River basin were generally in the normal range the first half year and in the below-normal range during the latter half year. The emergency due to drought, as declared by the Delaware River Basin Commission in 1981, was continued to April 27,1982. Despite the reservoirs filling and spilling in April, their storage declined to the drought-warning level, by November 8, as defined by a recommendation of the parties to the Decree. Deficient runoff occurred in five months; runoff in June was excessive. As a result of the deficiencies toward the end of the year, the rates of diversions and target flows for Montague were reduced November 13-30 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 under the resolutions and under the Decree, except that release of the excess quantity from 1981 was deleted December 1 to March 15 upon the unanimous request of parties to the Decree. The hydrologic procedures developed previously were used to guide operations in this office. The order of tables 8-13 was changed in this report to conform more closely to the text.

The advice and cooperation of your office and the members of the Delaware River Master Advisory Committee are greatly appreciated. Thanks are also given to personnel of the offices of the United States Geological Survey, National Weather Service, New York City Department of Environmental Protection, Bureau of Water Supply and Board of Water Resource Development, Pennsylvania Power & Light Company, Orange and Rockland

Utilities, Inc., gage readers, and others for supplying data needed in this report. Special credit is given to Robert W. Baebenroth and Beverly A. Roberts for their capable assistance in preparing this report.

Sincerely yours,



Robert E. Fish, P.E.
Deputy Delaware River Master

Section II

REPORT OF DELAWARE RIVER OPERATIONS

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. Resolutions restricting diversions and release requirements for drought conditions were adopted by the Delaware River Basin Commission with the consent of parties to the Decree and were in use October 17, 1980 to April 27, 1982. This report describes the operations December 1, 1981 to November 30, 1982.

Definitions of Terms and Procedures

The following definitions apply to various terms and procedures as used in operations in this report. A table for converting inch-pound units to International System of Units (SI) is given on page 17. 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 areas 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-operating 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. Two exceptions were made due to deficient precipitation and runoff. First, to conserve storage in Pepacton, Cannonsville and Neversink Reservoirs equivalent to a drawdown in Beltzville Reservoir, the design rate at Montague was lowered from 1,850 to 1,750 cfs most weekdays September 25 to October 27. Second, 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 13-30 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. 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. An example of credits made for other releases is shown in table 13 on July 23 when 83 cfs from these reservoirs contributed to the excess-release rate of the discharge of 2,240 cfs at Montague.

Acknowledgements

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 Sup-

ply; from Lake Wallenpaupack by the Pennsylvania Power & Light Company; and from Mongaup Reservoir by Orange and Rockland Utilities, Inc.

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)

Abstract

A Decree of the U.S. Supreme 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 1982 report year, December 1, 1981 to November 30, 1982, was a year of below-normal precipitation and much below-average runoff in the Delaware River basin. At the beginning of the year, operations were under a status of emergency resulting from drought which had been declared by the Delaware River Basin Commission in its Resolution No. 81-1. The emergency was lifted April 27.

The annual flow of Delaware River at Montague, adjusted for change in reservoir storage and diversions was 19 percent below 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 November 13-30 to conserve the water supply in the reservoirs during a drought-warning status. Additional conservation measures were introduced during the year, viz., the release of the excess quantity was

deferred December 1 to March 15; directed releases for anticipated deficiencies at Montague were reduced on 2 days during December 1 to April 27 for earlier credits; and beginning November 13, the design rate at Montague was lowered to 1,655 cfs during a drought-warning status. By resolutions of the Commission, 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 reduction adopted for November 13-30.

The combined usable contents of Pepacton, Cannonsville and Neversink Reservoirs on December 1, 1981, was 49.7 percent, and on November 30, 1982, the combined contents was 34.3 percent of capacity. The reservoirs reached a maximum combined storage of 101.2 percent of capacity April 23 and a minimum of 34.1 percent November 29.

Precipitation

Precipitation observed on the basin above Montague for the 1982 report year was below normal, totaling 38.13 inches. Precipitation for June was excessive while those for July, August and October 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 1981 Average	December 1981 to November 1982 Amount	December 1981 to November 1982 Percentage of average
December	3.47	3.43	99
January	2.94	2.94	100
February	2.78	3.44	124
March	3.31	2.65	80
April	3.62	4.49	124
May	4.11	3.02	73
June	3.92	5.54	141
July	4.10	2.33	57
August	3.99	2.47	62
September	3.75	2.42	65
October	3.41	1.22	36
November	3.70	4.18	113
12 months	43.10	38.13	88

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

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 1981-82, precipitation of 19.97 inches was observed, which was 99 percent of the 41-year average. During June to November, precipitation of 18.16 inches was observed, which was 79 percent of the 41-year average. The maximum monthly precipitation listed during the year for any of the ten stations was 6.78 inches in June at Rock Hill, N.Y.; the minimum monthly precipitation observed was 0.67 inch in October at Narrowsburg, N.Y.

Operations December to May

During the first half of the report year, precipitation was average and varied slightly by months. Pepacton, Cannonsville and Neversink Reservoirs reached their maximum combined storage of 101.2 percent of capacity April 23.

On December 1, 1981, Pepacton Reservoir contained 72.085 billion gallons of water in storage above the point of maximum depletion, or 51.4 percent of the reservoir's storage capacity of 140.190 billion gallons. Cannonsville Reservoir contained 45.167 billion gallons, or 47.2 percent of the reservoir's storage capacity of 95.706 billion gallons and Neversink Reservoir contained 17.298 billion gallons, or 49.5 percent of the reservoir's storage capacity of 34.941 billion gallons. The combined storage in the three reservoirs as of December 1 was 134.550 billion gallons, or 49.7 percent of their combined capacities. Daily storages in Pepacton, Cannonsville and Neversink Reservoirs are shown in tables 8, 9 and 10, respectively.

A state of emergency due to drought was declared January 15, 1981 by the Delaware River Basin Commission in consultation with this office, and acting under its enabling act (Delaware River Basin Compact, 1961). The Commission enacted resolutions planned to cope with the deficient conditions by reductions of diversions and releases from the reservoirs provided under the Decree and by other conservation measures. The River Master deferred the release of the excess quantity defined in paragraph III.B1 (c) of the Decree (scheduled to begin June 15) at the unanimous request of the parties to the Decree (letter of May 27, 1981). The design rate at Montague continued to be 1,750 cfs at the end of that report year, November 30, 1981. 1/

During the winter and spring of 1981-82 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 85.272 billion gallons and averaged 469 mgd. The equivalent diversion rate June 1, 1981 to May 31,

1/ Schaefer, F.T., and Fish, R.E., Report of the River Master of the Delaware River, 1981, U.S. Geol. Survey.

1982 was 615 mgd. The diversions did not exceed the limit of 800 mgd specified by the Decree as shown in table 11.

There were 4 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 1,750 cfs and required releases to satisfy that minimum basic rate of the Montague Formula (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 Commission Resolutions No. 81-25 and 81-26 (Conservation Order No.9). The latter order provided for a crediting of augmented conservation releases and for a reduction of the credits after September 15, 1981. The requirements for the release of the excess quantity, which was deferred by the River Master at the unanimous request of the parties to the Decree, terminated March 14. The crediting procedure of Commission Conservation Order No. 9 was concluded with the termination of the drought emergency April 27. During December 1 to May 31, there were 4 days when the discharge at Montague was less than 1,750 cfs and 178 days when the discharge was equal to or above that rate. (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 41-year period, December 1940 to May 1981, was 304.7 billion gallons. During the corresponding 6 months of the current report year, inflow to the three reservoirs totaled 265.300 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 in these three reservoirs in 1982 to 259.618 billion gallons by May 31, an increase of 124.776 billion gallons from November 30, 1981 to May 31.

Operations June to November

During the second half of the report year, precipitation in June was excessive but the following 5 months accrued a deficiency of 6 inches below average. During the period, part of the storage and inflow to the New York City reservoirs was required for diversions and releases. Diversions to Rondout Reservoir during June 1 to November 30 totaled 124.599 billion gallons. The equivalent diversion rate did not exceed the limit specified by the Decree and was 681 mgd on November 12. Upon direction by the River Master and the consent of parties to the Decree to Resolution No. 82-17 adopted by the Delaware River Basin Commission, diversions were limited to an average of 680 mgd beginning November 13 because reservoir storage declinedto a drought-warning status. The latter limit was exceeded for one day when the average reached 681 mgd November 26. Diversions November 13-30 averaged 679 mgd. Releases were required to satisfy the Montague Formula on days when the anticipated discharge at Montague, ex-

clusive of water released from the City reservoirs, fell below the design rate. Under Commission Resolution No. 82-7 the augmented conservation rates of the Memorandum of Agreement approved by the River Master effective June 27, 1977 and extended May 22, 1979, were resumed May 31, 1982 to May 31, 1983. The Agreement to provide for investigation of the fisheries and habitats 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 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 to be maintained at Montague became1,850 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 1982 (limited to an increase of $7\frac{1}{4}$ billion gallons over actual consumption in any previous year) was less than New York City's estimate of safe yield during 1982, 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 1982 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 1982 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 1982 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, 1982, computed

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

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 would be required June 15 to November 30 unless the excess-release quantity were expended in a shorter time. However, the parties to the Decree desired to take advantage of an extraordinary release of 2,500 cfs-days of water from Beltzville Reservoir that permitted the construction of a boat ramp and dock for use by the handicapped. The release contributed to flows in Delaware River at Trenton. To effect a comparable conservation in storage of water in Pepacton, Cannonsville and Neversink Reservoirs, the parties and the Delaware River Master consented to Commission Resolution No. 82-17 proposing to reduce the flow objective at Montague from 1,850 to 1,750 cfs during most weekdays, beginning September 25, until a credit of 2,500 cfs-days was accrued. A further exception occurred 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 and the design rate at Montague was lowered from 1,850 to 1,655 cfs November 13-30 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 November 12, except September 25 to October 2, October 5-9, 12-16, 19-23, 26, 27 when the design rate was 1,750 cfs. The credits from the reductions accrued to 2,500 cfs-days by October 27. Directed releases from the City reservoirs were designed to provide 1,665 cfs at Montague November 13-30.

On the basis of advance estimates, releases from the reservoirs designed to maintain the prevailing rate at Montague were required 141 days from July 11 to November 30 (table 12). During those 141 days there were 64 days when the discharge at Montague was less than the prevailing design rate and 77 days when the discharge was above the prevailing design rate (table 13).

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

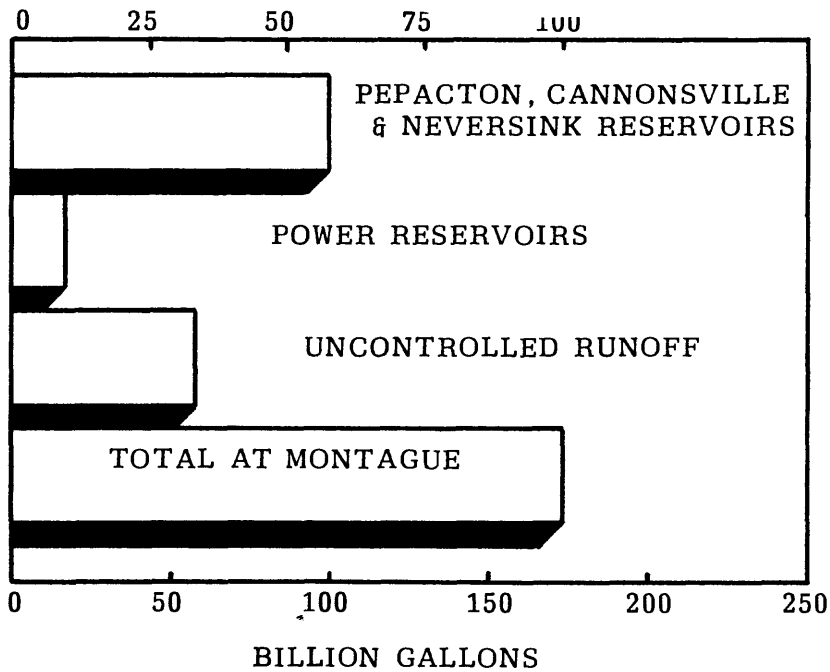
The hydrographs of plate 1, June 1 to November 30, show the total discharge at Montague; the part derived from uncontrolled runoff downstream from the reservoirs; the part contributed by the power reservoirs; and the part contributed by Pepacton, Cannonsville and Neversink Reservoirs. In analyzing the 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 11 to November 30. The diversions and releases from the City reservoirs were made under the provisions of the Montague Formula, Resolutions No. 82-7, 82-17, and direction of the River Master.

Diverted to Rondout Reservoir		162,614 cfs-days
Delaware River at Montague	Advance estimates (cfs-days)	Observed operations (cfs-days)
New York City releases (Pepacton, Cannonsville, Neversink)		
Directed	[a] 149,136	[b] 149,316
Other		3,557
Wallenpaupack & Mongaup power releases	27,417	25,936
Runoff from uncontrolled area	87,722	88,841
Flow at Montague		267,650

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

The contributions to flow of the Delaware River at Montague during July 11 to November 30 are also shown in the graph below.



Summary

From December 1, 1981 to November 30, 1982, diversions to Rondout Reservoir totaled 209.871 billion gallons, and all releases from the New York City reservoirs to the Delaware River totaled 191,721 cfs-days (123.931 billion gallons).

During the year, maximum storage in Pepacton Reservoir was 141.172 billion gallons, or 100.7 percent of capacity, on April 25. Maximum storage in Cannonsville Reservoir was 99.440 billion gallons, or 103.9 percent of capacity, on April 5. Maximum storage in Neversink Reservoir was 35.214 billion gallons, or 100.8 percent of capacity, April 20. The maximum combined storage in the three reservoirs during the year was 274.114 billion gallons, or 101.2 percent of capacity, on April 23.

Minimum storage during the year in Pepacton Reservoir was 63.641 billion gallons, or 45.4 percent of capacity on November 29. The minimum storage in Cannonsville Reservoir was 15.149 billion gallons, or 15.8 percent of capacity on November 22. Minimum storage in Neversink Reservoir was 12.830 billion gallons, or 36.7 percent of capacity on November 29. Minimum combined storage in the three reservoirs was 92.469 billion gallons, or 34.1 percent of capacity November 29.

A resume' of the combined storage of the three reservoirs on the first day of month June 1967 to December 1982 is shown in figure 3. Storages for May, July and August, 1982, were above medians for their respective previous months, others were below their medians. Storage for the report year was within the range between highest and lowest storage of earlier years.

On November 30, Pepacton Reservoir contained 63.653 billion gallons or 45.4 percent of capacity. Cannonsville Reservoir contained 16.416 billion gallons, or 17.2 percent of capacity. Neversink Reservoir contained 12.863 billion gallons, or 36.8 percent of capacity. Combined storage in the three reservoirs was 92.932 billion gallons, or 34.3 percent of their combined capacity. During the year, combined storage decreased 41.910 billion gallons, or 15.5 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 should the flow of the Delaware River at Trenton, N.J. become 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 op-

eration 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) segregation of the daily average flow at Montague among its various source components (table 13) and (2) advance estimates of the daily average flow at Montague, exclusive of controlled releases from New York City's reservoirs (table 12). 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 1982 report year except for December 25 to March 19.

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:

Source	Dec. 25 to Mar. 19 Hours
Pepacton Reservoir	84
Cannonsville Reservoir	72
Neversink Reservoir	57

With melting and breakup of the river ice, transit times from these reservoirs to Montague lessened, and transit times for average open-river conditions were resumed March 20.

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 benefit of concurrent specific information that changes in stage-discharge relations 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. 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 on page 25 for travel time of water. 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; (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 and Orange and Rockland Utilities, Inc. committed themselves to large efforts to follow their given schedules, within practicable limits and were quite 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 operation 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 25 to March 19, 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. The drainage areas of several of the stations were revised based upon measurements by the Albany office from recent topographic maps.

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 that 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 inflow, exclusive of New York City releases are too high, insufficient water is released, and, when too low, more water is released than necessary. Such deviations from the estimates are unavoidable. However, any cumulative deviations in the estimating procedure over a period of time should be reduced or eliminated. An adjustment for the deviations was 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 generally 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 column 14. The balancing adjustment was applied July 14 to November 12 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 equivalent rate of the combined diversions from the reservoirs, computed as prescribed by the Decree December 1 to November 12 and the average as prescribed by Resolution No. 82-17 November 13-30. The tabulation shows that the maximum equivalent diversion rate of the Decree was not exceeded at any time. The average rate of the resolution was exceeded November 26 as a 14-day average, 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 1982 were compared with actual uncontrolled runoff and powerplant releases during July 11 to November 30, which included most of the days for which releases were directed for the excess-release rate of the Montague Formula or the design rates of the Resolutions.

Uncontrolled Runoff Forecasts

A comparison of the hydrographs on figure 2 of forecast uncontrolled runoff and the actual uncontrolled runoff hydrograph 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 11 to November 30 (Montague dates) was 88,841 cfs-days. The forecast of uncontrolled runoff for those days was 87,722 cfs-days, or 1.3 percent less than actual runoff.

Powerplant Release Forecasts

During July 11 to November 30 (Montague dates), the total actual release from the powerplants was 25,936 cfs-days. The advance estimates of powerplant releases for those days were 27,417 cfs-days, or 5.7 percent more than actual releases.

Summary of Forecasts

The actual uncontrolled runoff plus actual powerplant releases during July 11 to November 30 (Montague dates) totaled 114,777 cfs-days, and the advance estimate was 115,139 cfs-days. The net cumulative difference between the estimate and the actual was 0.3 percent.

On the basis of the observed discharges at Montague, exact forecasting of releases required from the City's reservoirs during July 11 to November 30 would have totaled 145,203 cfs-days. The releases, as designed, totaled 149,136 cfs-days, or 2.7 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.

East Branch Delaware River at Downsville, N.Y.

The River Master operations data on the controlled releases from Pepacton Reservoir 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 (revised).

Releases were made at conservation or other rates by New York City during the year. There was good agreement, in general, between the venturi record and the Geological Survey record. For flows of approximately 55, 70 and 610 cfs at the gaging station, the venturi meter instruments indicated -7.2, +0.8 and -0.6 percent difference, respectively, in rates of release from the reservoir than those shown by the gaging-station records.

West Branch Delaware River at Stilesville, N.Y.

Data similar to those previously noted on releases from Pepacton Reservoir were collected for Cannonsville Reservoir.

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 Can-

nonsville 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. There was good agreement between the venturi record and the Geological Survey record. For conservation flows of approximately 40 cfs at the gaging station, the venturi meter instruments indicated 11 percent less water being released from the reservoir than those shown by the gaging-station records. The venturi indicated 8.4 percent more discharge than that shown by the gaging-station records at flows of approximately 330 cfs. The venturi indicated 0.9 percent more discharge for flows in the 1,100 cfs range than the gaging-station records.

Wallenpaupack Creek at Wilsonville, Pa.

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. No water was spilled from Lake Wallenpaupack during the report year.

During December 1981 through November 1982, the River Master's record, based on computations by Pennsylvania Power & Light Company, indicated 0.4 percent less discharge than the Geological Survey record.

Neversink River at Neversink, N.Y.

Similar data to those previously noted on releases from Pepacton Reservoir were collected for Neversink Reservoir.

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 (revised).

Releases were made at conservation or other low rates by New York City during the year. There was good agreement between the venturi record and the Geological Survey record.

For flows of approximately 25, 45 and 65 cfs at the gaging station, the venturi meter instrument indicated +5.4, +6.8 and +9.7 percent difference, respectively, in rates of release from the reservoir than those shown by the gaging-station records.

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 11 current-meter measurements showed on the average the the venturi-meter instruments gave higher figures by 6.3 percent for the totalizer, 7.2 percent for the manometer and 5.8 percent for the indicator needle.

A series of flow measurements was made October 5, 6 to check the accuracy of the venturi-meter instruments. Measurements at flows of approximately 300 mgd and 450 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. The mean results of 4 current-meter measurements and 2 color-velocity measurements at the lower flow showed respective higher figures of 6.1 and 2.2 percent for the venturi-meter totalizer. At the higher flow, 4 current-meter measurements and 2 color-velocity measurements showed respective higher figures of 5.1 and 0.6 percent for the venturi-meter totalizer. The differences between the current-meter method and the color-velocity 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 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 7.6 percent

for the totalizer, 12.1 percent for the manometer and 6.8 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 five current-meter measurements agreed fairly well. The average difference between the two methods showed the venturi higher by 9.5 percent for the totalizer, 12.8 percent for the manometer, and 13.5 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, 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. On the basis of that meager information, 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. Resolution No. 82-21 as a conservation measure adopted November 10 by the Delaware River Basin Commission, with the consent of parties to the Decree, reduced allowable diversions by New Jersey to an average of 85 mgd (131.5 cfs). This rate was effective November 13-30. The canal was blocked from Delaware River flows October 31, 1981 to June 7, 1982 by the State of New Jersey to permit clearing of the canal box culvert along U.S. Highway 1 in Trenton. On many days during that period and at other times during June and July, water from Carnegie Lake was diverted into the canal at the aqueduct over Millstone River 2.0 miles upstream of gage.

Summarized below are the discharges at the Kingston gaging station from table 6 and as adjusted for the inflow from Carnegie Lake. The summary table shows that the Decree limitations were not exceeded during the year December 1 to November 30. The table also shows the average rate of Resolution 82-21 (85 mgd) was not exceeded November 13-30.

