REPORT OF THE RIVER MASTER

of the

DELAWARE RIVER

for the period

Dec. 1, 1959 - Nov. 30, 1960

River Master

Official Copy

WASHINGTON, D. C.

MAY 1961

CONTENTS

Page

Section 1 - River Master letter of transmittal and special report . . 1
Section II - Report on Delaware River operations 7
Summary of operations during the 1960 report year 9
Precipitation 9
Operations 10
Definitions of terms and procedures 12
Components of flow, Delaware River at Montague, N.J. 13
Time of transit 13
Basic data 14
Records of U. S. G. S. gaging stations 14
River Master daily operation records 15
Reservoir releases and segregation of flow at Montague 15
Advance estimates of components of flow at Montague 16
Diversions to New York City water supply 20
Storage in New York City reservoirs. 20
Analysis of estimating procedures 21
Uncontrolled runoff estimates and weather adjustment estimates . 22
Powerplant release estimates 24
Summary. 24
Summary comparisons of River Master operation data and other streamflow records 24
East Branch Delaware River at Downsville, N. Y. 25
Neversink River at Neversink, N. Y. 25
Wallenpaupack Creek at Wilsonville, Pa. 26
Delaware River at Montague, N. J.. 26
Pepacton and Neversink diversion tunnels 26
Section III - Compensating releases during report year beginning December 1, 1960 and ending November 30, 1961 28
Section IV - Report on salinity investigation, Delaware River Estuary. 65
River Master function and quality of water interests. 66
Salinity in Delaware River Estuary. 67
Estuarine zones and salinity 67
Measuring salinity 67
Salinity conditions in 1960 68
Tidal action and salinity. 69
Yearly comparison of duration of salt water invasions. 71

TABLES

Page

Table 1. Daily discharge East Branch Delaware River at Downsville, N.Y. 30
2. Daily discharge Neversink River at Neversink, N.Y. 31
3. Daily discharge Wallenpaupack Creek at Wilsonville, Pa. . . . 32
4. Daily discharge Delaware River at Montague, N.J. 33
5. Daily discharge Delaware & Raritan Canal at Kingston, N.J.. 34
6. Daily discharge Delaware River at Trenton, N.J. 35
7. Reservoir releases and segregation of flow at Montague . . 36
8. Reservoir release design data 48
9. Diversions to New York City water supply 52
10. Storage in Pepacton Reservoir, N. Y. 58
11. Storage in Neversink Reservoir, N.Y. 59
12. New York City consumption of water 1914 to 1960 60
13. Chloride concentration, Delaware River at Chester, Pa. . . 72
14. Chloride concentration, Delaware River at Delaware Memorial Bridge, Del. 73
15. Chloride concentration, Delaware River at Reedy Island Jetty, Del. 74

ILLUSTRATIONS

Map of Delaware River basin above Trenton, N.J. 8

Plate 1. Components of flow, Delaware River at Montague, N.J. 61
2. Hydrographs of uncontrolled component, Delaware River at Montague, N.J. 63
3. Map showing sampling station locations 75
4. Maximum and minimum chloride concentrations, Delaware River at Delaware Memorial Bridge, Del. 76
5. Maximum and minimum chloride concentrations, Delaware River at Reedy Island Jetty, Del. 77

Section I

RIVER MASTER LETTER OF TRANSMITTAL

AND

SPECIAL REPORT

OFFICE OF THE DELAWARE RIVER MASTER

Milford, Pa.