Month	Discharge at Kingston, cfs	Discharge at Kingston adjusted to except inflow from Carnegie Lake	
		Monthly, cfs	Maximum daily, cfs
December	0	0	0
January	1.39	0	0
February	40.3	0	0
March	54.7	0	0
April	61.8	0	0
May	49.3	0	0
June	64.0	34.3	66
July	42.7	26.9	55
August	17.5	17.5	43
September	26.2	26.2	55
October	57.7	57.7	85
November 1-12	75.0	75.0	79
November 13-30	89.1	89.1	102

Conformance of Operations as Provided Under Amended Decree of the U.S. Supreme Court, dated June 7, 1954

Prior to the beginning of the report year, the Delaware River Basin Commission had declared an emergency due to drought and had made reductions in allowable diversions from the basin and rates of flow of Delaware River at Montague as conservation measures. With general improvement over drought and the filling of reservoirs, the emergency was lifted April 27. When reservoir storage again declined rapidly, reductions were imposed beginning November 13.

With respect to diversions from the Delaware River basin to the water-supply system of the City of New York, the River Master found that diversions were less than the 800 mgd authorized under the Decree. For a part of year, permissible diversions during the droughts were established by resolutions of the Commission. Allowable and actual diversions are shown below.

Effective dates	Allowable diversion under Decree. Equivalent rate not to exceed	Actual diversions
June 1, 1981 to May 31	800 mgd	615 mgd
June 1 to Nov. 12	800 mgd	681 mgd

Effective dates	Authorized under Resolution Average not to exceed	Actual diversions
Nov. 13-30	680 mgd	679 mgd

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 April 28 to June 14, September 25 to October 2, October 5-9, 12-16, 19-23, 26, 27; and at the excess-release rate of 1,850 cfs June 15 to November 12, except for the September and October periods mentioned. Releases from the reservoirs, under the reductions, and in accordance with the design data of the River Master, were made to provide at the gaging station at Montague, N.J.:

Dec. 1-24	1,750 cfs
Dec. 25, 26	1,700 cfs
Dec. 27 to Apr. 27	1,750 cfs
Nov. 13-30	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 declared emergency due to drought which ended April 27, no diversion was reported. In the restrictions November 13-30, the average diversion was less than the authorized 85 mgd.

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

for the year ending November 30, 1982

(Preliminary U.S.G.S. gaging-station record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	56	55	53	55	68	576	72	71	67	104	97	627
2	56	55	53	53	67	596	72	71	66	103	37	627
3	56	56	54	54	69	574	73	72	68	103	97	500
4	54	54	54	57	69	545	74	71	68	103	97	212
5	54	57	54	53	69	507	67	71	82	103	97	286
6	54	54	54	58	68	455	69	71	104	103	97	574
7	54	54	54	58	70	301	72	82	99	102	98	612
8	54	55	54	54	66	141	74	101	98	103	100	612
9	55	53	54	55	64	82	74	83	88	102	100	618
10	53	56	54	56	66	74	74	64	70	103	100	618
11	55	52	54	54	67	73	75	69	70	102	100	613
12	55	55	54	59	70	73	75	71	70	102	100	612
13	55	54	54	54	72	74	75	70	68	102	100	612
14	57	54	55	56	72	74	77	83	66	102	207	612
15	57	55	55	57	64	74	72	101	66	102	320	613
16	55	53	55	57	62	70	72	100	68	102	318	559
17	54	52	51	56	64	69	71	100	66	102	317	506
18	53	55	54	52	66	71	70	100	68	102	472	561
19	53	54	54	57	66	75	71	100	84	102	650	617
20	56	53	55	60	68	67	70	84	99	102	682	600
21	54	52	57	56	70	75	70	68	85	102	677	600
22	53	51	58	58	282	69	70	68	66	102	650	463
23	55	51	57	58	853	70	71	69	82	102	624	164
24	54	51	55	55	1,060	70	70	68	104	102	625	116
25	54	51	53	54	1,050	70	70	69	97	102	624	145
26	54	51	50	55	850	69	70	82	104	102	624	177
27	55	52	54	53	763	71	70	85	104	109	624	237
28	55	52	53	56	628	72	70	66	103	104	624	116
29	55	52		65	450	71	72	66	104	98	624	8.0
30	55	52		69	481	70	71	66	104	97	624	7.8
31	55	52		67		71		66	104		624	
Total cfs-days	1,695	1,653	1,516	1,761	7,834	5,349	2,153	2,408	2,592	3,069	11,190	13,224.8
Mean cfs	54.7	53.3	54.1	56.8	261	173	71.8	77.7	83.6	102	361	441

Year total 54,444.8 cfs-days

Mean 149 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, 1982

(Preliminary U.S.G.S. gaging-station record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	41	42	47	36	63	682	53	1,290	600	977	1,460	802
2	42	42	44	36	61	622	58	1,260	530	994	1,460	494
3	42	42	50	36	470	570	66	1,060	530	1,330	1,270	340
4	41	45	53	36	2,260	530	58	889	658	1,350	1,290	146
5	41	45	45	37	3,080	486	63	706	889	1,390	1,300	59
6	41	44	39	37	3,030	446	88	560	1,200	1,100	1,180	45
7	41	44	38	37	2,580	418	182	438	1,230	1,080	1,230	77
8	42	43	37	37	2,130	394	308	370	889	1,180	1,460	105
9	42	43	37	37	1,880	388	388	446	863	1,220	1,500	397
10	41	42	37	37	1,650	418	424	520	863	1,460	1,290	507
11	41	38	37	37	1,500	400	430	340	915	1,480	1,150	422
12	41	35	37	40	1,370	320	424	330	863	1,270	1,060	328
13	41	35	38	42	1,290	262	694	330	1,150	1,110	486	116
14	41	35	37	42	1,300	212	682	335	1,180	976	967	159
15	42	35	37	42	1,300	143	520	330	889	947	1,240	52
16	41	34	37	42	1,240	100	412	520	928	1,170	1,210	81
17	41	34	37	43	1,320	67	388	580	980	1,490	863	194
18	41	34	37	43	1,990	53	382	340	941	1,460	876	238
19	41	34	37	44	2,430	53	355	330	863	1,200	580	263
20	41	34	37	45	2,260	54	330	330	1,240	1,220	274	261
21	41	34	37	47	2,030	284	330	330	1,160	1,170	430	238
22	111	34	37	47	1,800	177	330	330	952	1,180	790	202
23	97	34	37	47	1,570	66	330	850	928	1,120	838	127
24	47	34	37	47	1,380	56	330	814	937	1,350	520	69
25	42	37	36	49	1,210	54	330	345	332	1,320	540	53
26	42	41	36	55	1,090	53	330	658	792	915	610	45
27	42	41	36	50	1,050	52	330	742	1,210	1,000	646	44
28	42	41	36	47	967	53	330	494	1,210	1,170	646	39
29	42	41		47	863	54	370	325	872	1,250	730	17
30	42	41		54	766	52	967	706	912	1,260	814	16
31	42	43		58		54		889	977		730	
Total cfs-days	1,415	1,201	1,090	1,334	45,930	7,573	10,282	17,787	28,483	36,139	29,440	5,936
Mean cfs	45.6	38.7	38.9	43.0	1,531	244	343	574	919	1,205	950	198

Year total 186,610 cfs-days

Mean 511 cfs

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

for the year ending November 30, 1982

(Preliminary U.S.G.S. gaging-station record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	0	0	0	253	875	477	427	427	0	158	107	0
2	0	0	0	248	877	831	550	427	157	150	0	0
3	0	0	0	220	877	833	849	0	151	167	0	0
4	0	146	0	229	898	835	859	0	165	0	101	0
5	0	4	0	237	943	715	849	0	162	0	110	0
6	0	0	0	0	959	580	843	446	157	0	107	0
7	0	0	0	0	961	580	846	434	0	114	106	0
8	0	0	57	207	961	0	845	452	0	107	110	38
9	0	0	0	221	961	0	846	448	162	109	0	0
10	0	0	0	240	959	242	840	0	162	104	0	0
11	0	283	0	240	962	238	840	0	152	0	113	0
12	0	258	0	231	964	0	783	437	160	0	104	0
13	0	244	0	0	962	0	627	436	166	141	109	0
14	0	0	0	0	962	0	663	433	0	106	109	0
15	0	0	0	708	962	0	445	435	0	109	109	59
16	0	0	291	701	956	0	336	441	160	107	0	0
17	0	166	316	694	0	0	436	0	159	106	0	0
18	0	64	298	694	959	269	454	0	160	0	219	0
19	0	0	292	700	963	261	665	483	168	0	227	0
20	0	0	0	0	964	274	665	433	160	94	218	0
21	0	0	0	0	964	267	441	434	0	112	224	0
22	0	14	245	958	963	0	431	425	0	101	218	0
23	0	0	265	0	963	0	421	434	163	107	0	0
24	0	0	255	670	963	430	433	0	165	104	0	0
25	0	0	260	985	966	427	427	0	157	0	229	0
26	0	81	247	972	962	412	0	283	145	0	220	0
27	0	0	0	873	919	438	0	0	161	110	224	0
28	0	0	0	875	962	405	443	0	0	109	221	0
29	0	0		872	964	0	442	0	0	110	242	0
30	0	0		860	957	0	422	0	161	132	0	0
31	0	0		873		0		0	186		0	0
Total cfs-days	0	1,260	2,526	13,761	27,508	8,514	17,128	7,308	3,539	2,457	3,427	97
Mean cfs	0	40.6	90.2	444	917	275	571	236	114	81.9	111	3.23

Year total 87,525 cfs-days

Mean 240 cfs

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

for the year ending November 30, 1982

(Preliminary U.S.G.S. gaging-station record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	26	23	23	25	44	46	44	42	43	63	64	21
2	26	23	23	25	43	46	45	42	45	63	64	26
3	24	23	25	26	46	46	46	42	43	64	64	26
4	24	24	24	27	44	46	46	42	43	63	64	25
5	24	23	24	27	45	46	46	42	43	63	64	24
6	22	24	25	28	49	46	45	42	51	64	64	24
7	23	24	27	28	44	47	44	42	64	64	64	24
8	24	24	24	28	42	47	44	42	64	66	64	24
9	23	24	24	27	43	47	44	42	64	64	66	24
10	22	24	30	25	44	48	45	42	59	64	66	24
11	23	24	27	26	45	48	45	42	46	64	66	24
12	24	24	24	26	44	49	45	42	45	64	66	18
13	24	24	24	26	45	49	45	42	47	66	63	10
14	24	24	24	26	44	45	45	42	47	68	54	17
15	24	23	26	26	45	43	45	47	43	68	64	10
16	23	24	26	27	45	43	45	59	43	64	64	24
17	23	24	25	27	46	43	45	61	43	63	66	24
18	24	24	25	27	45	43	45	64	43	63	66	24
19	24	24	24	27	528	43	45	66	52	66	66	24
20	24	23	24	27	675	43	45	57	66	66	68	24
21	24	24	24	27	382	43	45	41	55	66	68	24
22	24	24	24	27	226	43	46	45	43	66	66	17
23	25	24	24	27	108	43	46	45	43	64	66	5.0
24	26	24	25	27	54	43	45	45	51	64	66	11
25	27	23	25	27	48	43	43	45	63	66	64	24
26	27	23	25	27	48	43	46	45	64	66	64	24
27	27	24	25	26	320	43	46	45	64	64	68	23
28	27	24	25	26	223	43	45	46	63	64	66	16
29	23	24		27	58	45	47	43	63	64	66	5.2
30	23	24		34	48	44	47	43	63	64	49	5.5
31	24	23		46		44		43	63		19	
Total cfs-days	752	735	695	852	3,521	1,391	1,355	1,428	1,629	1,938	1,949	595.7
Mean cfs	24.3	23.7	24.8	27.5	117	44.9	45.2	46.1	52.5	64.6	62.9	19.9

Year total 16,840.7 cfs-days Mean 46.1 cfs

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

for the year ending November 30, 1982

(Preliminary U.S.G.S. gaging-station record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	2,000	2,700	1,950	2,300	16,900	7,160	2,780	6,010	1,650	1,610	2,010	1,760
2	2,420	2,800	2,800	2,800	19,200	6,320	5,010	5,030	1,650	1,900	2,000	1,750
3	3,570	3,100	4,500	2,600	15,600	6,210	6,260	4,280	1,600	1,960	1,910	1,790
4	4,120	3,600	8,000	2,300	29,200	6,230	5,440	3,530	1,630	2,070	1,900	1,600
5	3,570	9,400	16,000	2,700	24,400	5,660	4,820	3,140	1,560	1,970	1,810	2,270
6	3,170	10,500	12,000	2,400	18,700	5,060	4,830	2,800	1,720	1,930	1,940	2,190
7	2,750	8,370	9,200	2,600	15,600	4,770	6,750	3,200	1,770	1,830	1,830	1,790
8	2,700	6,820	7,200	2,800	13,100	4,200	7,720	2,960	1,800	1,790	1,810	1,690
9	2,830	5,600	6,000	2,700	11,500	3,340	6,810	2,680	2,030	1,830	1,900	1,590
10	2,570	4,500	5,400	2,600	10,400	3,110	5,690	2,400	2,480	2,000	1,940	1,470
11	2,490	3,200	4,800	2,600	10,200	3,470	4,980	1,710	2,300	2,020	1,860	1,650
12	2,320	3,100	4,200	3,200	9,930	3,180	4,620	1,790	2,030	2,050	1,810	1,760
13	2,070	3,400	4,100	5,000	9,420	2,810	4,710	2,420	1,890	2,140	1,710	2,000
14	1,840	3,700	3,900	7,000	9,550	2,630	7,760	2,560	1,720	2,090	1,730	2,270
15	2,000	3,700	3,600	9,400	9,400	2,390	7,370	2,320	1,720	1,820	1,450	2,520
16	2,100	3,400	3,600	9,800	9,090	2,050	6,000	2,320	1,640	1,870	1,520	2,190
17	2,400	3,100	4,300	9,000	8,760	1,870	5,780	2,220	1,580	1,800	2,010	1,810
18	2,200	3,000	4,200	8,400	19,100	1,800	5,770	1,730	1,760	1,910	1,870	1,690
19	1,950	2,900	4,000	10,500	22,500	2,030	5,270	1,760	1,820	1,870	1,870	1,630
20	1,400	2,700	3,800	11,400	16,800	2,160	4,630	2,310	1,850	1,820	1,920	1,740
21	1,300	2,800	3,200	12,400	14,000	2,370	3,900	2,380	1,760	1,850	1,880	1,790
22	1,400	2,600	3,200	13,600	11,700	1,960	3,750	2,360	1,800	1,880	1,670	1,770
23	2,800	2,700	3,400	13,900	10,100	1,810	3,720	2,120	1,670	1,950	1,780	1,860
24	3,300	2,600	3,300	13,400	9,230	2,080	3,700	1,940	1,750	1,870	1,830	2,280
25	4,800	2,200	3,200	14,900	8,580	2,910	3,210	1,600	1,900	1,730	1,810	2,220
26	4,000	2,400	2,900	20,400	8,110	2,840	2,860	1,510	1,990	1,790	1,860	1,860
27	3,400	2,400	2,600	22,900	9,990	2,550	2,290	1,870	1,450	1,950	1,840	1,740
28	3,200	2,300	2,200	15,400	10,900	2,490	2,230	1,920	1,800	1,810	1,890	1,610
29	3,500	2,200		11,900	9,530	2,890	2,980	2,050	1,790	1,630	1,900	1,760
30	2,900	2,000		10,500	8,090	2,830	5,120	1,780	1,710	1,920	1,900	1,990
31	2,600	1,700		10,400		2,750		1,520	1,640		1,760	
Total cfs-days	83,670	115,490	137,550	261,800	399,580	103,930	146,760	78,220	55,460	56,660	56,920	56,040
Mean cfs	2,699	3,725	4,913	8,445	13,320	3,353	4,892	2,523	1,789	1,889	1,836	1,868

Year total 1,552,080 cfs-days

Mean 4,252 cfs

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

for the year ending November 30, 1982

(Preliminary U.S.G.S. gaging-station record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	0	0	0	55	53	68	76	60	13	17	33	70
2	0	0	0	55	57	67	76	61	13	13	31	72
3	0	0	11	55	60	66	74	57	13	18	33	73
4	0	33	.68	55	65	66	72	56	13	20	48	74
5	0	10	15	55	65	65	71	59	13	20	53	76
6	0	0	31	56	64	63	70	58	13	20	27	79
7	0	0	33	57	63	62	71	65	13	19	11	78
8	0	0	36	59	58	62	66	69	13	20	33	76
9	0	0	39	58	58	62	62	68	14	26	70	75
10	0	0	42	57	58	62	55	61	43	28	67	75
11	0	0	44	56	59	60	52	59	30	22	57	75
12	0	0	44	56	58	60	55	47	14	16	55	77
13	0	0	44	55	57	60	57	33	16	16	52	85
14	0	0	45	55	57	37	67	33	16	16	55	91
15	0	0	45	55	57	11	67	33	16	15	62	90
16	0	0	48	55	57	14	63	33	17	15	62	97
17	0	0	52	55	58	17	64	33	17	21	60	102
18	0	0	54	55	60	17	64	32	17	28	60	97
19	0	0	54	54	59	17	59	32	16	21	61	93
20	0	0	55	53	58	16	52	17	16	22	61	92
21	0	0	55	53	58	48	47	9.6	16	32	64	90
22	0	0	55	53	59	62	59	21	16	34	67	90
23	0	0	55	53	65	61	66	39	16	34	67	90
24	0	0		53	67	62	72	43	16	37	67	84
25	0	0		53	66	24	69	41	18	37	67	81
26	0	0	53	54	66	16	68	40	24	34	80	82
27	0	0	54	54	72	50	66	28	24	35	85	82
28	0	0	55	53	76	56	64	38	18	48	75	82
29	0	0		53	74	58	59	55	18	55	84	86
30	0	0		53	70	62	58	29	18	48	73	90
31	0	0		53		76		13	22		69	
Total cfs-days	0	43	1,127.68	1,696	1,854	1,527	1,921	1,322.6	542	787	1,789	2,504
Mean cfs	0	1.39	40.3	54.7	61.8	49.3	64.0	42.7	17.5	26.2	57.7	83.5

Year total 15,113.28 cfs-days Mean 41.4 cfs

Note. - Discharges Jan. 4 to June 7 are inflows from Carnegie Lake.

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

for the year ending November 30, 1982

(Preliminary U.S.G.S. gaging-station record)

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	5,510	6,970	7,050	6,740	19,400	18,100	12,000	16,900	4,430	4,470	3,990	3,900
2	7,940	9,890	9,100	6,470	26,400	16,100	13,500	15,500	3,990	4,460	4,110	3,740
3	9,330	8,700	25,000	6,810	28,900	14,600	17,800	13,100	4,120	4,680	4,100	3,470
4	8,670	20,900	34,300	6,770	43,000	13,800	17,900	13,400	3,970	5,550	4,050	3,370
5	9,140	30,800	28,100	6,430	51,000	13,000	16,800	11,200	3,860	4,980	3,930	4,980
6	8,110	29,500	30,400	6,580	40,000	12,100	15,300	9,750	3,820	4,800	3,880	7,820
7	7,170	25,300	22,500	7,900	33,400	11,300	15,000	8,690	3,720	4,600	3,770	6,920
8	6,760	20,100	18,200	12,000	28,500	10,800	15,000	8,060	3,770	4,490	3,880	6,060
9	6,670	15,800	16,200	10,200	24,700	10,200	15,700	7,670	8,410	4,640	3,790	5,210
10	6,690	13,000	14,800	8,880	21,800	8,970	14,100	7,100	13,300	4,510	3,850	4,630
11	6,450	7,550	13,100	8,100	21,800	8,310	12,300	6,580	9,750	4,500	3,900	4,210
12	5,680	7,250	11,100	8,600	21,700	8,230	11,300	5,990	7,880	4,520	3,840	3,950
13	5,460	9,150	10,000	12,000	20,400	7,730	11,800	7,140	6,640	4,490	3,720	5,190
14	5,330	8,100	9,210	15,100	19,500	7,210	18,600	6,790	5,880	4,460	3,870	7,000
15	6,040	8,500	8,780	17,100	19,100	6,900	18,700	6,680	5,200	4,150	4,820	6,540
16	7,940	7,600	8,860	19,500	18,000	6,530	16,800	6,290	4,860	4,220	4,600	6,080
17	6,540	7,600	10,500	20,000	16,600	6,080	21,000	5,740	4,630	4,020	4,300	5,870
18	5,880	6,400	11,100	18,900	19,100	5,720	17,300	5,590	4,420	3,910	4,460	5,370
19	5,700	6,700	10,300	18,200	32,000	5,350	15,300	5,260	4,300	3,870	4,590	4,940
20	4,900	7,200	10,300	21,000	31,400	5,360	13,800	4,970	4,300	4,350	4,350	4,650
21	4,670	6,700	10,200	22,400	27,500	5,890	12,400	5,750	4,240	4,040	4,250	4,480
22	4,130	6,050	9,890	24,200	23,600	6,050	11,000	6,450	4,150	4,010	4,210	4,600
23	4,520	5,900	9,430	25,300	19,800	6,040	10,100	5,870	3,990	4,230	4,120	4,620
24	6,610	6,150	9,960	24,900	17,200	6,030	10,400	5,310	4,010	4,310	3,960	4,640
25	7,180	6,100	9,660	24,200	15,400	6,530	9,600	4,820	4,260	4,260	4,190	4,720
26	8,210	5,650	8,330	25,600	15,300	7,270	8,630	4,510	7,570	3,990	4,770	4,990
27	8,030	5,200	7,550	33,800	22,000	7,320	8,310	4,260	7,370	4,100	4,940	4,780
28	7,570	5,350	7,340	33,000	28,000	6,420	7,730	4,690	5,920	4,860	4,730	4,430
29	7,200	5,250		25,000	24,500	11,000	8,300	5,900	4,950	5,050	4,500	5,630
30	7,030	5,350		20,600	20,700	15,200	16,300	5,300	4,770	4,390	4,370	7,080
31	6,480	5,250		18,300		14,100		4,870	4,610		3,980	
Total cfs-days	207,540	319,960	381,260	514,580	750,700	288,240	412,770	230,130	167,090	132,910	129,820	153,870
Mean cfs	6,695	10,320	13,620	16,600	25,020	9,298	13,760	7,424	5,390	4,430	4,188	5,129

Year total 3,688,870 cfs-days Mean 10,110 cfs

Table 8. - Storage in Pepacton Reservoir, N.Y., for year ending November 30, 1982

(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	72,085	73,016	83,276	99,567	116,010	140,801	134,013	139,050	130,103	116,060	101,727	80,713
2	72,072	73,250	84,173	99,707	117,602	140,839	134,103	139,362	129,696	115,592	101,195	79,851
3	72,111	73,433	84,876	99,800	118,816	140,839	134,462	139,454	129,324	115,143	100,714	78,817
4	72,124	73,810	87,941	99,893	121,625	140,839	134,805	139,473	128,902	114,678	100,234	78,126
5	72,098	75,149	90,525	99,908	123,653	140,801	135,058	139,399	128,480	114,197	99,877	77,896
6	72,072	76,064	92,175	99,908	125,090	140,746	135,457	139,252	128,005	113,717	99,490	77,293
7	71,995	76,890	93,319	99,800	125,975	140,635	136,164	139,050	127,530	113,239	98,937	76,489
8	71,944	77,547	94,126	99,722	126,639	140,375	136,836	138,792	127,076	112,728	98,460	75,653
9	72,008	78,126	94,321	99,629	127,425	140,209	137,439	138,498	126,674	112,251	97,954	74,794
10	72,253	78,573	94,770	99,567	128,163	140,080	137,858	138,187	126,255	111,792	97,497	73,940
11	72,433	78,871	95,146	99,167	128,761	139,914	138,096	137,895	125,801	111,285	97,009	73,003
12	72,394	79,169	95,524	99,413	129,341	139,749	138,114	137,621	125,298	110,811	96,506	72,163
13	72,317	79,455	95,902	100,001	129,572	139,602	138,114	137,329	124,829	110,306	96,053	71,635
14	72,201	79,796	96,234	100,993	129,873	139,399	138,169	137,001	124,413	109,836	95,630	71,097
15	72,175	80,138	96,536	101,664	130,139	139,142	138,169	136,782	123,928	109,332	94,980	70,435
16	72,124	80,425	96,826	102,242	130,440	138,811	138,023	136,399	123,480	108,879	94,426	69,839
17	72,072	80,713	97,207	102,743	130,759	138,480	138,132	136,037	123,015	108,379	93,767	69,235
18	71,944	80,892	97,481	103,326	132,791	138,096	138,169	135,638	122,653	107,879	93,170	68,607
19	71,802	81,071	97,786	104,004	134,895	137,712	138,169	135,221	122,207	107,364	92,398	67,896
20	71,905	81,264	98,061	104,510	138,077	137,293	138,132	134,895	121,711	106,852	91,438	67,177
21	72,008	81,471	98,276	105,066	139,362	137,074	137,913	134,570	121,249	106,404	90,614	66,486
22	71,712	81,636	98,506	105,812	140,375	136,690	137,804	134,211	120,787	105,876	89,738	65,812
23	71,545	81,857	98,691	106,420	140,968	136,399	137,749	133,779	120,293	105,431	88,894	65,372
24	71,854	82,037	98,875	106,980	141,135	136,182	137,676	133,330	119,801	104,955	88,100	65,152
25	72,111	82,176	99,029	107,637	141,172	135,892	137,512	132,862	119,359	104,478	87,309	64,861
26	72,459	82,315	99,121	108,717	141,024	135,566	137,329	132,398	118,867	104,004	86,322	64,547
27	72,795	82,427	99,260	110,518	140,987	135,203	137,147	131,916	118,395	103,547	85,414	64,208
28	73,107	82,538	99,383	111,711	140,913	134,841	137,074	131,559	117,923	103,106	84,426	63,821
29	72,977	82,635		112,695	140,783	134,534	137,256	131,238	117,434	102,649	83,485	63,641
30	72,834	82,761		113,552	140,746	134,444	138,388	130,865	116,931	102,180	82,552	63,653
31	72,808	82,872		114,379		134,265		130,458	116,445		81,581	
Change	+633	+10,064	+16,511	+14,996	+26,367	-6,481	+4,123	-7,930	-14,013	-14,265	-20,599	-17,928
Equiv. mgd	+20.4	+324.6	+589.7	+483.7	+878.9	-209.1	+137.4	-255.8	-452.0	-474.5	-664.5	-597.6
Equiv. cfs	+31.6	+502	+912	+748	+1,360	-323	+213	-396	-699	-736	-1,028	-924

Change for year -8,522 million gallons Equiv. for year -23.3 mgd Equiv. for year -36.0 cfs

Table 9. - Storage in Cannonsville Reservoir, N.Y., for year ending November 30, 1982

(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	45,167	51,628	52,969	67,530	92,512	97,154	95,250	97,524	85,051	64,389	42,731	21,254
2	45,523	51,581	53,681	67,688	94,885	97,041	95,722	97,508	84,603	63,842	41,848	20,400
3	45,768	51,639	54,486	67,887	96,752	96,977	95,754	97,154	84,169	63,167	40,986	19,668
4	46,035	51,686	57,130	68,060	98,861	96,897	95,706	96,881	83,706	62,365	40,241	19,141
5	46,257	52,187	60,549	68,192	99,440	96,832	95,819	96,623	83,099	61,524	39,411	18,930
6	46,424	53,412	62,390	68,457	99,408	96,752	95,980	96,366	82,319	60,756	38,675	18,726
7	46,591	54,112	63,765	68,828	99,150	96,720	96,237	96,060	81,452	60,109	37,946	18,374
8	46,746	54,638	64,402	69,106	98,796	96,671	96,543	95,819	80,598	59,486	37,202	17,945
9	46,958	54,932	65,026	68,841	98,619	96,639	96,720	95,645	79,976	58,754	36,291	17,502
10	47,113	55,115	65,548	68,616	98,362	96,704	96,784	95,143	79,382	57,997	35,429	16,745
11	47,347	55,079	65,815	68,470	98,200	96,671	96,816	94,763	78,678	57,008	34,627	16,075
12	47,358	55,018	65,994	68,616	98,040	96,462	96,800	94,520	78,028	56,165	33,953	15,406
13	47,458	54,969	66,146	69,569	97,959	96,334	96,720	94,200	77,282	55,420	33,358	15,181
14	47,547	54,944	66,299	71,199	97,959	96,189	96,671	93,850	76,343	54,801	33,260	15,258
15	47,658	54,969	66,388	72,139	97,959	95,996	96,301	93,607	75,486	54,264	32,463	15,271
16	47,758	54,993	66,503	73,013	97,911	95,803	95,980	93,181	74,851	53,646	31,730	15,386
17	47,814	54,932	66,707	73,742	97,959	95,630	95,947	92,664	74,077	52,829	31,109	15,432
18	47,892	54,801	66,885	74,782	98,603	95,463	95,947	92,147	73,424	51,931	30,618	15,393
19	47,925	54,638	67,013	75,901	98,925	95,265	95,819	91,720	72,695	51,103	29,950	15,335
20	47,925	54,486	67,089	77,089	98,925	95,219	95,630	91,355	71,980	50,379	29,505	15,258
21	47,892	54,381	67,127	78,194	98,667	95,113	95,493	90,853	71,080	49,702	29,144	15,213
22	47,836	54,241	67,153	79,410	98,442	94,809	95,569	90,427	70,258	48,993	28,591	15,149
23	47,936	54,089	67,153	80,460	98,200	94,748	95,615	90,047	69,490	48,325	27,936	15,226
24	48,470	53,937	67,127	81,510	97,959	95,113	95,645	89,195	68,722	47,669	27,358	15,438
25	49,095	53,762	67,076	82,579	97,798	95,128	95,630	88,587	68,179	46,880	26,881	15,618
26	49,527	53,552	66,949	83,952	97,637	95,143	95,615	88,115	67,940	46,112	26,353	15,419
27	49,854	53,331	67,153	86,438	97,556	95,098	95,569	87,334	67,344	45,523	25,553	15,605
28	50,146	53,296	67,331	87,782	97,476	95,022	95,539	86,828	66,605	44,989	24,830	15,785
29	50,437	53,156		88,739	97,347	95,006	95,786	86,510	65,917	44,255	24,116	15,998
30	50,706	53,039		89,591	97,235	95,052	97,058	86,207	65,446	43,477	23,118	16,416
31	51,254	52,887		90,610		95,158		85,600	64,861		22,206	
Change	+5,909	+1,633	+14,444	+23,279	+6,625	-2,077	+1,900	-11,458	-20,739	-21,384	-21,271	-5,790
Equiv. mgd	+190.6	+52.7	+515.9	+750.9	+220.8	-67.0	+63.3	-369.6	-669.0	-712.8	-686.2	-193.0
Equiv. cfs	+295	+81.5	+798	+1,162	+342	-104	+97.9	-572	-1,035	-1,103	-1,062	-299

Change for year -28,929 million gallons Equiv. for year -79.3 mgd Equiv. for year -123 cfs

Table 10. - Storage in Neversink Reservoir, N.Y. for year ending November 30, 1982

(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	17,298	17,192	18,278	22,736	26,287	34,473	30,118	32,307	29,697	26,139	22,423	17,819
2	17,326	17,162	18,547	22,799	27,013	34,199	30,109	32,269	29,666	26,076	22,295	17,549
3	17,408	17,073	18,704	22,850	27,473	34,062	30,227	32,222	29,621	26,005	22,151	17,254
4	17,442	17,086	19,609	22,870	28,919	33,930	30,323	32,160	29,544	25,900	22,008	16,914
5	17,529	17,511	20,253	22,929	29,697	33,722	30,401	32,108	29,396	25,783	21,868	16,672
6	17,501	17,705	20,592	22,988	30,168	33.615	30,611	32,137	29,244	25,599	21,741	16,474
7	17,452	17,812	20,821	23,075	30,515	33,437	31,392	32,071	29,115	25,508	21,619	16,228
8	17,539	17,879	21,010	23,155	30,781	33,259	31,817	31,991	28,999	25,379	21,485	15,968
9	17,546	17,893	21,207	23,099	31,035	33,067	32,024	31,925	28,901	25,271	21,344	15,719
10	17,549	17,938	21,370	22,968	31,234	32,876	32,174	31,831	28,786	25,018	21,218	15,467
11	17,525	17,917	21,363	22,996	31,415	32,700	32,283	31,831	28,762	24,895	21,082	15,210
12	17,511	17,900	21,370	22,988	31,583	32,524	32,387	31,597	28,654	24,723	20,946	14,949
13	17,497	17,907	21,508	23,028	31,737	32,307	32,486	31,559	28,535	24,686	20,821	14,768
14	17,350	17,935	21,611	23,206	31,925	32,113	32,662	31,471	28,438	24,592	20,731	14,756
15	17,353	17,949	21,695	23,131	32,085	31,906	32,690	31,392	28,258	24,462	20,607	14,643
16	17,339	17,987	21,791	23,206	32,156	31,564	32,681	31,290	28,097	24,340	20,484	14,520
17	17,326	18,011	21,907	23,361	32,373	31,373	32,686	31,187	27,970	24,209	20,324	14,358
18	17,333	17,924	21,992	23,425	34,184	31,280	32,686	31,076	27,875	24,080	20,205	14,190
19	17,305	17,910	22,085	23,501	35,170	31,197	32,662	30,984	27,762	23,910	20,068	14,018
20	17,264	17,896	22,182	23,573	35,214	31,104	32,643	30,901	27,632	23,753	19,939	13,853
21	17,220	17,893	22,260	23,585	35,080	30,984	32,595	30,823	27,520	23,693	19,818	13,662
22	17,209	17,837	22,334	23,553	35,016	30,878	32,538	30,744	27,378	23,657	19,690	13,538
23	17,216	17,900	22,408	23,657	34,946	30,790	32,505	30,657	27,266	23,641	19,554	13,472
24	17,261	17,903	22,474	23,874	34,867	30,707	32,472	30,570	27,150	23,517	19,402	13,421
25	17,298	17,837	22,537	23,882	34,768	30,652	32,410	30,451	27,030	23,226	19,268	13,361
26	17,281	17,893	22,595	24,141	34,655	30,565	32,340	30,305	26,987	22,945	19,138	13,238
27	17,254	17,945	22,638	24,299	35,075	30,570	32,292	30,172	26,859	22,870	18,907	13,114
28	17,199	17,997	22,681	24,863	35,055	30,497	32,217	29,987	26,689	22,807	18,675	12,965
29	17,179	18,053		25,031	34,906	30,455	32,123	29,873	26,540	22,681	18,444	12,830
30	17,230	18,095		25,155	34,714	30,419	32,302	29,769	26,397	22,552	18,193	12,863
31	17,264	18,155		25,433		30,195		29,760	26,257		18,011	
Change	-58	+891	+4,526	+2,752	+9,281	-4,519	+2,107	-2,542	-3,503	-3,705	-4,541	-5,148
Equiv. mgd	-1.87	+28.7	+161.6	+88.8	+309.4	-145.8	+70.2	-82.0	-113.0	-123.5	-146.5	-171.6
Equiv. cfs	-2.89	+44.4	+250	+137	+479	-226	+109	-127	-175	-191	-227	-265

Change for year -4,459 million gallons Equiv. for year -12.2 mgd Equiv. for year -18.9 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 1981	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1981 to date	Date 1982	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1981 to date
Dec. 1	336	168	72	760	Jan. 1	0	392	91	719
2	337	166	72	759	2	0	392	119	718
3	337	167	73	758	3	0	392	80	717
4	337	166	0	756	4	0	394	51	716
5	337	166	94	755	5	0	394	71	715
6	336	166	108	755	6	0	396	76	714
7	337	165	0	753	7	0	396	83	712
8	227	165	56	752	8	3	396	83	711
9	0	164	74	749	9	0	396	56	710
10	0	161	69	746	10	0	396	91	709
11	282	168	71	745	11	0	397	78	708
12	281	168	60	744	12	0	396	60	707
13	282	168	186	743	13	0	397	59	706
14	244	168	61	742	14	0	396	73	705
15	295	168	68	741	15	0	394	50	704
16	228	168	70	740	16	0	393	55	703
17	322	168	51	739	17	0	393	133	702
18	301	168	70	738	18	0	394	77	701
19	0	168	69	735	19	0	394	72	700
20	20	167	72	733	20	0	394	73	699
21	449	168	48	732	21	0	394	105	698
22	451	167	72	732	22	0	393	0	697
23	279	168	66	731	23	0	391	73	696
24	205	167	56	730	24	0	391	111	695
25	0	168	76	727	25	0	394	0	694
26	0	168	87	725	26	0	391	0	692
27	19	168	94	723	27	0	299	0	691
28	450	169	68	723	28	0	279	0	689
29	451	170	0	722	29	0	279	0	687
30	231	170	0	721	30	0	279	0	686
31	132	339	129	720	31	0	280	0	684
Total	7,506	5,355	2,092		Total	3	11,662	1,820	

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 June 1, 1981 to date	Date 1982	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1981 to date
Feb. 1	0	281	0	682	Mar. 1	0	0	0	639
2	0	282	0	681	2	0	0	0	636
3	0	281	0	679	3	0	0	0	634
4	0	283	0	678	4	135	0	0	632
5	0	283	0	676	5	331	0	0	631
6	0	283	0	675	6	331	0	0	630
7	0	283	0	673	7	331	0	0	629
8	0	283	0	671	8	336	282	99	629
9	0	281	0	670	9	337	341	124	630
10	0	284	119	669	10	337	341	90	630
11	0	283	93	668	11	337	342	83	631
12	0	284	0	666	12	337	343	48	631
13	0	284	0	665	13	337	343	82	632
14	0	284	0	663	14	336	343	167	632
15	0	284	0	662	15	337	344	63	633
16	0	284	0	660	16	337	344	20	633
17	0	284	0	659	17	335	344	55	633
18	0	285	0	657	18	334	344	38	634
19	0	284	0	656	19	337	345	84	634
20	0	285	0	655	20	338	344	102	635
21	0	285	0	653	21	337	344	211	636
22	0	284	0	652	22	336	344	88	636
23	0	284	0	651	23	336	345	18	636
24	0	285	0	649	24	337	346	96	637
25	0	285	0	648	25	211	345	98	637
26	0	75	0	646	26	0	346	81	636
27	0	0	0	643	27	0	347	85	635
28	0	0	0	641	28	0	347	112	635
					29	0	346	83	634
					30	0	224	6	633
					31	0	172	132	632
Total	0	7,163	212		Total	7,060	7,906	2,065	

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 June 1, 1981 to date	Date 1982	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1981 to date
Apr. 1	18	40	75	630	May 1	0	0	473	605
2	234	0	89	629	2	0	0	321	604
3	0	0	125	627	3	0	0	292	603
4	19	0	0	625	4	0	0	349	602
5	247	0	0	624	5	0	0	228	601
6	241	0	0	623	6	127	0	287	601
7	277	0	0	622	7	337	0	298	601
8	0	0	0	620	8	336	0	291	601
9	0	0	0	618	9	335	0	288	601
10	0	0	0	616	10	338	0	257	601
11	0	0	0	614	11	337	128	240	601
12	281	0	0	613	12	337	183	308	602
13	335	0	0	612	13	379	180	270	602
14	338	0	65	611	14	450	267	271	604
15	338	0	162	611	15	450	297	417	605
16	335	0	176	611	16	450	296	230	606
17	336	0	138	610	17	450	297	146	607
18	336	0	134	610	18	450	296	133	608
19	29	0	143	608	19	451	238	146	608
20	0	0	393	608	20	449	229	179	609
21	0	0	372	607	21	449	229	141	610
22	0	0	345	606	22	448	229	142	610
23	0	0	331	605	23	448	19	156	610
24	0	0	341	605	24	452	184	125	611
25	115	0	364	604	25	452	232	146	611
26	338	0	363	605	26	453	232	22	612
27	337	0	375	605	27	450	229	112	612
28	336	0	443	605	28	451	231	105	613
29	210	0	466	606	29	452	232	142	613
30	0	0	469	605	30	451	232	307	614
					31	452	232	171	615
Total	4,700	40	5,369		Total	10,634	4,692	6,993	

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 June 1, 1982 to date	Date 1982	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1982 to date
June 1	283	21	149	453	July 1	376	0	93	412
2	0	386	0	420	2	453	135	98	420
3	0	497	0	445	3	452	180	114	430
4	0	274	0	402	4	452	179	79	438
5	0	236	0	369	5	453	179	3	444
6	0	237	0	347	6	450	219	95	453
7	0	4	0	298	7	446	231	107	462
8	0	0	0	261	8	451	231	97	470
9	0	0	0	232	9	451	287	111	480
10	126	0	0	221	10	451	296	21	487
11	337	0	0	232	11	451	296	268	500
12	338	0	0	241	12	447	296	92	508
13	337	0	0	248	13	448	296	107	516
14	335	212	104	277	14	447	295	102	523
15	335	230	107	303	15	455	295	107	531
16	336	230	99	326	16	452	295	109	538
17	338	229	97	346	17	453	295	110	545
18	335	229	99	363	18	454	294	81	551
19	335	229	96	379	19	446	294	107	557
20	335	230	104	393	20	446	294	81	562
21	335	21	113	397	21	445	293	83	567
22	339	0	100	399	22	451	293	83	572
23	337	0	91	400	23	450	294	86	577
24	333	0	109	402	24	447	293	112	582
25	337	0	113	404	25	448	293	147	588
26	337	0	83	404	26	451	293	117	592
27	337	0	116	406	27	453	190	227	597
28	334	0	174	410	28	452	176	136	600
29	332	0	50	409	29	450	175	108	602
30	337	0	96	410	30	450	175	0	603
					31	450	175	74	604
Total	7,128	3,265	1,900		Total	13,881	7,537	3,155	

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 June 1, 1982 to date	Date 1982	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 1982 to date
Aug. 1	451	174	34	605	Sept. 1	451	0	103	630
2	450	172	58	606	2	451	0	90	629
3	450	173	72	608	3	452	0	90	628
4	450	173	143	610	4	451	0	102	627
5	450	172	148	613	5	450	0	159	627
6	450	172	108	614	6	451	0	63	626
7	450	172	91	616	7	447	0	99	625
8	450	171	78	617	8	447	0	73	624
9	449	170	105	619	9	449	0	216	625
10	450	171	97	620	10	449	0	95	624
11	448	177	0	620	11	449	0	137	623
12	450	172	101	621	12	449	0	0	622
13	451	175	99	623	13	452	0	58	621
14	450	174	142	625	14	449	0	93	620
15	452	174	146	627	15	452	0	97	619
16	450	173	113	628	16	451	67	106	619
17	450	173	96	629	17	451	0	100	619
18	450	173	101	631	18	450	0	135	618
19	450	173	100	632	19	451	0	119	618
20	450	173	95	633	20	449	0	34	617
21	449	173	119	634	21	449	0	0	615
22	449	172	106	635	22	451	0	0	614
23	448	174	93	636	23	451	0	92	613
24	457	173	104	637	24	457	0	280	614
25	447	18	29	636	25	458	0	242	615
26	449	0	104	635	26	458	0	48	614
27	451	0	146	634	27	447	0	98	614
28	451	0	111	633	28	442	0	113	613
29	451	0	106	633	29	441	0	106	613
30	447	0	113	632	30	441	0	107	612
31	450	0	103	631					
Total	13,950	4,167	3,061		Total	13,496	67	3,055	

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 June 1, 1982 to date	Date 1982	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	*Average to date June 1 - Nov. 12 or Nov.13-30
Oct. 1	445	0	105	611	Nov. 1	575	455	275	636
2	445	0	106	611	2	575	455	302	641
3	444	0	112	611	3	573	454	341	645
4	345	0	106	609	4	573	454	348	650
5	325	0	96	608	5	567	453	321	654
6	452	0	95	607	6	566	453	292	658
7	453	0	108	607	7	566	453	307	663
8	450	0	119	607	8	571	451	272	667
9	450	0	99	606	9	572	453	276	670
10	450	0	102	606	10	576	451	275	674
11	449	0	102	605	11	575	451	289	678
12	450	0	95	605	12	479	407	265	681
13	451	0	97	605	13	451	0	214	665
14	451	0	108	604	14	451	0	205	660
15	449	0	102	604	15	449	0	187	652
16	449	0	124	604	16	448	0	214	655
17	448	0	94	603	17	447	0	207	655
18	448	134	106	604	18	450	0	228	658
19	448	169	100	605	19	457	0	201	658
20	447	168	98	605	20	457	0	200	658
21	448	168	104	606	21	458	0	189	657
22	446	167	102	607	22	457	0	192	656
23	446	166	122	608	23	426	0	206	654
24	446	166	98	608	24	450	0	184	652
25	583	166	107	610	25	450	330	194	677
26	578	311	199	613	26	450	76	204	681
27	578	317	197	617	27	449	0	221	680
28	574	317	204	620	28	449	0	236	680
29	571	441	219	624	29	451	0	210	679
30	594	476	174	628	30	451	0	215	679
31	571	458	194	632					
Total	14,584	3,624	3,794		Total	14,869	5,796	7,270	

* Average of combined diversions under Section III A 3 of Amended Decree to November 12. Beginning November 13, average was computed by number of elapsed days.