March 2, 1961

The Chief Justice
Earl Warren
U. S. Supreme Court

The Honorable
Elbert N. Carvel
Governor of Delaware

The Honorable
Robert B. Meyner
Governor of New Jersey

The Honorable
Nelson A. Rockefeller
Governor of New York

The Honorable
David L. Lawrence
Governor of Pennsylvania

The Honorable
Robert F. Wagner
Mayor of the City of New York

Amended Decree of the United States
Supreme Court of June 7, 1954; Re:
New Jersey v. New York et al,
Delaware River

Dear Sirs:

It was with deep regret that I notified representatives of the Governors and Mayor of the death of Mr. Carl G. Paulsen, Delaware River Master, January 30, 1961 in Caldwell, Idaho. The Chief Hydraulic Engineer notified the Chief Justice, the Governors and the Mayor and simultaneously announced, with the concurrence of the Director of the United States Geological Survey, the designation of Joseph V. B. Wells as River Master in accordance with the terms of the Amended Decree of June 7, 1954.

For the record and information of the United States Supreme Court, the States of Delaware, New Jersey, New York, and Pennsylvania, and the City of New York, I am transmitting herewith, on behalf of Mr. Paulsen, the Seventh Annual Report of the River Master of the Delaware River for the year December 1, 1959 to November 30, 1960, under terms of the Amended Decree of the Supreme Court, dated June 7, 1954. Additional copies of this report are being furnished in the number desired.

The 1960 report year, which began December 1, 1959 and ended November 30, 1960 was one of varied hydrologic conditions in the Delaware River basin. Streamflow as indicated by Delaware River at Montague, N.J. was slightly above average for the year but by months it included a record-low flow for March and a record-high flow for September. The combined storage in Pepacton and Neversink Reservoirs was 70 percent of their capacities on December 1, 1959 and the reservoirs filled and overflowed in April 1960. Diversions for water supply of New York City and releases to maintain flow of Delaware River at Montague, N. J. during the year were accomplished under the supervision of the River Master.

Representatives previously designated by the Governors and Mayor continued to function as a Delaware River Master Advisory Committee for the purpose of reviewing with the River Master operating plans and procedures for the Delaware River under the terms of the Decree.

During the current report year, a meeting of the Delaware River Master Advisory Committee was held with the River Master at Milford, Pa. on May 9. Minutes of the meeting, as approved by the Committee, were maintained by the River Master.

The following State and City representatives and other interested officials were present at the meeting:

Delaware

Dr. Johan J. Groot (a)
General Norman M. Lack, Ret. (b)

New Jersey

Mr. George R. Shanklin (a)
Mr. Howard W. Acken

New York

Mr. John C. Thompson (a)

Pennsylvania

Mr. Maurice K. Goddard (a)

New York City

Mr. Arthur C. Ford (a)
Mr. Stanley M. Dore
Mr. Eugene F. Farnan
Mr. Vincent G. Terenzio
Mr. Edward J. Clark
Mr. Frank X. Elder
Mr. Abraham Groopman
Mr. Fred C. Stein, Jr.

(a) Designated Committee representative
(b) Designated Committee alternate representative

Since March 1955 the Geological Survey has maintained a field office of the Water Resources Division at Milford, Pa. The purpose of this office, which has been designated as the Milford Office of the Delaware River Master, is to assemble and supply hydraulic and hydrologic information needed by the River Master in carrying out his responsibilities under the Amended Decree. Mr. Robert E. Fish, Deputy Delaware River Master was in charge of the Milford Office, and Mr. Walter R. Scott, hydraulic engineer, succeeded by Mr. Bernard Dunn, was his assistant.

During the report year the Milford office continued the weekly distribution of summary river data. These weekly reports contain preliminary data on releases and spills from the New York City reservoirs to the Delaware River, diversions to New York City water-supply system, reservoir contents, and daily segregation of flow of Delaware River at the Montague gaging station. The reports are made available to the State and City representatives on the Delaware River Master Advisory Committee and to certain other parties interested in Delaware River operations.

Sections II and III of the accompanying report pertain to Delaware River operations. They describe in detail river operations during the report year, discuss and summarize various phases of river operations, and present data on correlation of streamflow records.