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	Credit	Directed
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	deficiency cfs	reduction cfs	release cfs
1981/82	1	2	3	4		5	6	7	8
MONTAGUE DESIGN RATE = 1,750 CFS DECEMBER 1, 1981 TO JUNE 14, 1982									
December 1-24, estimated Montague discharge greater than 1,750 cfs									
Dec. 21	0	0	1,500	0	Dec. 25	1,500	250	-50	200
22	0	0	1,490	50	26	1,540	210	-50	160
December 27, 1981 to May 22, 1982, estimated Montague discharge greater than 1,750 cfs									
May 20	0	0	1,180	87	May 23	1,267	483		483
21	0	0	1,150	336	24	1,466	264		264
May 25 to June 14, estimated Montague discharge greater than 1,750 cfs									
Total	0	0	5,320	473		5,793	1,207	-100	1,107

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index and key gaging stations.
Col. 4 - Computed increase in runoff based on precipitation and temperature forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,750 cfs - Col. 5, except total.
Col. 7 - Credit reduction terminated Apr. 27.
Col. 8 = Col. 6 - Col. 7.

Note. - Releases designed on basis of Montague rate following letter of May 27, 1981 from representatives of parties to the Amended Decree. Release credit reduction applied following Delaware River Basin Commission Conservation Order No. 9 until April 27.

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 Reservoir cfs	Uncontrolled runoff: Present conditions cfs	Uncontrolled runoff: Weather adjustment cfs	Date	Discharge cfs	Indicated deficiency cfs	Balancing adjustment cfs	Directed release cfs	Computations for 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
1982	1	2	3	4		5	6	7	8	9	10	11	12	13	14
MONTAGUE DESIGN RATE = 1,850 CFS JUNE 15 TO NOVEMBER 12, EXCEPT SEPTEMBER 25 TO OCTOBER 2; OCTOBER 5-9, 12-16, 19-23, 26, 27 WHEN DESIGN RATE = 1,750 CFS June 15 to July 10, estimated Montague discharge greater than 1,850 cfs															
July 8	0	0	1,221	0	July 11	1,221	629	-	629	629	629	673	673	-44	4
9	0	86	1,062	31	12	1,179	671	-	671	671	1,300	687	1,360	-60	6
10	436	324	895	133	13	1,788	62	-	62	62	1,362	0	1,360	2	0
11	436	324	803	152	14	1,715	135	-	135	135	1,497	0	1,360	137	-14
12	436	324	931	13	15	1,704	146	4	150	150	1,647	0	1,360	287	-29
13	436	324	934	14	16	1,708	142	6	148	148	1,795	0	1,360	435	-44
14	436	324	846	0	17	1,606	244	0	244	244	2,039	39	1,399	640	-64
15	0	0	1,034	70	18	1,104	746	-14	732	732	2,771	777	2,176	595	-60
16	0	108	840	92	19	1,040	810	-29	781	781	3,552	801	2,977	575	-58
17	436	324	751	137	20	1,648	202	-44	158	158	3,710	0	2,977	733	-73
18	436	270	645	156	21	1,507	343	-64	279	279	3,989	0	2,977	1,012	-100
19	436	378	626	167	22	1,607	243	-60	183	183	4,172	0	2,977	1,195	-100
20	436	324	685	1,752	23	3,197	0	-58	0	0	4,172	83	3,060	1,112	-100
21	436	216	860	0	24	1,512	338	-73	265	265	4,437	254	3,314	1,123	-100
22	0	0	722	20	25	742	1,108	-100	1,008	1,008	5,445	1,171	4,485	960	-96
23	0	108	681	17	26	806	1,044	-100	944	944	6,389	1,316	5,801	588	-59
24	436	324	605	30	27	1,395	455	-100	355	355	6,744	481	6,282	462	-46
25	0	324	544	57	28	925	925	-100	825	825	7,569	810	7,092	477	-48
26	0	324	489	57	29	870	980	-96	884	884	8,453	728	7,820	633	-63
27	0	324	466	388	30	1,178	672	-59	613	613	9,066	703	8,523	543	-54
28	0	324	595	454	31	1,373	477	-46	431	431	9,497	840	9,363	134	-13
Total	4,796	5,054	16,235	3,740		29,825	10,372		9,497	9,497		9,363			

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 precipitation forecasts.

Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,850 cfs - Col. 5, except total.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = Col. 6 + Col. 7, when positive and/or Col. 5 is equal to design rate or less; 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.)
Col. 12 = Summation of Col. 11.
Col. 14 = Col. 13 divided by minus 10.

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
1982	1	2	3	4		5	6	7	8	9	10	11	12	13	14
July 29	0	216	649	60	Aug. 1	925	925	-48	877	877	10,374	1,144	10,507	-133	13
30	0	108	613	43	2	764	1,086	-63	1,023	1,023	11,397	1,228	11,735	-338	34
31	165	324	579	0	3	1,068	782	-54	728	728	12,125	996	12,731	-606	61
Aug. 1	165	324	677	0	4	1,166	684	-13	671	671	12,796	919	13,650	-854	85
2	165	324	625	80	5	1,194	656	13	669	669	13,465	990	14,640	-1,175	118
3	165	324	585	0	6	1,074	776	34	810	810	14,275	954	15,594	-1,319	100
4	165	162	545	16	7	888	962	61	1,023	1,023	15,298	1,116	16,710	-1,412	100
5	0	0	542	0	8	542	1,308	85	1,393	1,393	16,691	1,454	18,164	-1,473	100
6	0	0	531	0	9	531	1,319	118	1,437	1,437	18,128	1,229	19,393	-1,265	100
7	165	162	505	54	10	886	964	100	1,064	1,064	19,192	386	19,779	-587	59
8	165	108	504	114	11	891	959	100	1,059	1,059	20,251	547	20,326	-75	8
9	165	135	596	61	12	957	893	100	993	993	21,244	755	21,081	163	-16
10	165	162	589	0	13	916	934	100	1,034	1,034	22,278	910	21,991	287	-29
11	165	162	580	0	14	907	943	59	1,002	1,002	23,280	1,067	23,058	222	-22
12	0	0	580	0	15	580	1,270	8	1,278	1,278	24,558	1,351	24,409	149	-15
13	0	0	535	0	16	535	1,315	-16	1,299	1,299	25,857	1,426	25,835	22	-2
14	165	162	478	0	17	805	1,045	-29	1,016	1,016	26,873	1,177	27,012	-139	14
15	165	108	474	2	18	749	1,101	-22	1,079	1,079	27,952	1,108	28,120	-168	17
16	165	108	436	6	19	715	1,135	-15	1,120	1,120	29,072	1,077	29,197	-125	12
17	165	162	430	22	20	779	1,071	-2	1,069	1,069	30,141	1,035	30,232	-91	9
18	165	162	490	16	21	833	1,017	14	1,031	1,031	31,172	1,052	31,284	-112	11
19	0	0	428	48	22	476	1,374	17	1,391	1,391	32,563	1,429	32,713	-150	15
20	0	0	438	82	23	520	1,330	12	1,342	1,342	33,905	1,547	34,260	-355	36
21	165	162	447	0	24	774	1,076	9	1,085	1,085	34,990	1,233	35,493	-503	50
22	165	162	427	13	25	767	1,083	11	1,094	1,094	36,084	1,082	36,575	-491	49
23	165	162	387	20	26	734	1,116	15	1,131	1,131	37,215	1,070	37,645	-430	43
24	165	162	375	695	27	1,397	453	36	489	489	37,704	907	38,552	-848	85
25	165	162	381	206	28	914	936	50	986	986	38,690	1,110	39,662	-972	97
26	0	0	453	22	29	475	1,375	49	1,424	1,424	40,114	1,537	41,199	-1,085	100
27	0	0	463	20	30	483	1,367	43	1,410	1,410	41,524	1,583	42,782	-1,258	100
28	165	162	460	84	31	871	979	85	1,064	1,064	42,588	1,306	44,088	-1,500	100
Total	3,465	4,185	15,802	1,664		25,116	32,234		33,091	33,091		34,725			

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 precipitation forecasts.

Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,850 cfs - Col. 5, except total.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = Col. 6 + Col. 7, when positive and/or Col. 5 is equal to design rate or less; 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.)
Col. 12 = Summation of Col. 11.
Col. 14 = Col. 13 divided by minus 10.

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	Powerplant release forecasts: Mongaup Reservoir	Uncontrolled runoff: Present conditions	Uncontrolled runoff: Weather adjustment	Date	Discharge	Indicated deficiency	Balancing adjustment	Directed release	Computations for balancing adjustment: Directed release: Daily	Directed release: Cumulative	Actual deficiency: Daily	Actual deficiency: Cumulative	Cumulative difference Col. 10 - Col. 12	Balancing adjustment
	cfs	cfs	cfs	cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs-days	cfs
1982	1	2	3	4		5	6	7	8	9	10	11	12	13	14
Aug. 29	165	162	422	103	Sept. 1	852	998	97	1,095	1,095	43,683	1,396	45,484	-1,801	100
30	165	162	376	101	2	804	1,046	100	1,146	1,146	44,829	1,182	46,666	-1,837	100
31	165	162	363	109	3	799	1,051	100	1,151	1,151	45,980	1,095	47,761	-1,781	100
Sept. 1	165	162	416	26	4	769	1,081	100	1,181	1,181	47,161	1,054	48,815	-1,654	100
2	0	0	369	48	5	417	1,433	100	1,533	1,533	48,694	1,495	50,310	-1,616	100
3	0	0	450	0	6	450	1,400	100	1,500	1,500	50,194	1,481	51,791	-1,597	100
4	0	0	383	0	7	383	1,467	100	1,567	1,567	51,761	1,626	53,417	-1,656	100
5	110	162	369	28	8	669	1,181	100	1,281	1,281	53,042	1,407	54,824	-1,782	100
6	110	162	320	98	9	690	1,160	100	1,260	1,260	54,302	1,365	56,189	-1,887	100
7	110	162	298	9	10	579	1,271	100	1,371	1,371	55,673	1,312	57,501	-1,828	100
8	110	162	284	0	11	556	1,294	100	1,394	1,394	57,067	1,292	58,793	-1,726	100
9	0	0	286	0	12	286	1,564	100	1,664	1,664	58,731	1,542	60,335	-1,604	100
10	0	0	266	31	13	297	1,553	100	1,653	1,653	60,384	1,468	61,803	-1,419	100
11	110	162	261	0	14	533	1,317	100	1,417	1,417	61,801	1,250	63,053	-1,252	100
12	110	324	245	0	15	679	1,171	100	1,271	1,271	63,072	1,338	64,391	-1,319	100
13	110	324	225	127	16	786	1,064	100	1,164	1,164	64,236	1,196	65,587	-1,351	100
14	110	324	245	123	17	802	1,048	100	1,148	1,148	65,384	1,228	66,815	-1,431	100
15	110	162	250	66	18	588	1,262	100	1,362	1,362	66,746	1,331	68,146	-1,400	100
16	0	0	269	0	19	269	1,581	100	1,681	1,681	68,427	1,710	69,856	-1,429	100
17	0	0	267	37	20	304	1,546	100	1,646	1,646	70,073	1,696	71,552	-1,479	100
18	110	162	251	52	21	575	1,275	100	1,375	1,375	71,448	1,398	72,950	-1,502	100
19	110	162	248	99	22	619	1,231	100	1,331	1,331	72,779	1,325	74,275	-1,496	100
20	110	162	227	109	23	608	1,242	100	1,342	1,342	74,121	1,267	75,542	-1,421	100
21	110	162	268	45	24	585	1,265	100	1,365	1,365	75,486	1,334	76,876	-1,390	100
22	110	162	246	55	25	573	1,177	100	1,277	1,277	76,763	1,318	78,194	-1,431	100
23	0	0	276	29	26	305	1,445	100	1,545	1,545	78,308	1,527	79,721	-1,413	100
24	0	0	302	40	27	342	1,408	100	1,508	1,508	79,816	1,313	81,034	-1,218	100
25	110	0	297	289	28	696	1,054	100	1,154	1,154	80,970	1,097	82,131	-1,161	100
26	110	0	278	424	29	812	938	100	1,038	1,038	82,008	1,194	83,325	-1,317	100
27	110	0	300	73	30	483	1,267	100	1,367	1,367	83,375	1,256	84,581	-1,206	100
Total	2,530	3,402	9,057	2,121		17,110	37,790	2,997	40,787	40,787		40,493			

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 precipitation forecasts.

Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,850 cfs - Col. 5, Sept. 1-24;
1,750 cfs - Col. 5, Sept. 25-30, except total.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = Col. 6 + Col. 7, when positive and/or Col. 5 is equal to design rate or less; otherwise Col. 8 = 0.

Col. 9 = Col. 8.
Col. 10 = Summation of Col. 9.
Col. 11 = 1,850 (or 1,750 as noted for Col. 6) - (Col. 9 + Col. 10 from Table 13).
Col. 12 = Summation of Col. 11.
Col. 14 = Col. 13 divided by minus 10.

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 cfs	Mongaup Reservoir cfs	Present conditions cfs	Weather adjustment cfs	Date	Discharge cfs	cfs	cfs	cfs	Daily cfs	Cumulative cfs	Daily cfs	Cumulative cfs	cfs-days	cfs
1982	1	2	3	4		5	6	7	8	9	10	11	12	13	14
Sept. 28	110	0	329	0	Oct. 1	439	1,311	100	1,411	1,411	84,786	1,205	85,786	-1,000	100
29	110	0	325	0	2	435	1,315	100	1,415	1,415	86,201	1,237	87,023	-822	82
30	0	0	295	0	3	295	1,555	100	1,655	1,655	87,856	1,611	88,634	-778	78
Oct. 1	0	0	276	20	4	296	1,554	100	1,654	1,654	89,510	1,652	90,286	-776	78
2	110	0	282	31	5	423	1,327	100	1,427	1,427	90,937	1,423	91,709	-772	77
3	110	0	263	0	6	373	1,377	82	1,459	1,459	92,396	1,331	93,040	-644	64
4	110	0	250	0	7	360	1,390	78	1,468	1,468	93,864	1,450	94,490	-626	63
5	110	0	257	104	8	471	1,279	78	1,357	1,357	95,221	1,392	95,882	-661	66
6	110	0	248	72	9	430	1,320	77	1,397	1,397	96,618	1,358	97,240	-622	62
7	0	0	246	54	10	300	1,550	64	1,614	1,614	98,232	1,663	98,903	-671	87
8	0	0	243	0	11	243	1,607	63	1,670	1,670	99,902	1,661	100,564	-662	66
9	110	0	245	0	12	355	1,395	66	1,461	1,461	101,363	1,391	101,955	-592	59
10	110	81	246	38	13	475	1,275	62	1,337	1,337	102,700	1,323	103,278	-578	58
11	110	162	250	39	14	561	1,189	67	1,256	1,256	103,956	1,223	104,501	-545	54
12	110	162	246	713	15	1,231	519	66	585	585	104,541	845	105,346	-805	80
13	110	0	258	250	16	618	1,132	59	1,191	1,191	105,732	1,379	106,725	-993	99
14	0	0	270	0	17	270	1,580	58	1,638	1,638	107,370	1,455	108,180	-810	81
15	0	0	289	0	18	289	1,561	54	1,615	1,615	108,985	1,520	109,700	-715	72
16	221	0	340	0	19	561	1,189	80	1,269	1,269	110,254	1,093	110,793	-539	54
17	221	0	353	0	20	574	1,176	99	1,275	1,275	111,529	1,028	111,821	-292	29
18	221	0	306	0	21	527	1,223	81	1,304	1,304	112,833	1,110	112,931	-98	10
19	221	0	315	260	22	796	954	72	1,026	1,026	113,859	1,051	113,982	-123	12
20	221	0	295	71	23	587	1,163	54	1,217	1,217	115,076	1,132	115,114	-38	4
21	0	0	322	0	24	322	1,528	29	1,557	1,557	116,633	1,571	116,685	-52	5
22	0	0	322	0	25	322	1,528	10	1,538	1,538	118,171	1,574	118,259	-88	9
23	221	0	302	0	26	523	1,227	12	1,239	1,239	119,410	1,107	119,386	44	-4
24	221	0	279	0	27	500	1,250	4	1,254	1,254	120,864	1,153	120,519	145	-14
25	221	0	270	32	28	523	1,327	5	1,332	1,332	121,996	1,260	121,779	217	-22
26	221	0	275	0	29	496	1,354	9	1,363	1,363	123,359	1,278	123,057	302	-30
27	221	0	268	0	30	489	1,361	-4	1,357	1,357	124,716	1,265	124,322	394	-39
28	0	0	268	123	31	391	1,459	-14	1,445	1,445	126,161	1,554	125,876	285	-28
Total	3,530	405	8,733	1,807		14,475	40,975	1,811	42,786	42,786		41,295			

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 precipitation forecasts.

Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 8 = 1,850 cfs - Col. 5, except 1,750 cfs - Col. 5 Oct. 1,2, 5-9, 12-16, 19-23, 26, 27 and total.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = Col. 6 + Col. 7, when positive and/or Col. 5 is equal to design rate or less; otherwise Col. 8 = 0.

Col. 9 = Col. 8.
Col. 10 = Summation of Col. 9.
Col. 11 = 1,850 (or 1,750 as noted for Col. 6) - (Col. 9 + Col. 10 from Table 13).
Col. 12 = Summation of Col. 11.
Col. 14 = Col. 13 divided by minus 10.

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
1982	1	2	3	4		5	6	7	8	9	10	11	12	13	14
Oct. 29	0	0	268	86	Nov. 1	354	1,496	-22	1,474	1,474	127,635	1,526	127,402	233	-23
30	0	0	285	90	2	375	1,475	-30	1,445	1,445	129,080	1,442	128,844	236	-24
31	0	0	255	94	3	349	1,501	-39	1,462	1,462	130,542	1,500	130,344	198	-20
Nov. 1	0	0	273	391	4	664	1,186	-28	1,158	1,158	131,700	1,349	131,693	7	-1
2	0	0	327	564	5	891	959	-23	936	936	132,636	464	132,157	479	-48
3	0	0	335	992	6	1,327	523	-24	499	499	133,135	159	132,316	819	-82
4	0	0	306	1,555	7	1,861	0	-20	0	0	133,135	173	132,489	646	-65
5	0	0	1,232	0	8	1,232	618	-1	617	617	133,752	757	133,246	506	-51
6	0	0	1,091	0	9	1,091	759	-48	711	711	134,463	988	134,234	229	-23
7	0	0	1,016	7	10	1,023	827	-82	745	745	135,208	1,144	135,378	-170	17
8	0	0	646	0	11	646	1,204	-65	1,139	1,139	136,347	1,364	136,742	-395	40
9	0	0	573	41	12	614	1,236	-51	1,185	1,185	137,532	1,249	137,991	-459	46
MONTAGUE DESIGN RATE = 1,655 CFS NOVEMBER 13-30															
10	0	0	504	44	13	548	1,107		1,107						
11	0	0	466	275	14	741	914		914						
12	0	0	504	356	15	860	795		795						
13	0	0	921	0	16	921	734		734						
14	0	0	971	0	17	971	684		684						
15	0	0	933	0	18	933	722		722						
16	0	0	876	0	19	876	779		779						
17	0	0	794	74	20	868	787		787						
18	0	0	683	50	21	733	922		922						
19	0	0	661	73	22	734	921		921						
20	0	0	641	161	23	802	853		853						
21	0	0	689	165	24	854	801		801						
22	0	0	767	448	25	1,215	440		440						
23	0	0	1,404	120	26	1,524	131		131						
24	0	0	1,420	0	27	1,420	235		235						
25	0	0	1,474	0	28	1,474	181		181						
26	0	0	1,315	24	29	1,339	316		316						
27	50	0	1,253	70	30	1,373	282		282						
Total	50	0	22,883	5,680		28,613	23,388	-433	22,975	11,371			12,115		

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 precipitation forecasts.

Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = 1,850 cfs - Col. 5, Nov. 1-12;
1,655 cfs - Col. 5, Nov. 13-30.
Col. 7 = Col. 14 (4 days earlier), Nov. 1-12.
Col. 8 = Col. 6 + Col. 7, when positive and/or Col. 5 is equal to design rate or less; otherwise Col. 8 = 0; Nov. 1-12.
Col. 8 = Col. 6, Nov. 13-30.

Col. 9 = Col. 8, Nov. 1-12.
Col. 10 = Summation of Col. 9.
Col. 11 = 1,850 - (Col. 9 + Col. 10 from Table 13).
Col. 12 = Summation of Col. 11.
Col. 14 = Col. 13 divided by minus 10.

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						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
1981	1	2	3	4		5	6		7	8	9	10	11	12	13
Nov. 28	0	51	39	28	Nov. 30	0	108	Dec. 1	0	118	108	1,824	2,050	0	2,203
29	0	51	39	26	Dec. 1	0	286	2	0	116	286	2,048	2,450	0	2,203
30	0	51	37	26	2	0	254	3	0	114	254	3,172	3,540	0	2,203
Dec. 1	0	53	37	25	3	0	270	4	0	115	270	3,735	4,120	0	2,203
2	0	51	37	25	4	0	194	5	0	113	194	3,293	3,600	0	2,203
3	0	53	39	25	5	0	97	6	0	117	97	2,976	3,190	0	2,203
4	0	50	39	25	6	0	49	7	0	114	49	2,607	2,770	0	2,203
5	0	50	37	25	7	0	130	8	0	112	130	2,448	2,890	0	2,203
6	0	51	37	25	8	0	211	9	0	113	211	2,526	2,850	0	2,203
7	0	51	37	25	9	0	216	10	0	113	216	2,241	2,570	0	2,203
8	0	51	39	25	10	0	173	11	0	115	173	2,232	2,520	0	2,203
9	0	51	39	25	11	0	86	12	0	115	86	2,119	2,320	0	2,203
10	0	50	39	25	12	0	0	13	0	114	0	1,986	2,100	0	2,203
11	0	51	39	25	13	0	0	14	0	115	0	1,725	1,840	0	2,203
12	0	51	39	25	14	0	0	15	0	115	0	1,885	2,000	0	2,203
13	0	50	39	25	15	0	54	16	0	114	54	1,932	2,100	0	2,203
14	0	51	37	25	16	0	167	17	0	113	167	2,120	2,400	0	2,203
15	0	51	39	25	17	0	151	18	0	115	151	1,934	2,200	0	2,203
16	0	53	39	25	18	0	124	19	0	117	124	1,709	1,950	0	2,203
17	0	50	37	25	19	0	0	20	0	112	0	1,288	1,400	0	2,203
18	0	50	37	25	20	0	0	21	0	112	0	1,188	1,300	0	2,203
19	0	51	39	25	21	0	16	22	0	115	16	1,269	1,400	0	2,203
20	0	53	39	25	22	0	302	23	0	117	302	2,381	2,800	0	2,203
					23	0	140	24			140	3,160	3,300	0	2,203
21	200	50	125	25	24	0	70	25	200	0	70	4,530	4,800	-50	2,153
22	160	50	87	25	25	0	0	26	162	0	0	3,838	4,000	-50	2,103
23	0	51	39	25	26	0	0	27	0	115	0	3,285	3,400	0	2,103
24	0	48	39	25	27	0	65	28	0	112	65	3,023	3,200	0	2,103
25	0	50	39	25	28	0	259	29	0	114	259	3,127	3,500	0	2,103
26	0	50	39	25	29	0	194	30	0	114	194	2,592	2,900	0	2,103
27	0	51	39	25	30	0	113	31	0	115	113	2,372	2,600	0	2,103
Total	360	1,525	1,286	755		0	3,729		362	3,204	3,729	76,565	83,860		

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. 25, 26.
Col. 8 = Col. 2 + Col. 3 + Col. 4 Dec. 1-23, 27-31.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.
Col. 12 - Reduction of credits for releases following DRBC Conservation Order No. 9.
Col. 13 - Cumulation of credits July 22 to November 30, 1981 = 2,203 cfs-days.

Note: Computational time of transit from New York reservoirs to Montague was increased 24 hours beginning Dec. 25 (Montague date); 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						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
1981/82	1	2	3	4		5	6		7	8	9	10	11	12	13
Dec. 28	0	51	39	25	Dec. 31	0	173	Jan. 1	0	115	173	2,362	2,650	0	2,103
29	0	51	39	25	Jan. 1	0	0	2	0	115	0	2,685	2,800	0	2,103
30	0	51	39	25	2	0	0	3	0	115	0	2,985	3,100	0	2,103
31	0	51	39	25	3	0	86	4	0	115	86	3,399	3,600	0	2,103
Jan. 1	0	53	39	25	4	146	254	5	0	117	400	8,883	9,400	0	2,103
2	0	53	39	25	5	3	362	6	0	117	365	10,018	10,500	0	2,103
3	0	53	39	25	6	0	319	7	0	117	319	8,094	8,530	0	2,103
4	0	50	39	25	7	0	319	8	0	114	319	6,497	6,930	0	2,103
5	0	53	39	25	8	0	265	9	0	117	265	5,218	5,600	0	2,103
6	0	50	40	25	9	0	0	10	0	115	0	4,385	4,500	0	2,103
7	0	53	40	25	10	0	59	11	0	118	59	3,023	3,200	0	2,103
8	0	51	40	25	11	233	281	12	0	116	514	2,470	3,100	0	2,103
9	0	50	40	25	12	247	265	13	0	115	512	2,773	3,400	0	2,103
10	0	53	36	25	13	242	265	14	0	114	507	3,079	3,700	0	2,103
11	0	51	32	25	14	0	297	15	0	108	297	3,295	3,700	0	2,103
12	0	50	32	25	15	0	173	16	0	107	173	3,120	3,400	0	2,103
13	0	50	32	25	16	0	0	17	0	107	0	2,993	3,100	0	2,103
14	0	50	32	25	17	166	49	18	0	107	215	2,478	2,800	0	2,103
15	0	54	32	25	18	64	286	19	0	111	350	2,439	2,900	0	2,103
16	0	50	32	25	19	0	200	20	0	107	200	2,393	2,700	0	2,103
17	0	50	32	25	20	0	254	21	0	107	254	2,439	2,800	0	2,103
18	0	50	32	25	21	0	270	22	0	107	270	2,223	2,600	0	2,103
19	0	50	32	25	22	14	351	23	0	107	365	2,228	2,700	0	2,103
20	0	50	32	25	23	0	173	24	0	107	173	2,320	2,600	0	2,103
21	0	50	32	25	24	0	86	25	0	107	86	2,007	2,200	0	2,103
22	0	50	31	25	25	0	243	26	0	106	243	1,951	2,300	0	2,103
23	0	50	32	25	26	81	275	27	0	107	356	1,837	2,300	0	2,103
24	0	50	37	25	27	0	270	28	0	112	270	1,818	2,200	0	2,103
25	0	50	40	25	28	0	248	29	0	115	248	1,737	2,100	0	2,103
26	0	50	39	32	29	0	86	30	0	121	86	1,793	2,000	0	2,103
27	0	50	40	23	30	0	0	31	0	113	0	1,587	1,700	0	2,103
Total	0	1,578	1,118	780		1,196	5,909		0	3,476	7,105	104,529	115,110		

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. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.
Col. 12 - Reduction of credits for releases following DRBC Conservation Order No. 9.
Col. 13 - Cumulation of credits July 22 to November 30, 1981 = 2,203 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						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
1982	1	2	3	4		5	6		7	8	9	10	11	12	13
Jan. 28	0	50	40	28	Jan. 31	0	81	Feb. 1	0	118	81	1,751	1,950	0	2,103
29	0	50	40	23	Feb. 1	0	324	2	0	113	324	2,363	2,800	0	2,103
30	0	50	39	25	2	0	211	3	0	114	211	4,175	4,500	0	2,103
31	0	50	40	23	3	0	383	4	0	113	383	7,504	8,000	0	2,103
Feb. 1	0	50	40	25	4	0	378	5	0	115	378	15,507	16,000	0	2,103
2	0	50	40	28	5	0	389	6	0	118	389	11,493	12,000	0	2,103
3	0	50	40	25	6	0	313	7	0	115	313	8,772	9,200	0	2,103
4	0	50	36	28	7	0	297	8	0	114	297	6,789	7,200	0	2,103
5	0	50	34	28	8	57	259	9	0	112	316	5,372	5,800	0	2,103
6	0	50	34	26	9	0	281	10	0	110	281	4,809	5,200	0	2,103
7	0	50	34	25	10	0	259	11	0	109	259	4,232	4,600	0	2,103
8	0	50	34	29	11	0	259	12	0	113	259	3,628	4,000	0	2,103
9	0	51	34	31	12	0	265	13	0	116	265	3,619	4,000	0	2,103
10	0	50	34	25	13	0	162	14	0	109	162	3,529	3,800	0	2,103
11	0	51	34	25	14	0	97	15	0	110	97	3,393	3,600	0	2,103
12	0	51	34	26	15	0	259	16	0	111	259	3,330	3,700	0	2,103
13	0	51	34	28	16	291	259	17	0	113	550	3,637	4,300	0	2,103
14	0	51	34	29	17	316	286	18	0	114	602	3,484	4,200	0	2,103
15	0	51	34	28	18	298	259	19	0	113	557	3,330	4,000	0	2,103
16	0	50	34	28	19	292	265	20	0	112	557	3,131	3,800	0	2,103
17	0	48	34	28	20	0	178	21	0	110	178	2,912	3,200	0	2,103
18	0	50	34	28	21	8	70	22	0	112	78	3,010	3,200	0	2,103
19	0	51	34	28	22	237	227	23	0	113	464	2,823	3,400	0	2,103
20	0	53	34	28	23	265	281	24	0	115	546	2,639	3,300	0	2,103
21	0	53	34	28	24	258	227	25	0	115	485	2,600	3,200	0	2,103
22	0	53	34	28	25	257	281	26	0	115	538	2,247	2,900	0	2,103
23	0	51	34	28	26	247	162	27	0	113	409	2,078	2,600	0	2,103
24	0	53	34	28	27	0	0	28	0	115	0	2,085	2,200	0	2,103
Total	0	1,418	995	757		2,526	6,712		0	3,170	9,238	124,242	136,650		

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.
Col. 8 = 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.
Col. 12 - Reduction of credits for releases following DRBC Conservation Order No. 9.
Col. 13 - Cumulation of credits July 22 to November 30, 1981 = 2,203 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						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
1982	1	2	3	4		5	6		7	8	9	10	11	12	13
Feb.25	0	48	34	28	Feb.28	0	113	Mar. 1	0	110	113	2,077	2,300	0	2,103
26	0	48	34	28	Mar. 1	253	194	2	0	110	447	2,243	2,800	0	2,103
27	0	51	34	28	2	248	173	3	0	113	421	2,066	2,600	0	2,103
28	0	51	34	28	3	220	265	4	0	113	485	1,702	2,300	0	2,103
Mar. 1	0	51	34	28	4	233	243	5	0	113	476	2,111	2,700	0	2,103
2	0	51	34	28	5	233	243	6	0	113	476	1,811	2,400	0	2,103
3	0	51	34	29	6	0	313	7	0	114	313	2,173	2,600	0	2,103
4	0	50	34	29	7	3	97	8	0	113	100	2,587	2,800	0	2,103
5	0	51	34	29	8	204	421	9	0	114	625	1,961	2,700	0	2,103
6	0	51	34	29	9	221	103	10	0	114	324	2,162	2,600	0	2,103
7	0	56	34	29	10	240	130	11	0	119	370	2,111	2,600	0	2,103
8	0	51	34	28	11	240	130	12	0	113	370	2,717	3,200	0	2,103
9	0	51	34	28	12	230	140	13	0	113	370	4,517	5,000	0	2,103
10	0	51	34	28	13	0	0	14	0	113	0	6,887	7,000	0	2,103
11	0	51	34	28	14	3	92	15	0	113	95	9,192	9,400	0	2,103
12	0	50	34	28	15	704	254	16	0	112	958	8,730	9,800	0	2,103
13	0	50	34	28	16	701	281	17	0	112	982	7,906	9,000	0	2,103
14	0	50	34	28	17	694	248	18	0	112	942	7,346	8,400	0	2,103
15	0	51	34	28	18	694	367	19	0	113	1,061	9,326	10,500	0	2,103
16/17	0	100	68	56	19	700	308	20	0	224	1,008	10,368	11,600	0	2,103
18	0	50	34	28	20	0	281	21	0	112	281	12,307	12,700	0	2,103
19	0	50	34	28	21	0	297	22	0	112	297	13,691	14,100	0	2,103
20	0	50	34	28	22	956	367	23	0	112	1,325	12,863	14,300	0	2,103
21	0	51	36	28	23	4	373	24	0	115	377	13,308	13,800	0	2,103
22	0	50	36	28	24	997	497	25	0	114	1,494	13,592	15,200	0	2,103
23	0	54	36	28	25	960	513	26	0	118	1,493	18,789	20,400	0	2,103
24	0	51	34	28	26	940	502	27	0	113	1,442	21,545	23,100	0	2,103
25	0	50	36	28	27	870	486	28	0	114	1,356	14,330	15,800	0	2,103
26	0	51	36	28	28	872	513	29	0	115	1,385	10,700	12,200	0	2,103
27	0	50	36	28	29	875	502	30	0	114	1,377	9,209	10,700	0	2,103
28	0	53	39	28	30	853	524	31	0	120	1,377	9,103	10,600	0	2,103
Total	0	1,624	1,105	901		13,170	8,970		0	3,630	22,140	239,430	265,200		

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. 7 - Col. 8 - Col. 9.
Col. 11 - 24 hours of calendar day shown.
Col. 12 - Reduction of credits for releases following DRBC Conservation Order No. 9.
Col. 13 - Cumulation of credits July 22 to November 30, 1981 = 2,203 cfs-days.

Note: Computational time of transit from New York City reservoirs to Montague was decreased 24 hours on March 20 (Montague date); 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						Credits	
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				Daily	Cumulative
1982	1	2	3	4		5	6		7	8	9	10	11	12	13
Mar. 29	0	70	45	51	Mar. 31	883	524	Apr. 1	0	166	1,407	15,527	17,100	0	2,103
30	0	70	45	53	Apr. 1	875	437	2	0	168	1,312	18,120	19,600	0	2,103
31	0	71	45	48	2	875	497	3	0	164	1,372	14,464	16,000	0	2,103
Apr. 1	0	70	45	50	3	877	475	4	0	165	1,352	27,583	29,100	0	2,103
2	0	68	45	48	4	928	535	5	0	161	1,463	22,976	24,600	0	2,103
3	0	71	45	51	5	943	486	6	0	167	1,429	17,304	18,900	0	2,103
4	0	70	45	57	6	959	459	7	0	172	1,418	14,410	16,000	0	2,103
5	0	70	45	54	7	961	443	8	0	169	1,404	12,027	13,600	0	2,103
6	0	70	45	50	8	961	508	9	0	165	1,469	10,166	11,800	0	2,103
7	0	71	45	50	9	961	502	10	0	166	1,463	8,971	10,600	0	2,103
8	0	70	45	50	10	958	502	11	0	165	1,460	8,675	10,300	0	2,103
9	0	68	45	50	11	964	518	12	0	163	1,482	8,455	10,100	0	2,103
10	0	70	45	51	12	964	394	13	0	166	1,358	7,996	9,520	0	2,103
11	0	70	45	51	13	961	470	14	0	166	1,431	7,923	9,520	0	2,103
12	0	71	70	51	14	964	373	15	0	192	1,337	7,891	9,420	0	2,103
13	0	71	45	51	15	962	346	16	0	167	1,308	7,655	9,130	0	2,103
14	0	68	45	51	16	634	248	17	0	164	882	7,734	8,780	0	2,103
15	0	68	45	51	17	0	0	18	0	164	0	19,136	19,300	0	2,103
16	0	68	45	51	18	963	394	19	0	164	1,357	21,179	22,700	0	2,103
17	0	68	45	51	19	964	508	20	0	164	1,472	15,464	17,100	0	2,103
18	0	70	45	51	20	963	497	21	0	166	1,460	12,774	14,400	0	2,103
19	0	70	45	51	21	964	508	22	0	166	1,472	10,362	12,000	0	2,103
20	0	71	45	51	22	964	497	23	0	167	1,461	8,672	10,300	0	2,103
21	0	71	45	51	23	963	340	24	0	167	1,303	7,820	9,290	0	2,103
22	0	70	45	51	24	962	400	25	0	166	1,362	7,122	8,650	0	2,103
23	0	70	45	52	25	966	356	26	0	167	1,322	6,651	8,140	0	2,103
24	0	69	45	51	26	942	513	27	0	165	1,455	8,380	10,000	0	2,103
25	0	70	45	51	27	939	443	28	0	166	1,382	9,552	11,100		
26	0	70	45	51	28	962	497	29	0	166	1,459	7,995	9,620		
27	0	70	45	51	29	962	329	30	0	166	1,291	6,693	8,150		
Total	0	2,094	1,375	1,531		27,144	12,999		0	5,000	40,143	359,677	404,820		

Col. 2 - 24 hours beginning 1200 of date shown, except 23 hours Apr. 24.
Col. 3 - 24 hours ending 2400 one day later, except 23 hours Apr. 24.
Col. 4 - 24 hours beginning 1500 one day later, except 23 hours Apr. 23.
Col. 5 - 24 hours beginning 0800 of date shown, except 23 hours Apr. 24.
Col. 6 - 24 hours beginning 1200 of date shown, except 23 hours Apr, 24.
Col. 8 = 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 23 hours Apr. 25.
Col. 12 - Reduction of credits for releases following DRBC Conservation Order No. 9.
Col. 13 - Cumulation of credits July 22 to November 30, 1981 = 2,203 cfs-days. Credits concluded with termination of drought emergency Apr. 27 by DRBC Resolution No. 82-4.

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			Computed uncontrolled	Total	
Date	Amount								N.Y.C. reservoirs Directed	N.Y.C. reservoirs Other	Powerplants			
1982	1	2	3	4		5	6		7	8	9	10	11	
Apr. 28	0	88	45	51	Apr. 30	957	286	May 1	0	184	1,243	5,803	7,230	
29	0	73	45	51	May 1	432	259	2	0	169	691	5,480	6,340	
30	0	73	45	51	2	835	157	3	0	169	992	5,059	6,220	
May 1	0	71	45	51	3	833	535	4	0	167	1,368	4,685	6,220	
2	0	73	45	51	4	835	329	5	0	169	1,164	4,347	5,680	
3	0	68	45	51	5	629	286	6	0	164	915	3,981	5,060	
4	0	70	45	51	6	580	319	7	0	166	899	3,695	4,760	
5	0	77	45	50	7	386	227	8	0	172	613	3,455	4,240	
6	0	68	45	51	8	0	0	9	0	164	0	3,236	3,400	
7	0	68	45	51	9	0	43	10	0	164	43	2,913	3,120	
8	0	70	45	51	10	242	302	11	0	166	544	2,710	3,420	
9	0	70	45	51	11	238	221	12	0	166	459	2,535	3,160	
10	0	70	45	51	12	0	200	13	0	166	200	2,444	2,810	
11	0	71	45	53	13	0	216	14	0	169	216	2,225	2,610	
12	0	70	45	51	14	0	200	15	0	166	200	2,024	2,390	
13	0	68	45	45	15	0	0	16	0	158	0	1,892	2,050	
14	0	73	45	45	16	0	65	17	0	163	65	1,632	1,860	
15	0	73	45	45	17	0	92	18	0	163	92	1,535	1,790	
16	0	71	45	45	18	269	162	19	0	161	431	1,408	2,000	
17	0	70	45	45	19	261	232	20	0	160	493	1,477	2,130	
18	0	70	45	45	20	274	567	21	0	160	841	1,339	2,340	
19	0	73	45	45	21	267	43	22	0	163	310	1,457	1,930	
20	483	68	351	45	22	0	0	23	464	0	0	1,346	1,810	
21	264	70	149	45	23	0	11	24	264	0	11	1,845	2,120	
22	0	70	45	45	24	430	308	25	0	160	738	2,032	2,930	
23	0	70	45	45	25	427	205	26	0	160	632	2,098	2,890	
24	0	70	45	45	26	412	211	27	0	160	623	1,787	2,570	
25	0	70	45	45	27	438	308	28	0	160	746	1,624	2,530	
26	0	70	45	45	28	405	200	29	0	160	605	2,105	2,870	
27	0	70	45	45	29	0	238	30	0	160	238	2,432	2,830	
28	0	70	45	46	30	0	0	31	0	161	0	2,549	2,710	
Total	747	2,206	1,805	1,487		9,150	6,222		728	4,770	15,372	83,150	104,020	

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, May 23, 24.
Col. 8 = Col. 2 + Col. 3 + Col. 4 May 1-22, 25-31.
Col. 9 = Col. 5 + Col. 6.
Col.10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col.11 - 24 hours of calendar day shown.