As shown in Section II, page 12 of the accompanying report, the City of New York diverted a total of 185.151 billion gallons from the basin during the report year ending November 30, 1960, and released 11.278 billion gallons, and 35.732 billion gallons spilled to the Delaware River during the same period. During the low-flow period, July 24 to September 11, 1960, Montague dates, 4.718 billion gallons, excluding 0.754 billion gallons of conservation releases, were released to the Delaware River from Pepacton and Neversink Reservoirs. This release contributed materially to the flow at the Montague gaging station as shown in the color graph on plate 1.

Section IV of the report on salinity investigations in the Delaware Estuary was prepared upon request by Norman H. Beamer, District Chemist, Quality of Water Branch, Water Resources Division, U. S. Geological Survey at Philadelphia, Pa. in collaboration with the Milford office. It contains data showing the extent of salinity invasion in the Delaware Estuary during the low-flow season of the report year.

It is my pleasure to report that, during the current report year, there has been compliance with all provisions of the Amended Decree applying to the period, under the second phase of the Decree, following completion and placing in operation of Pepacton and Neversink Reservoirs of the City of New York.

The accompanying report for the year ending November 30, 1960 has been reviewed by the Delaware River Master Advisory Committee for the Delaware River Master.

The advice and cooperation of Mr. Paulsen and of the Delaware River Master Advisory Committee have been greatly appreciated. Thanks are also due to personnel of the District and Field Offices of the U. S. Geological Survey, the U. S. Weather Bureau, the New York City Board of Water Supply and the Department of Water Supply, Gas and Electricity, the 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 Bernard Dunn and Mrs. Pauline L. Hendershott for their capable assistance in preparing these reports.

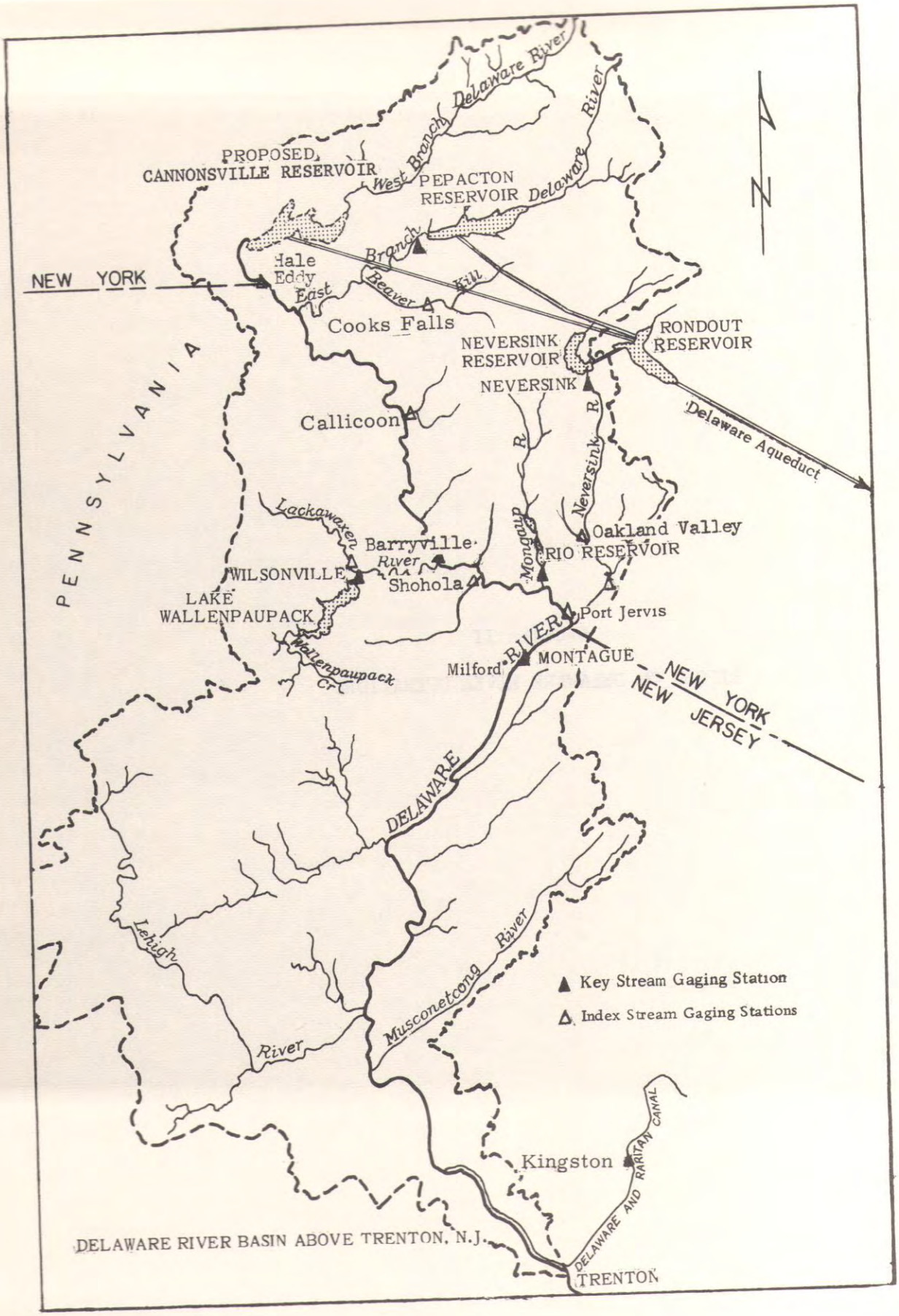
Sincerely yours,

Robert E. Fish

Robert E. Fish
Deputy Delaware River Master

Section II

REPORT ON DELAWARE RIVER OPERATIONS


PROPOSED
CANNONSVILLE RESERVOIR
West Branch Delaware River
PEPACTON
RESERVOIR
Delaware River
Branch
Hale
Eddy
East
Beaver Kill
NEW YORK
Cooks Falls
NEVERSINK
RESERVOIR
RONDOUT
RESERVOIR
NEVERSINK
Delaware Aqueduct
PENNSYLVANIA
Callicoon
R
Neversink
Lackawaxen
Barryville
Oakland Valley
Mongaup
RIO RESERVOIR
River
WILSONVILLE
Shohola
LAKE
WALLENPAUPACK
Port Jervis
Wallenpaupack
Cr
Milford
RIVER
MONTAGUE
NEW YORK
NEW JERSEY
DELAWARE
Lehigh
River
Musconetcong River
▲ Key Stream Gaging Station
△ Index Stream Gaging Stations
Kingston
DELAWARE AND RARITAN CANAL
DELAWARE RIVER BASIN ABOVE TRENTON, N.J.
TRENTON

Summary of Operations during the 1960 Report Year

The 1960 report year, December 1, 1959 to November 30, 1960, was a year of slightly above average runoff in the Delaware River basin. During several periods of the year the runoff varied widely from average conditions. The flow of Delaware River at Montague for March was the lowest March flow in 20 years of record; the flow for September was the highest September flow of record. The flow of Delaware River at Montague was maintained by directing releases from Pepacton and Neversink Reservoirs in accordance with the requirements of the Decree. Diversions to New York City and through the Delaware & Raritan Canal were within prescribed amounts.

Precipitation

The runoff at Montague was sustained chiefly by precipitation observed during the 1960 report year as 101 percent of a 19-year average. The precipitation was unevenly distributed throughout the year as shown in the following table:

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

Month	Dec. 1940 to Nov. 1959 Average	Dec. 1959 to Nov. 1960 Amount	Dec. 1959 to Nov. 1960 Percent of average
December	3.43	4.14	121
January	2.83	3.46	122
February	2.73	3.71	136
March	3.31	2.00	60
April	3.75	3.84	102
May	4.37	4.18	96
June	3.65	6.00	164
July	4.47	4.70	105
August	3.84	4.45	116
September	3.62	8.35	231
October	3.51	1.65	47
November	3.81	1.71	45
12 months	43.32	43.55	101

These data were computed from records of U. S. Weather Bureau at ten stations distributed over the basin area above Montague, except for the period June to October 1960, which was based upon records from nine stations reported daily to the River Master's office.