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		
Date	Amount								N.Y.C. reservoirs		Powerplants			Daily	Cumulative
									Directed	Other					
1962	1	2	3	4		5	6		7	8	9	10	11	12	13
May 29	0	70	45	46	May 31	0	27	June 1	0	161	27	2,562	2,770	-	-
30	0	70	45	46	June 1	425	200	2	0	161	625	4,144	4,930	-	-
31	0	70	45	48	2	829	216	3	0	163	1,045	5,042	6,250	-	-
June 1	0	70	45	50	3	864	211	4	0	165	1,075	4,250	5,490	-	-
2	0	71	45	50	4	849	216	5	0	166	1,065	3,649	4,660	-	-
3	0	74	45	50	5	844	113	6	0	169	957	3,634	4,760	-	-
4	0	70	45	48	6	843	130	7	0	163	973	5,524	6,660	-	-
5	0	66	45	46	7	646	157	8	0	159	1,003	6,616	7,760	-	-
6	0	71	45	46	6	642	497	9	0	162	1,339	5,369	6,670	-	-
7	0	71	45	46	9	846	151	10	0	162	999	4,549	5,710	-	-
8	0	70	45	46	10	840	108	11	0	161	948	3,921	5,030	-	-
9	0	70	45	46	11	640	103	12	0	161	943	3,556	4,660	-	-
10	0	71	45	46	12	690	22	13	0	162	712	3,806	4,680	-	-
11	0	71	45	46	13	668	70	14	0	162	736	6,790	7,690	-	-
12	0	71	362	46	14	440	383	15	0	479	623	6,138	7,440	0	0
13	0	71	360	46	15	445	518	16	0	477	963	4,560	6,020	0	0
14	0	71	360	46	16	336	254	17	0	477	590	4,703	5,770	0	0
15	0	71	360	46	17	442	200	18	0	477	642	4,681	5,800	0	0
16	0	71	360	46	18	672	292	19	0	477	964	3,799	5,240	0	0
17	0	71	360	46	19	663	248	20	0	477	911	3,272	4,660	0	0
18	0	71	360	46	20	454	86	21	0	477	540	2,933	3,950	0	0
19	0	71	360	46	21	454	59	22	0	477	513	2,750	3,740	0	0
20	0	71	360	45	22	433	130	23	0	476	563	2,681	3,720	0	0
21	0	71	360	48	23	425	232	24	0	479	657	2,534	3,670	0	0
22	0	71	360	43	24	433	0	25	0	474	433	2,323	3,230	0	0
23	0	70	360	42	25	397	0	26	0	472	397	2,021	2,890	0	0
24	0	71	360	45	26	0	0	27	0	476	0	1,864	2,340	0	0
25	0	71	360	45	27	29	0	28	0	476	29	1,735	2,240	66	86
26	0	70	360	43	28	443	216	29	0	473	659	1,688	3,020	0	86
27	0	70	360	45	29	439	216	30	0	475	655	3,960	5,090	0	66
Total	0	2,120	6,392	1,384		16,733	5,055		0	9,896	21,788	115,296	146,980		

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 0600 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. 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 during seasonal period that part or all of Col. 8, contributing to Col. 11 for quantities less than 1,650 cfs and greater than 1,750 cfs.
Col. 13 - Season limit of cumulative credit June 15, 1962 to Mar. 14, 1983 = 11,416 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
1982	1	2	3	4		5	6		7	8	9	10	11	12	13
June 28	0	70	360	51	June 30	421	178	July 1	0	481	599	5,060	6,140	0	86
29	0	70	362	45	July 1	428	130	2	0	477	558	4,055	5,090	0	86
30	0	71	362	45	2	401	0	3	0	478	401	3,551	4,430	0	66
July 1	0	71	362	45	3	0	0	4	0	478	0	3,192	3,670	0	66
2	0	70	362	45	4	0	0	5	0	477	0	2,793	3,270	0	86
3	0	71	362	45	5	26	66	6	0	478	112	2,260	2,850	0	66
4	0	70	362	45	6	450	335	7	0	477	785	1,968	3,230	0	86
5	0	71	362	45	7	426	356	8	0	476	784	1,758	3,020	0	86
6	0	71	360	46	6	455	227	9	0	479	682	1,569	2,750	0	86
7	0	101	362	46	9	421	238	10	0	511	659	1,300	2,470	0	86
6	629	101	464	48	10	0	0	11	633	0	0	1,177	1,610	60	146
9	671	71	558	48	11	30	103	12	677	0	133	1,030	1,640	90	236
10	62	70	360	48	12	434	270	13	62	416	704	1,368	2,550	62	296
11	135	73	360	48	13	436	378	14	135	346	614	1,395	2,690	135	433
12	150	73	360	48	14	433	281	15	150	331	714	1,255	2,450	150	583
13	146	70	360	48	15	408	313	16	148	330	721	1,251	2,450	148	731
14	244	101	360	66	16	441	216	17	244	285	657	1,154	2,340	244	975
15	732	102	565	70	17	0	146	16	737	0	146	927	1,810	60	1,035
16	761	101	619	71	16	21	281	19	791	0	302	747	1,640	90	1,125
17	156	101	359	71	19	484	346	20	158	373	830	1,069	2,430	158	1,283
18	279	101	357	71	20	437	259	21	279	250	696	1,285	2,510	279	1,562
19	163	101	357	40	21	431	346	22	183	315	777	1,215	2,490	183	1,745
20	0	70	357	46	22	428	335	23	0	473	763	1,004	2,240	63	1,628
21	265	71	357	46	23	406	236	24	265	209	644	952	2,070	265	2,093
22	1,008	71	894	46	24	0	0	25	1,011	0	0	679	1,690	-60	2,033
23	944	/1	629	46	25	27	65	26	946	0	92	442	1,480	-270	1,763
24	355	71	354	46	26	256	518	27	355	116	774	595	1,640	90	1,853
25	825	70	704	46	27	0	518	28	820	0	518	522	1,660	110	1,963
26	864	101	739	48	26	0	259	29	888	0	259	863	2,010	260	2,223
27	613	70	495	46	29	0	281	30	613	0	281	866	1,760	10	2,233
26	431	70	354	46	30	0	236	31	470	0	236	772	1,480	-270	1,963
Total	9,497	2,466	13,798	1,559		7,702	6,941		9,565	8,258	14,643	48,094	80,560		

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 0600 of date shown.
Col. 6 - 24 hours beginning 1200 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 when Col. 1 is greater than 0, except July 13-17, 20-24, 27 and total.
Col. 8 = Col. 2 + Col. 3 + Col. 4 July 1-10, 23.
= Col. 2 + Col. 3 + Col. 4 - Col. 1 July 13-17, 20-24, 27.

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 during seasonal period that part or all of Col. 8 contributing to Col. 11 for quantities less than 1,850 cfs and greater than 1,750 cfs.
Col. 13 - Season limit of cumulative credit June 15, 198 to Mar. 14, 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
1982	1	2	3	4		5	6		7	8	9	10	11	12	13
July 29	877	70	758	46	July 31	0	0	Aug. 1	874	0	0	706	1,580	-170	1,793
30	1,023	70	903	45	Aug. 1	0	0	2	1,018	0	0	622	1,640	-110	1,683
31	728	70	611	45	2	157	0	3	726	0	157	697	1,580	-170	1,513
Aug. 1	671	70	554	45	3	151	173	4	669	0	324	607	1,600	-150	1,363
2	669	71	554	45	4	165	140	5	670	0	305	555	1,530	-220	1,143
3	810	71	698	45	5	162	151	6	814	0	313	583	1,710	-40	1,103
4	1,023	70	911	45	6	157	0	7	1,026	0	157	577	1,760	10	1,113
5	1,393	101	1,214	79	7	0	0	8	1,394	0	0	396	1,790	40	1,153
6	1,437	99	1,261	79	8	0	76	9	1,439	0	76	545	2,060	310	1,463
7	1,064	101	886	79	9	162	410	10	1,066	0	572	892	2,530	780	2,243
8	1,059	101	877	79	10	162	324	11	1,057	0	486	817	2,360	610	2,653
9	993	70	882	53	11	152	151	12	1,005	0	303	792	2,100	350	3,203
10	1,034	70	922	48	12	160	151	13	1,040	0	311	629	1,960	230	3,433
11	1,002	71	890	46	13	166	0	14	1,007	0	166	617	1,790	40	3,473
12	1,278	71	1,163	57	14	0	0	15	1,291	0	0	499	1,790	40	3,513
13	1,299	70	1,180	46	15	0	0	16	1,296	0	0	424	1,720	-30	3,483
14	1,016	70	891	46	16	160	0	17	1,007	0	160	513	1,660	-70	3,413
15	1,079	70	962	46	17	159	103	18	1,078	0	262	480	1,820	70	3,483
16	1,120	70	1,001	46	18	160	124	19	1,117	0	284	489	1,890	140	3,623
17	1,069	70	959	46	19	168	140	20	1,075	0	308	507	1,890	140	3,763
18	1,031	71	885	76	20	160	130	21	1,032	0	290	508	1,830	80	3,843
19	1,391	102	1,217	70	21	0	0	22	1,389	0	0	421	1,810	60	3,903
20	1,342	101	1,190	46	22	0	0	23	1,337	0	0	303	1,640	-110	3,793
21	1,085	70	967	46	23	163	151	24	1,083	0	314	303	1,700	-50	3,743
22	1,094	70	976	46	24	165	43	25	1,092	0	208	560	1,860	110	3,853
23	1,131	101	972	77	25	157	130	26	1,150	0	287	493	1,930	180	4,033
24	489	87	337	73	26	145	86	27	497	0	231	712	1,440	-310	3,723
25	986	101	826	73	27	161	205	28	1,000	0	366	374	1,740	-10	3,713
26	1,424	101	1,256	70	28	0	0	29	1,427	0	0	313	1,740	-10	3,703
27	1,410	101	1,242	70	29	0	0	30	1,413	0	0	267	1,680	-70	3,633
28	1,064	101	885	70	30	161	119	31	1,056	0	280	264	1,600	-150	3,483
Total	33,091	2,532	28,830	1,783		3,353	2,807		33,145	0	6,160	16,465	55,770		

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.
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 during seasonal period that part or all of Col. 8 contributing to Col. 11 for quantities less than 1,850 cfs and greater than 1,750 cfs.
Col. 13 - Season limit of cumulative credit June 15, 1962 to Mar. 14, 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						
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
1982	1	2	3	4		5	6		7	8	9	10	11	12 / 13
Aug. 29	1,095	101	925	70	Aug.31	186	0	Sept. 1	1,096	0	186	268	1,550	-200 / 3,283
30	1,146	101	981	70	Sept. 1	158	140	2	1,152	0	298	370	1,820	70 / 3,353
31	1,151	101	984	70	2	150	113	3	1,155	0	263	492	1,910	160 / 3,513
Sept. 1	1,181	101	1,013	70	3	167	65	4	1,184	0	232	564	1,980	230 / 3,743
2	1,533	101	1,364	70	4	0	0	5	1,535	0	0	355	1,890	140 / 3,883
3	1,500	101	1,340	70	5	0	0	6	1,511	0	0	369	1,880	130 / 4,013
4	1,567	101	1,394	71	6	0	0	7	1,566	0	0	224	1,790	40 / 4,053
5	1,281	101	1,105	71	7	114	0	8	1,277	0	114	329	1,720	-30 / 4,023
6	1,260	101	1,083	71	8	107	124	9	1,255	0	231	254	1,740	-10 / 4,013
7	1,371	101	1,200	71	9	109	194	10	1,372	0	303	235	1,910	160 / 4,173
8	1,394	101	1,231	70	10	104	130	11	1,402	0	234	324	1,960	210 / 4,383
9	1,664	101	1,480	71	11	0	140	12	1,652	0	140	168	1,960	210 / 4,593
10	1,653	101	1,487	70	12	0	302	13	1,658	0	302	80	2,040	290 / 4,883
11	1,417	101	1,259	70	13	141	248	14	1,430	0	389	211	2,030	280 / 5,163
12	1,271	101	1,103	74	14	106	243	15	1,278	0	349	163	1,790	40 / 5,203
13	1,164	101	989	76	15	109	302	16	1,166	0	411	243	1,820	70 / 5,273
14	1,148	101	976	71	16	107	232	17	1,148	0	339	283	1,770	20 / 5,293
15	1,362	101	1,193	67	17	106	108	18	1,361	0	214	305	1,880	130 / 5,423
16	1,681	101	1,502	67	18	0	0	19	1,670	0	0	140	1,810	60 / 5,483
17	1,646	101	1,465	70	19	0	65	20	1,636	0	65	89	1,790	40 / 5,523
18	1,375	101	1,214	73	20	94	151	21	1,388	0	245	207	1,840	90 / 5,613
19	1,331	101	1,163	71	21	112	173	22	1,335	0	285	240	1,860	110 / 5,723
20	1,342	101	1,173	73	22	101	146	23	1,347	0	247	336	1,930	180 / 5,903
21	1,365	101	1,193	70	23	107	0	24	1,364	0	107	409	1,880	130 / 6,033
22	1,277	101	1,106	71	24	104	0	25	1,278	0	104	328	1,710	-40 / 5,993
23	1,545	101	1,366	70	25	0	0	26	1,537	0	0	223	1,760	10 / 6,003
24	1,508	101	1,332	70	26	0	0	27	1,503	0	0	437	1,940	190 / 6,193
25	1,154	99	987	71	27	110	0	28	1,157	0	110	543	1,810	60 / 6,253
26	1,038	101	873	70	28	109	0	29	1,044	0	109	447	1,600	-150 / 6,103
27	1,367	110	1,185	71	29	110	86	30	1,366	0	196	298	1,860	110 / 6,213
Total	40,787	3,037	35,666	2,120		2,511	2,962		40,823	0	5,473	8,934	55,230	

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. 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.
Col. 12 = Col. 11 - 1,750 cfs, computed algebraically, but not greater than Col. 7, except during seasonal period that part or all of Col. 8 contributing to Col. 11 for quantities less than 1,850 cfs and greater than 1,750 cfs.
Col. 13 - Season limit of cumulative credit June 15, 1982 to Mar. 14, 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						
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Mongaup Reservoir	Date	Controlled releases N.Y.C. reservoirs		Power-plants	Computed uncontrolled	Total	Excess release credits
Date	Amount								Directed	Other				Daily / Cumulative
1982	1	2	3	4		5	6		7	8	9	10	11	12 / 13
Sept.28	1,411	104	1,241	70	Sept.30	132	146	Oct. 1	1,415	0	278	267	1,960	210 / 6,423
29	1,415	102	1,245	70	Oct. 1	107	0	2	1,417	0	107	406	1,930	180 / 6,603
30	1,655	101	1,470	70	2	0	0	3	1,641	0	0	239	1,880	130 / 6,733
Oct. 1	1,654	101	1,471	70	3	0	49	4	1,642	0	49	149	1,840	90 / 6,823
2	1,427	101	1,262	70	4	101	92	5	1,433	0	193	134	1,760	10 / 6,833
3	1,459	101	1,290	70	5	110	65	6	1,461	0	175	244	1,880	130 / 6,963
4	1,468	101	1,299	70	6	107	49	7	1,470	0	156	144	1,770	20 / 6,983
5	1,357	101	1,191	70	7	106	97	8	1,362	0	203	155	1,720	-30 / 6,953
6	1,397	101	1,227	70	8	110	43	9	1,398	0	153	239	1,790	40 / 6,993
7	1,614	101	1,451	71	9	3	0	10	1,623	0	0	187	1,810	60 / 7,053
8	1,670	101	1,499	71	10	0	0	11	1,671	0	0	189	1,860	110 / 7,163
9	1,461	101	1,289	71	11	113	0	12	1,461	0	113	246	1,820	70 / 7,233
10	1,337	101	1,171	71	12	104	0	13	1,343	0	104	323	1,770	20 / 7,253
11	1,256	101	1,091	71	13	109	0	14	1,263	0	109	418	1,790	40 / 7,293
12	585	101	438	46	14	109	0	15	585	0	109	796	1,490	-260 / 7,033
13	1,191	101	1,027	71	15	109	0	16	1,199	0	109	262	1,570	-180 / 6,853
14	1,638	309	1,256	70	16	0	0	17	1,635	0	0	395	2,030	280 / 7,133
15	1,615	309	1,231	70	17	0	0	18	1,610	0	0	330	1,940	190 / 7,323
16	1,269	309	894	70	18	219	0	19	1,273	0	219	438	1,930	180 / 7,503
17	1,275	309	899	70	19	227	0	20	1,278	0	227	495	2,000	250 / 7,753
18	1,304	617	610	73	20	218	0	21	1,300	0	218	422	1,940	190 / 7,943
19	1,026	679	282	70	21	224	0	22	1,031	0	224	475	1,730	-20 / 7,923
20	1,217	679	473	70	22	218	0	23	1,222	0	218	400	1,840	90 / 8,013
21	1,557	671	820	70	23	0	0	24	1,561	0	0	279	1,840	90 / 8,103
22	1,538	619	855	70	24	0	0	25	1,544	0	0	276	1,820	70 / 8,173
23	1,239	619	548	70	25	229	0	26	1,237	0	229	414	1,880	130 / 8,303
24	1,254	622	571	70	26	220	0	27	1,263	0	220	377	1,860	110 / 8,413
25	1,332	620	647	73	27	224	0	28	1,340	0	224	366	1,930	180 / 8,593
26	1,363	619	676	73	28	221	0	29	1,368	0	221	351	1,940	190 / 8,783
27	1,357	617	667	71	29	242	0	30	1,355	0	242	343	1,940	190 / 8,973
28	1,445	620	753	71	30	0	0	31	1,444	0	0	296	1,740	-10 / 8,963
Total	42,786	9,838	30,844	2,163		3,559	541		42,845	0	4,100	10,055	57,000	

Col. 2 - 24 hours beginning 1200 of date shown, except 25 hours Oct. 23.
Col. 3 - 24 hours ending 2400 one day later, except 25 hours Oct. 23.
Col. 4 - 24 hours beginning 1500 one day later, except 25 hours Oct. 22.
Col. 5 - 24 hours beginning 0800 of date shown, except 25 hours Oct. 23.
Col. 6 - 24 hours beginning 1200 of date shown, except 25 hours Oct. 23.
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. 24.
Col. 12 = Col. 11 - 1,750 cfs, computed algebraically, but not greater than Col. 7, except during seasonal period that part or all of Col. 8 contributing to Col. 11 for quantities less than 1,850 cfs and greater than 1,750 cfs.
Col. 13 - Season limit of cumulative credit June 15, 1982 to Mar. 14, 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
1982	1	2	3	4		5	6		7	8	9	10	11	12
Oct. 29	1,474	619	826	21	Oct. 31	0	0	Nov. 1	1,466	0	0	324	1,790	40
30	1,445	616	744	22	Nov. 1	0	0	2	1,382	0	0	408	1,790	40
31	1,462	616	818	26	2	0	0	3	1,460	0	0	350	1,810	60
Nov. 1	1,158	622	511	26	3	0	0	4	1,159	0	0	501	1,660	-90
2	936	620	289	25	4	0	0	5	934	0	0	1,386	2,320	570
3	499	336	138	25	5	0	0	6	499	0	0	1,691	2,190	440
4	0	56	32	25	6	0	0	7	0	113	0	1,677	1,790	40
5	617	560	32	25	7	0	0	8	617	0	0	1,093	1,710	-40
6	711	620	73	25	8	38	43	9	718	0	81	781	1,580	-170
7	745	620	108	26	9	0	0	10	754	0	0	706	1,460	-290
8	1,139	619	490	25	10	0	0	11	1,134	0	0	486	1,620	-130
9	1,185	623	541	25	11	0	0	12	1,189	0	0	601	1,790	40
10	1,107	620	469	23	12	0	0	13	1,112	0	0	898	2,010	
11	914	622	295	3	13	0	0	14	920	0	0	1,380	2,300	
12	795	616	155	23	14	0	0	15	794	0	0	1,756	2,550	
13	734	617	114	3	15	59	0	16	734	0	59	1,427	2,220	
14	684	617	40	25	16	0	0	17	682	0	0	1,158	1,840	
15	722	619	80	25	17	0	0	18	724	0	0	986	1,710	
16	779	504	248	25	18	0	0	19	777	0	0	803	1,580	
17	787	517	244	25	19	0	0	20	786	0	0	874	1,660	
18	922	619	283	25	20	0	0	21	927	0	0	843	1,770	
19	921	620	277	25	21	0	0	22	922	0	0	848	1,770	
20	853	585	244	23	22	0	0	23	852	0	0	958	1,810	
21	801	623	173	5	23	0	0	24	801	0	0	1,439	2,240	
22	440	314	121	5	24	0	0	25	440	0	0	1,780	2,220	
23	131	50	59	26	25	0	0	26	135	0	0	1,725	1,860	
24	235	178	34	25	26	0	0	27	237	0	0	1,503	1,740	
25	181	125	34	25	27	0	0	28	184	0	0	1,416	1,600	
26	316	258	36	23	28	0	0	29	317	0	0	1,373	1,690	
27	282	251	26	5	29	0	0	30	282	0	0	1,648	1,930	
Total	22,975	14,882	7,534	635		97	43		22,938	113	140	32,819	56,010	

Excess release credits	
Daily	Cumulative
12	13
40	9,003
40	9,043
60	9,103
-90	9,013
570	9,583
440	10,023
40	10,063
-40	10,023
-170	9,853
-290	9,563
-130	9,433
40	9,473

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.
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 during seasonal period that part or all of Col. 8 contributing to Col. 11 for quantities less than 1,850 cfs and greater than 1,750 cfs to Nov. 12. Suspended Nov. 13-30.
Col. 13 - Season limit of cumulative credit June 15, 1982 to Mar. 14, 1983 = 11,418 cfs-days to Nov. 12. Suspended Nov. 13-30.

Table 14. - NEW YORK CITY CONSUMPTION OF WATER - 1940 to 1982

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

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

*Provisional

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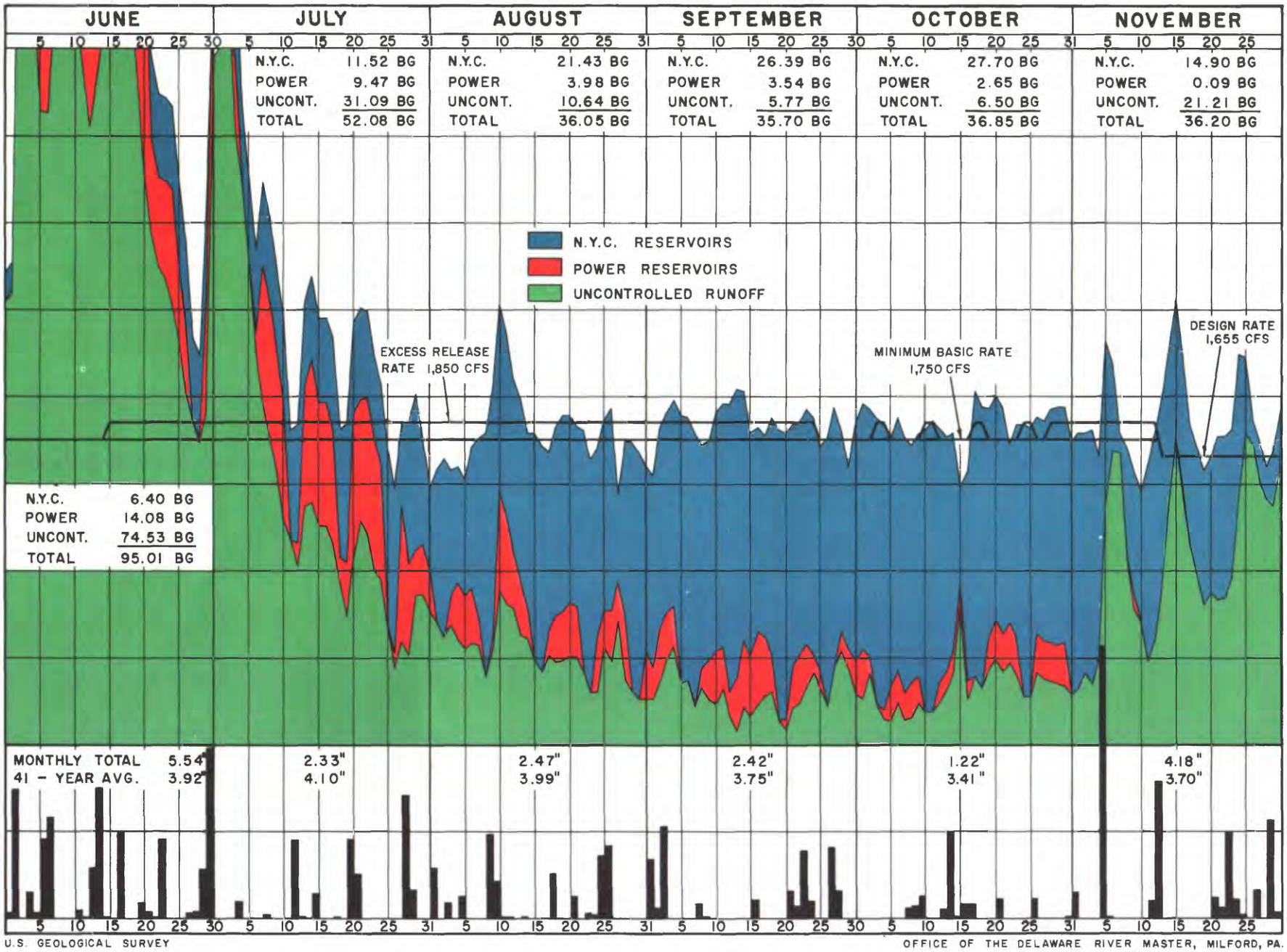
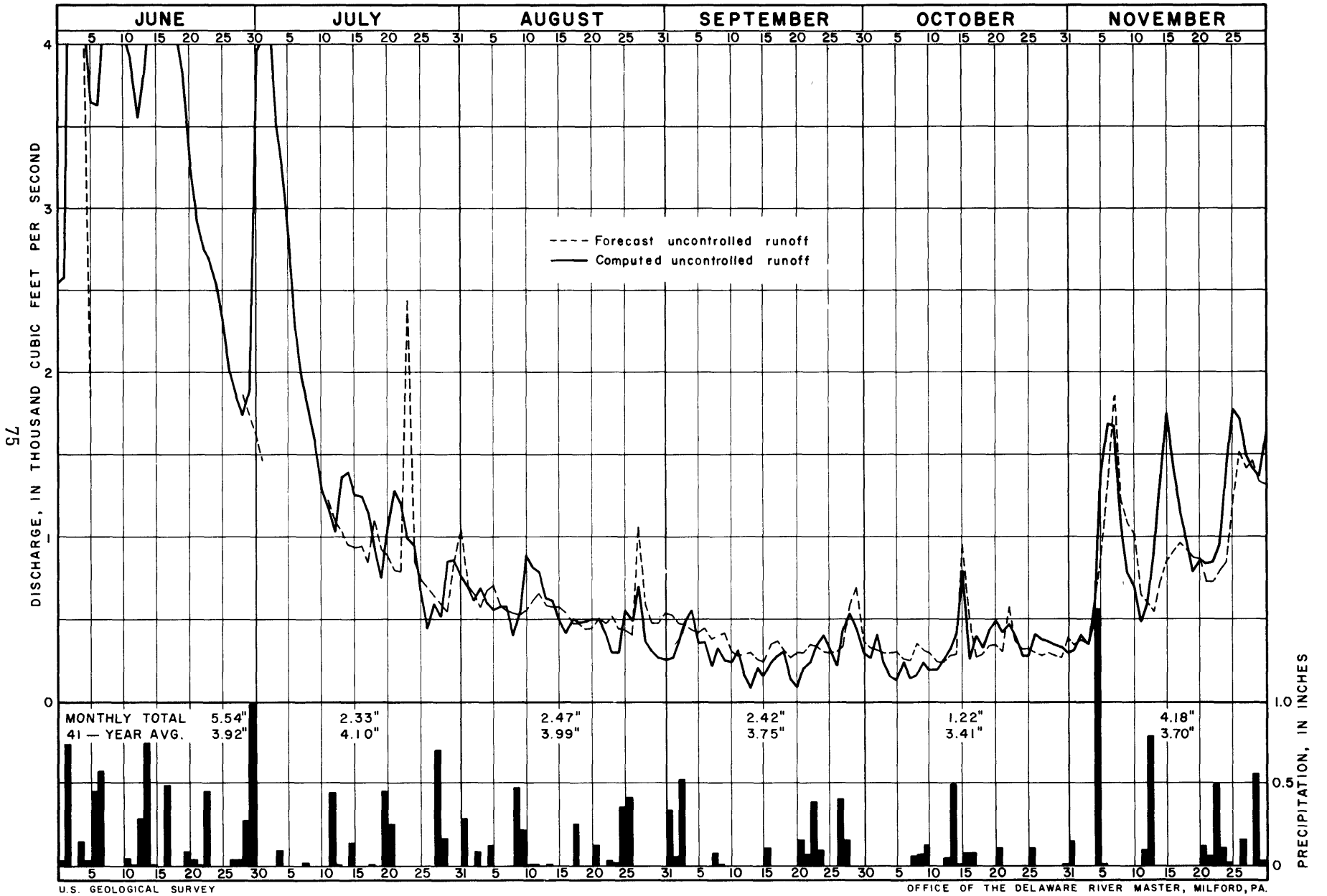
PLATE I.— COMPONENTS OF FLOW, DELAWARE RIVER AT MONTAGUE, N.J. 1982



U.S. GEOLOGICAL SURVEY

OFFICE OF THE DELAWARE RIVER MASTER, MILFORD, PA.

FIGURE 2—UNCONTROLLED COMPONENT, DELAWARE RIVER AT MONTAGUE, N.J. 1982



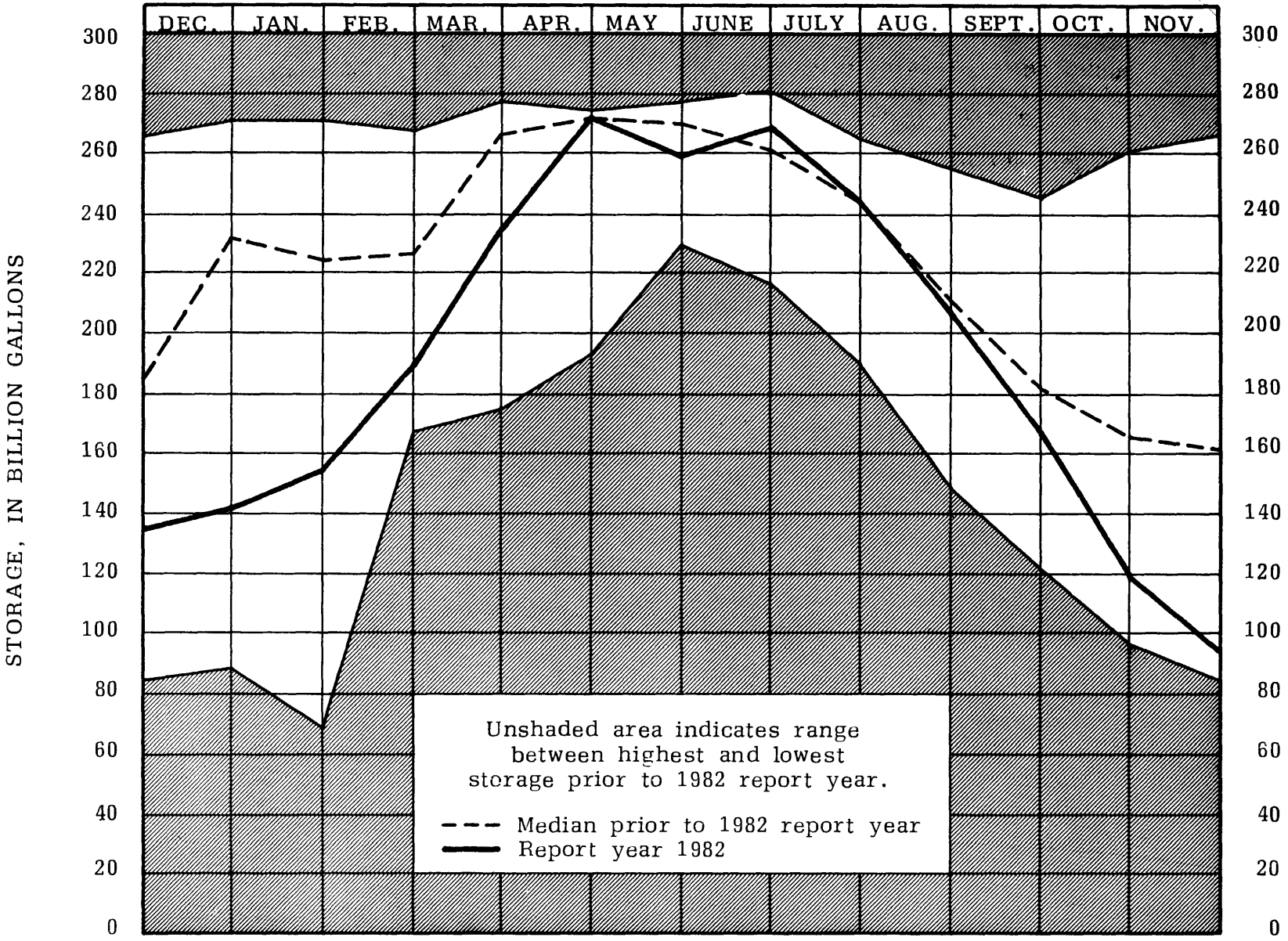


Figure 3. - Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs on first day of month, June 1967 to December 1982

Section III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

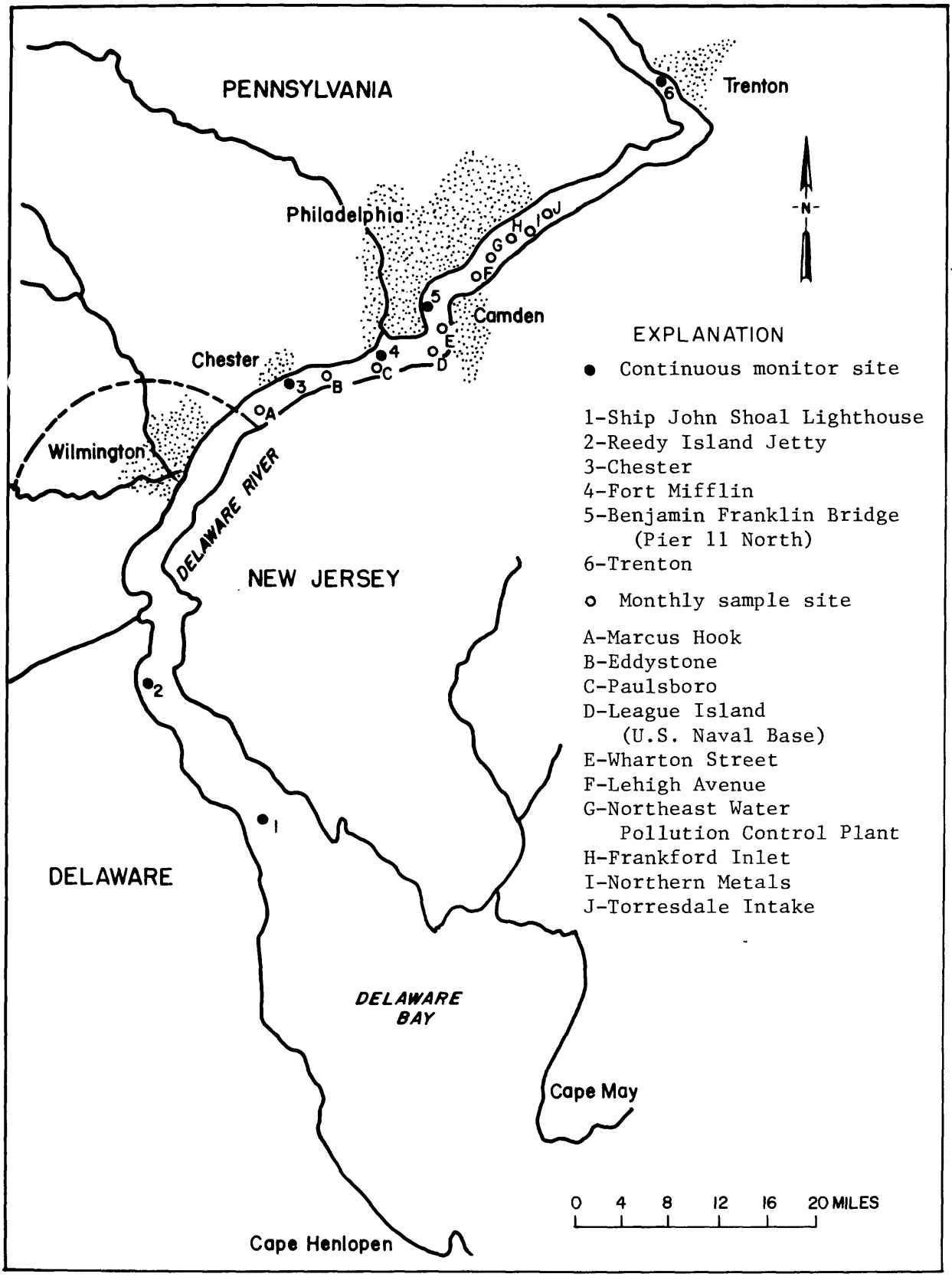


FIGURE 4.--Delaware River Estuary.

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Section III

WATER QUALITY OF THE DELAWARE RIVER ESTUARY

Introduction

This section describes the water-quality monitoring program carried out by the U.S. Geological Survey in the Delaware Estuary during the 1982 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, (Pier 11 North), Philadelphia, Pa., were not operated from early December 1981 through the end of March. At Ship John Shoal Lighthouse and Fort Mifflin the water was monitored for the two parameters of temperature and specific conductance. At the remaining sites, the water was monitored for the four parameters of temperature, specific conductance, dissolved oxygen, and pH.

Additional data were obtained at ten sites between Torresdale, Pa., and Marcus Hook, Pa., on a monthly basis except in the winter, when no samples were collected. 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 1982

The following is a summary and discussion of the data that were collected during the 1982 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 better water quality by limiting salt-water intrusion and diluting the concentration of dissolved minerals, both of which contribute to a lower specific conductance and chloride level. Increased flow also aids in maintaining lower water temperature during warm weather and supporting higher dissolved-oxygen levels.

Based on streamflow records for the Delaware River at Trenton, mean monthly streamflow was lowest for the year during October (4,188 cfs) and highest for the year during April (25,020 cfs), (see table 7). The mean monthly streamflow was above the respective median for the period of record during February, April, and June through September, 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 profound influence on various physical, chemical, and biological properties of the water. In general, increases in water temperature have deleterious effects on water quality by lowering the saturation level of dissolved oxygen and increasing biological activities.

The primary factors involved in controlling water emperature 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 April to November 1982, the mean monthly temperatures were below normal during April and June through October, and above normal May and November (based on the period 1962 to 1972). (See fig. 5).

Specific Conductance and Chloride

Specific conductance is a measure of 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 undesir-

able 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 were furnished by Scott Paper Company.

At Fort Mifflin, the chloride concentrations equaled or exceeded 50 mg/L on many days (see table 15). The maximum was not recorded due to an equipment failure that extended from mid-August to mid-November. At Chester, the chloride concentrations approximated 50 mg/L on many days and exceeded 250 mg/L September 22, October 5 to November 17, November 20 to 21, and November 23 with a maximum of 870 mg/L on November 4 (see table 16). The maximum daily chloride concentration in the estuary at Chester was greater than 50 mg/L 39 percent of the time and greater than 250 mg/L 13 percent of the time (see table 16). Chloride concentrations in excess of 250 mg/L were recorded on all 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 9,780 mg/L on October 27. There were 5 days when the minimum concentrations were less than 50 mg/L.

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 May 12 to June 14 and June 19 to November 7, and November 12 (see table 18). The minimum daily mean was

0.7 mg/L on August 19. At Chester, the mean dissolved-oxygen concentration was below 5 mg/L on most days from mid-May through mid-October (see table 19). The lowest daily mean recorded was 0.1 mg/L on July 18. The minimum hourly value recorded was 0.0 mg/L on July 17 and 18 and August 3 and 7. At Reedy Island Jetty, the minimum hourly value was 4.7 mg/L on July 24 and August 13, 15, and 17.

Figure 6 shows the frequency of hourly dissolved-oxygen concentration at Benjamin Franklin Bridge 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 and 60 percent of the time at Chester. Dissolved-oxygen concentrations were higher at the Benjamin Franklin Bridge in the 1982 report year than in the 1981 report year. Reduced waste-water flows from Philadelphia may account for some of the improvement. The bimodal distribution of dissolved oxygen at Chester suggests that a local source of contamination was present during part, but not all, of the summer.

Hydrogen-ion Concentration (pH)

Hydrogen-ion concentration (pH) is fundamentally a measure of acidity or alkalinity. Values of pH below 7 indicate acidity, whereas values above 7 indicate alkalinity. In natural waters, pH generally ranges from 6.0 to 8.5. The main factors controlling the pH of a body of water are usually the geochemistry of the drainage basin and external influences such as pollution. Photosynthetic activity can also have a considerable influence on pH values. Increased photosynthetic activity (algal bloom) produces higher pH values. All pH values at Benjamin Franklin Bridge, Chester, and Reedy Island Jetty were within the range of 6.1 to 8.3. The pH in the estuary tends to be lowest near Trenton 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, 1981 to November 30, 1982

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	40	31							40	*	–	–	43	31	38	*	37	30					–	–
2	48	33							48	*	–	–	38	*	30	*	33	*					–	–
3	–	–							33	*	*	*	30	*	31	*	33	*					–	–
4	–	–							31	*	*	*	37	*	35	*	33	30					–	–
5	–	–							*	*	30	*	45	*	31	*	35	31					–	–
6	–	–							*	*	*	*	35	*	*	*	40	31					–	–
7	–	–							–	–	33	*	31	*	*	*	43	33					–	–
8	–	–							–	–	45	*	30	*	*	*	48	31					–	–
9	–	–							–	–	35	*	*	*	33	*	59	33					–	–
10	–	–							–	–	31	*	*	*	35	*	59	33					–	–
11	–	–							–	–	42	*	*	*	33	*	59	35					–	–
12	–	–							–	–	43	*	31	*	37	*	60	37					74	43
13	–	–							–	–	40	*	37	*	33	*	–	–					59	30
14	–	–							–	–	43	*	35	*	33	*	–	–					48	37
15	–	–							–	–	38	*	*	*	33	*	–	–					50	31
16	–	–							–	–	38	*	*	*	33	*	–	–					48	33
17	–	–							–	–	37	*	30	*	33	*	–	–					42	30
18	–	–							–	–	37	*	*	*	35	*	–	–					42	30
19	–	–							–	–	38	*	*	*	35	*	–	–					45	31
20	–	–							–	–	38	*	31	*	35	*	–	–					43	31
21	–	–							–	–	42	*	33	*	38	*	–	–					40	31
22	–	–							–	–	47	30	35	*	38	*	–	–					40	30
23	–	–							–	–	52	31	37	*	35	*	–	–					42	30
24	–	–							–	–	48	33	37	*	37	*	–	–					38	30
25	–	–							–	–	55	35	37	*	37	30	–	–					37	*
26	–	–							–	–	53	33	37	*	38	30	–	–					35	*
27	–	–							–	–	45	31	35	*	37	30	–	–					40	30
28	–	–							–	–	43	31	37	*	53	30	–	–					37	*
29	–	–							–	–	48	31	37	*	53	33	–	–					55	31
30	–	–							–	–	47	*	37	*	35	*	–	–					52	*
31	–	–							–	–	47	30	–	–	38	30	–	–					–	–

* 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, 1981 to November 30, 1982

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	135	50	53	43	65	45	40	34	28	20	27	20	39	33	35	30	44	36	92	50	180	85	575	214
2	103	50	52	42	62	49	41	33	28	22	25	20	40	28	33	30	45	40	83	50	205	85	670	224
3	84	35	49	42	54	32	42	33	30	21	25	20	40	28	--	--	50	35	80	50	236	90	670	263
4	68	38	50	36	51	38	38	35	34	20	23	21	34	28	--	--	47	38	85	50	225	103	870	320
5	60	40	44	34	46	30	44	35	29	23	25	21	35	25	--	--	47	42	100	55	290	118	688	275
6	48	36	39	26	45	34	45	35	25	22	25	22	32	30	--	--	47	42	90	56	300	112	520	190
7	50	39	35	25	36	30	45	37	26	20	25	22	33	29	--	--	47	40	94	46	276	105	500	198
8	60	40	32	25	40	30	43	36	24	21	26	22	33	30	--	--	54	41	123	55	370	120	345	198
9	48	39	34	25	35	30	44	37	24	20	25	20	33	30	--	--	52	40	125	62	320	123	460	160
10	46	35	31	22	37	31	44	33	24	20	28	21	32	30	--	--	52	40	115	56	570	162	590	190
11	55	38	31	25	39	32	45	36	25	21	30	24	30	28	--	--	46	39	106	57	450	170	426	193
12	73	38	31	25	36	32	60	36	28	22	28	25	34	29	34	32	50	38	103	60	395	165	471	205
13	95	40	31	25	35	30	40	38	29	23	30	25	31	29	35	33	52	40	135	60	455	175	--	--
14	70	37	33	25	38	32	42	37	29	24	30	27	31	27	40	34	52	40	120	60	390	190	--	--
15	75	40	28	25	36	30	41	35	29	25	32	28	30	27	43	33	48	38	195	60	255	170	300	125
16	69	36	30	25	37	31	41	33	29	23	30	28	30	26	40	34	47	37	160	63	300	145	275	115
17	57	38	30	25	36	29	41	34	30	22	30	27	30	26	41	35	48	38	212	71	290	120	267	115
18	50	33	31	28	37	30	38	32	29	25	29	26	30	27	37	35	50	37	230	75	370	130	242	115
19	46	40	30	20	41	31	41	34	28	26	32	27	29	26	39	35	60	36	200	83	340	135	239	125
20	45	40	32	27	43	31	38	30	28	25	36	27	27	25	38	35	62	39	205	90	330	170	346	125
21	53	40	33	28	40	35	36	31	29	26	34	27	27	25	37	35	68	44	220	97	285	135	279	110
22	53	38	37	30	41	30	37	32	27	25	34	28	30	25	39	35	75	45	340	90	275	130	246	115
23	52	42	40	30	40	34	34	30	27	25	34	29	28	25	38	35	75	46	194	85	360	135	270	118
24	53	41	51	36	40	31	32	29	27	25	36	27	28	24	38	35	78	45	195	82	--	--	226	85
25	57	42	50	40	43	32	31	26	27	25	38	28	30	25	42	33	88	45	190	81	500	167	175	90
26	55	41	50	40	42	32	32	27	29	22	35	27	32	27	39	35	73	45	236	100	620	150	180	85
27	53	42	50	40	43	35	31	26	30	22	35	30	34	27	42	37	70	44	250	75	650	155	144	75
28	50	40	49	41	40	34	28	25	24	23	37	30	33	28	44	35	67	45	190	72	440	170	194	78
29	49	40	48	42	—	—	29	23	24	23	36	32	34	29	43	35	87	52	195	72	440	160	197	74
30	52	43	48	42	--	--	28	24	27	22	38	30	34	29	40	39	82	48	220	80	575	192	137	66
31	51	42	48	42	—	—	30	20	--	--	40	32	—	--	43	36	78	50	—	--	570	184	--	--

[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, 1981 to November 30, 1982

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	7700	4060	–	–	2590	2560			–	–	80	31	3640	997	1720	310	5030	1720	6950	2910	7920	3950	7860	5930
2	6920	6750	–	–	2560	2500			–	–	377	38	3080	850	2620	310	5500	1720	6820	2450	6970	4170	–	–
3	6820	6000	–	–	2500	2450			–	–	1120	38	2730	760	2450	332	5960	2060	6800	2520	7650	4170	–	–
4	6280	5000	6850	4560	2460	2250			–	–	940	38	2420	670	3510	422	5960	2040	6000	2640	7750	4380	–	–
5	5500	4380	6750	3650	2270	1960			–	–	952	52	3110	569	3290	535	6000	2340	5930	2760	7430	4320	–	–
6	5030	4030	3440	2420	1960	1720			–	–	1340	52	3190	648	3020	580	5450	2410	6250	2910	7650	4200	–	–
7	–	–	3510	2030	1720	1360			–	–	1020	59	2980	636	2690	625	5920	2480	5940	2970	6880	4170	–	–
8	7860	5970	2810	1750	1370	1220			–	–	1170	114	3880	749	2560	557	5600	2630	5970	3190	7400	4320	–	–
9	6380	4750	2080	1350	1230	1020			–	–	1330	114	3650	648	2360	557	5120	2530	5980	3110	6380	4200	–	–
10	6380	4650	1590	952	1030	918			–	–	1400	148	3700	726	2740	591	5030	2220	5910	3080	8450	5000	–	–
11	5900	4560	1410	1150	974	501			–	–	2420	239	3040	771	2910	760	4170	2140	5960	2550	7940	4800	–	–
12	5190	4380	1520	1300	918	726			–	–	3510	434	2980	794	2880	749	5370	2180	6380	2630	7700	4750	–	–
13	4700	4300	2280	1270	918	704			–	–	3600	659	2630	816	2840	828	5220	2150	5980	2870	6850	4800	–	–
14	8500	4170	2940	2040	1030	884			–	–	3040	681	2060	479	2980	839	5820	2210	6320	2840	–	–	–	–
15	8130	6500	2840	2310	1370	501			–	–	3050	738	2360	411	3620	873	5820	2180	6500	2940	–	–	–	–
16	6990	5940	2320	2140	1930	1160			–	–	3690	805	2140	389	3820	918	5980	2280	6600	3080	–	–	–	–
17	5940	4090	2210	1960	3620	1580			–	–	3080	907	1430	239	4060	1030	8500	2320	6800	3220	–	–	–	–
18	5750	4400	2200	1940	3950	3150			–	–	3360	929	1870	137	4030	1120	9040	3040	6870	3510	6880	3920	–	–
19	5900	4600	2360	2180	–	–			1860	148	3290	997	2200	159	4090	1150	7700	2770	6000	3600	5980	3920	–	–
20	5400	4800	2620	2350	–	–			1310	125	3600	1030	1730	137	4200	1200	7430	2910	5990	3650	6300	3920	–	–
21	6920	4090	2630	2600	–	–			816	137	3920	907	2280	182	4170	1330	5990	2900	6450	3820	5820	3640	–	–
22	6880	6380	2740	2620	–	–			816	102	3850	1030	2070	217	4520	1450	6000	2800	6940	3900	6000	3670	–	–
23	6950	6300	2760	2700	–	–			557	80	4090	1220	1790	217	4440	1540	6450	3180	6380	3920	6600	3700	–	–
24	6870	5960	2800	2730	–	–			771	91	4320	1290	1580	239	4090	1590	5900	2950	6280	3640	6940	4200	–	–
25	6970	6350	2780	2690	–	–			907	91	4200	1410	1710	310	4480	1690	5920	3060	6380	3700	8260	3950	–	–
26	6900	6750	2690	2600	–	–			1010	91	4200	1450	–	–	3820	1730	5340	2550	6750	3900	9700	3180	–	–
27	7600	6350	2600	2560	–	–			535	80	4170	1440	–	–	4140	1710	5980	2740	7000	4200	9780	5960	–	–
28	7130	6880	2640	2590	–	–			228	52	3820	1510	1610	366	4440	1940	6000	2630	6850	3800	9620	6320	–	–
29	–	–	2630	2620	–	–			681	38	3820	1300	1680	411	3820	1620	7130	2800	7000	3690	9700	5980	5820	3690
30	–	–	2630	2590	–	–			148	31	3580	1240	1680	366	4170	1510	7000	3360	7860	3980	9280	5980	5970	3364
31	–	–	2600	2560	–	–			–	–	3510	1040	–	–	5060	1540	6970	3110	–	–	9320	5970	–	–

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

Daily mean dissolved oxygen in milligrams per liter

December 1, 1981 to November 30, 1982

Day	December	January	February	March	April	May	June	July	August	September	October	November
	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean	Mean
1	6.4				---	6.6	2.7	2.6	1.9	2.4	1.4	4.7
2	---				9.4	6.6	2.4	2.6	1.8	2.2	1.6	4.5
3	---				9.4	6.7	2.4	2.5	1.6	1.9	1.6	4.1
4	---				9.2	6.5	2.7	2.3	1.4	1.8	1.5	3.9
5	---				9.3	6.3	2.8	2.2	1.4	2.0	1.4	4.2
6	---				9.4	5.9	2.9	2.4	1.3	2.1	---	4.5
7	---				10.2	5.8	3.2	2.4	1.1	2.3	---	4.7
8	---				10.5	5.3	3.1	2.3	1.3	2.2	---	5.1
9	---				10.7	5.1	1.9	1.9	1.3	1.9	1.5	5.4
10	---				10.8	5.3	2.1	1.8	1.0	1.7	1.9	5.2
11	---				11.2	5.0	2.6	1.7	1.2	1.8	2.0	5.0
12	---				11.4	4.7	2.9	1.8	1.4	1.9	1.9	4.9
13	---				11.3	4.4	3.4	1.7	1.4	2.0	1.6	5.5
14	---				11.0	4.2	4.5	1.6	1.2	1.9	1.4	5.6
15	---				10.6	4.2	4.9	1.5	1.0	1.6	1.7	5.6
16	---				10.1	4.1	5.0	1.4	1.0	1.2	2.1	5.9
17	---				9.7	4.9	5.2	1.7	.9	1.1	3.0	5.8
18	---				9.3	4.4	5.2	2.1	.8	1.3	3.3	5.8
19	---				9.3	4.1	4.7	2.2	.7	---	3.4	5.6
20	---				9.2	4.0	4.4	2.1	.8	---	3.3	5.4
21	---				8.4	3.7	4.3	2.1	---	---	3.3	5.4
22	---				8.0	3.0	3.8	2.5	---	1.2	3.3	5.5
23	---				7.9	2.8	3.2	2.6	---	1.2	3.5	5.2
24	---				7.7	2.6	2.9	2.9	---	1.5	3.8	5.2
25	---				7.7	2.1	2.7	3.6	---	1.5	4.2	5.6
26	---				7.5	1.7	2.7	3.8	---	1.6	4.9	5.6
27	---				7.3	1.4	2.7	3.7	---	1.9	4.7	6.2
28	---				7.4	1.2	2.6	3.2	1.7	1.8	4.5	6.2
29	---				7.3	1.3	2.3	2.9	2.3	1.7	4.6	6.2
30	---				6.9	2.0	2.2	2.5	2.6	1.6	4.7	6.4
31	---				---	2.5	---	2.0	2.6	---	4.7	---

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

Daily mean dissolved oxygen in milligrams per liter

December 1, 1981 to November 30, 1982

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	3.8				---	7.9	---	3.2	0.4	---	4.5	5.2
2	---				---	---	---	3.3	.4	5.0	4.0	5.0
3	---				---	---	---	---	.4	4.7	3.8	4.8
4	---				---	---	3.6	---	.4	4.0	3.7	4.9
5	---				---	---	3.5	---	.4	4.0	3.6	5.0
6	---				---	---	2.9	---	.4	4.1	3.4	5.0
7	---				---	---	2.4	---	.3	4.3	3.2	4.9
8	---				---	---	2.6	---	---	4.5	3.3	4.9
9	---				---	---	3.0	---	---	4.5	2.4	4.9
10	---				---	---	2.8	---	---	4.4	3.5	5.1
11	---				---	---	2.1	---	---	4.3	4.2	5.0
12	---				---	---	1.7	---	---	4.1	4.2	5.2
13	---				---	---	2.4	---	3.0	4.0	4.0	5.6
14	---				---	---	3.2	2.7	2.4	3.8	4.0	5.4
15	---				---	---	3.5	1.7	1.8	3.6	4.5	5.6
16	---				---	---	4.5	.7	1.6	3.6	4.4	5.7
17	---				---	---	5.0	.3	1.5	3.8	4.5	5.5
18	---				---	---	4.4	.1	1.3	4.1	4.8	5.5
19	---				---	---	4.0	---	---	4.3	5.0	5.7
20	---				---	---	3.8	---	---	4.6	4.9	5.9
21	---				---	---	3.7	---	---	4.4	5.0	5.8
22	---				---	---	3.4	---	---	4.5	4.9	5.5
23	---				---	---	3.3	---	---	4.4	4.9	5.2
24	---				---	---	3.1	1.7	---	4.3	5.2	5.1
25	---				---	---	2.8	1.4	---	4.1	5.8	5.3
26	---				---	3.8	2.4	1.1	---	4.3	6.3	5.7
27	---				---	3.4	2.0	1.0	---	5.0	6.4	6.0
28	---				---	3.3	---	1.1	---	4.8	6.1	6.0
29	---				---	3.2	---	.9	---	4.7	5.9	6.2
30	---				7.7	---	3.8	.7	---	4.9	5.7	6.0
31	---				---	---	---	.5	---	---	5.4	-

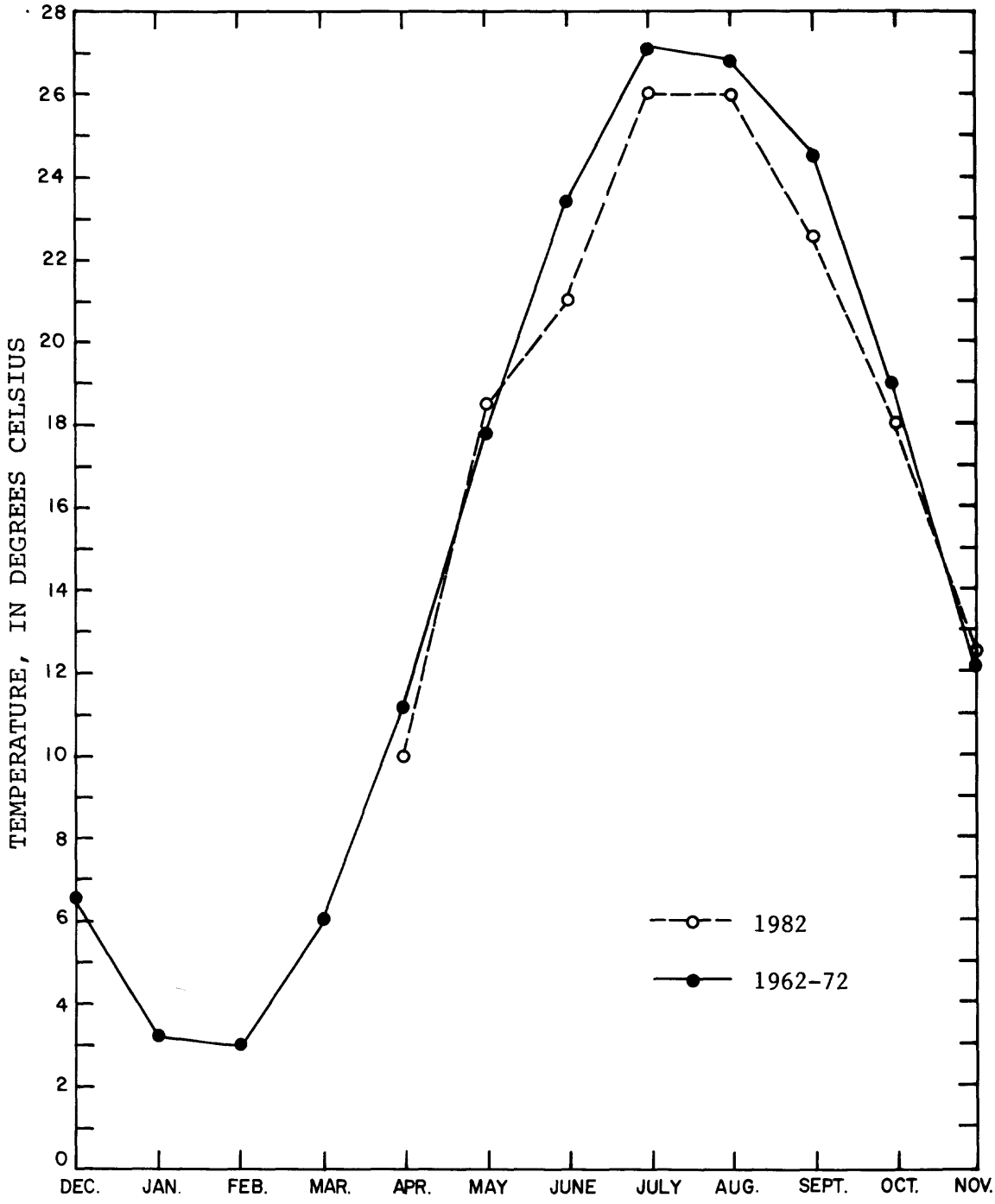

FIGURE 5.--Mean monthly temperatures of Delaware River at Benjamin Franklin Bridge, Philadelphia, Pennsylvania.

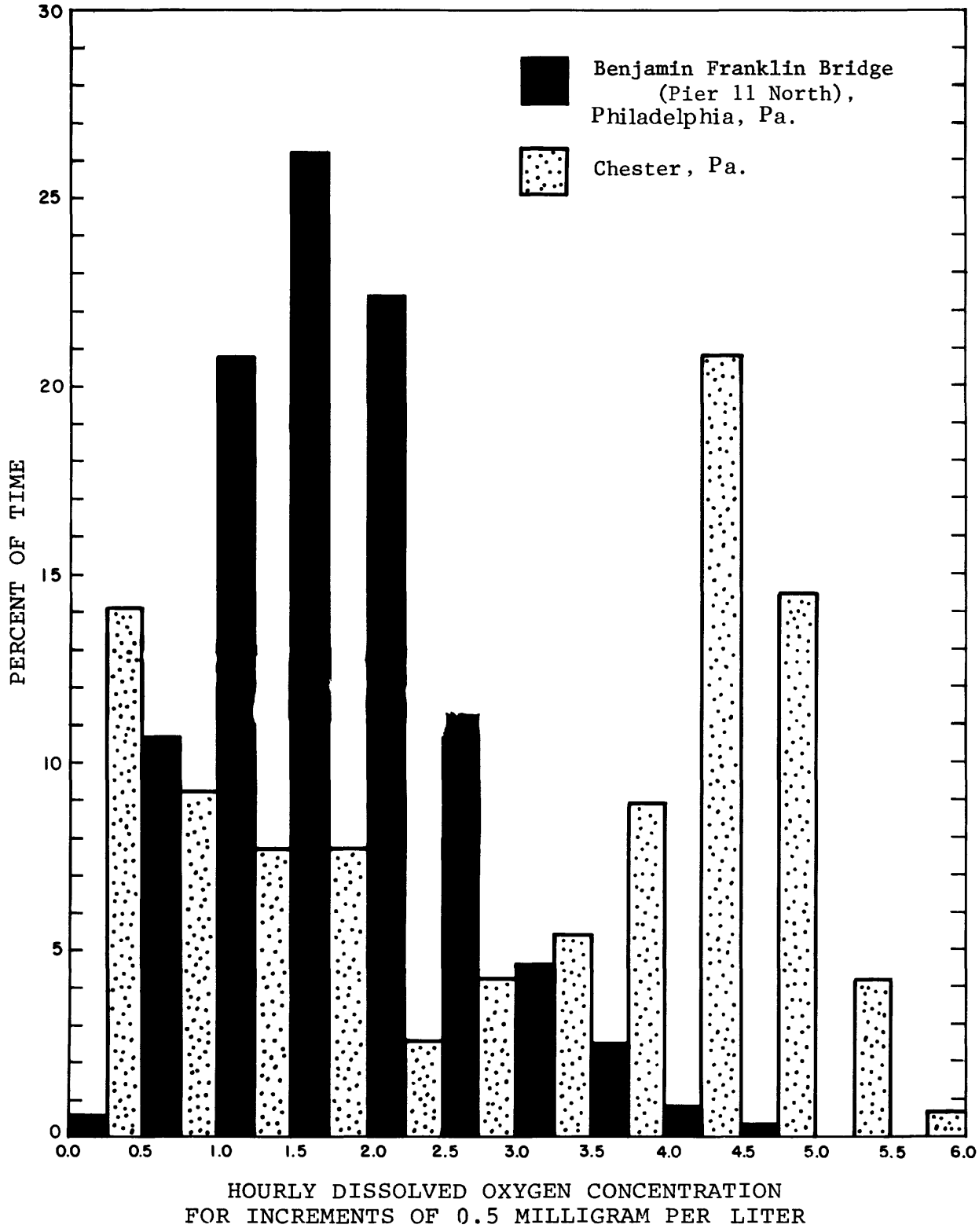

FIGURE 6.--Frequency of dissolved oxygen concentrations at two stations in the Delaware River July, August, and September 1982.