The period December to May is generally considered the season for filling of the reservoirs, and replenishing of ground water. During the 1960 season precipitation of 21.33 inches was observed, which was 104 percent of the 19-year average.

Operations

On December 1, 1959 Pepacton Reservoir contained 97.268 billion gallons of water in storage above the point of maximum depletion. This was 69 percent of this reservoir's storage capacity of 140.190 billion gallons. On the same date Neversink Reservoir contained 25.184 billion gallons of water in storage above the point of maximum depletion. This was 72 percent of this reservoir's capacity of 34.941 billion gallons. Combined storage in the two reservoirs was 122.452 billion gallons or 70 percent of their combined capacities.

During the seasonal period prior to December 1, 1959, there had been released from the reservoirs and credited at Montague 29,724 cfs-days (19,214 million gallons) of the seasonal excess release water credit, which had amounted to 51,054 cfs-days (33,002 million gallons) in the beginning. During the remainder of the seasonal period, December 1, 1959 to March 14, 1960 the discharge at Montague was above 1,951 cfs and no additional credits were made. Consequently, on March 14, 1960 the remaining unreleased credit of 21,330 cfs-days (13,788 million gallons) of excess release expired.

From March 15 to June 14, 1960 the prescribed basic rate to be maintained at Montague was 1,525 cfs. During this period the forecasted discharge was greater than 1,525 cfs each day.

Inflow to the City's reservoirs during the period December 1 to May 31 usually can be expected to exceed demands and there will be an increase in stored water. The average inflow for these six months during the 19-year period, December 1940 to May 1959, was 162.3 billion gallons. During the corresponding six months of the current report year, inflow to the reservoirs totalled 181.2 billion gallons. This amount of inflow was sufficient to fill each reservoir to capacity and to cause spilling for several weeks.

During the current winter and spring period a portion of the inflow to the reservoirs was required for releases and for diversions. Releases were made by New York City for conservation purposes. Diversions to Rondout Reservoir December 1 to May 31 totalled 96.901 billion gallons. Pepacton Reservoir reached its maximum storage April 5 when it contained 144.418 billion gallons or 103.0 percent of capacity.1/ Neversink Reservoir attained its maximum storage April 18 when it contained 35.214 billion gallons or 100.8 percent of capacity.1/ On June 1, 1960 the combined contents of the two reservoirs was 174.303 billion gallons or 99.5 percent of their combined capacity.2/

1/ From once daily pool elevation observed at 9 a.m. Includes surcharge above crest of spillway.
2/ From once daily pool elevation observed at 9 a.m.

On June 15, 1960 the seasonal period began for release of excess water and the design rate to be maintained at Montague became 1,815 cfs, which amounts to 290 cfs of excess release water above the basic rate of 1,525 cfs. On the basis of advance estimates, releases from the reservoirs designed to maintain the 1,815 cfs rate at Montague were required on June 15, on 23 days during the period July 24 to September 14, and on November 27 and 28. On those 26 days it was anticipated that the directed release for maintaining 1,815 cfs at Montague would be within the capacity of the release gates.

During the period June 15 to November 30 there were two days wherein the discharge was less than 1,525 cfs at Montague by daily deficiencies of 5 and 105 cfs. There were also seven days during this period wherein the discharge was between 1,525 and 1,815 cfs. There was sufficient water in the reservoirs and adequate capacity of the release gates to meet the requirements. The deficiencies were attributable to one or more of the following factors: uncontrolled flow being less than anticipated, weather adjustment less than forecasted, powerplant releases less than forecasted, or a negative balancing adjustment. A discussion of deficiency or excess in Montague flow as compensated by use of the balancing adjustment is given on page 20.

By November 30 the cumulative error in the directed release, using the balancing adjustment, indicated 3,404 cfs-days (2,200 million gallons) had been released to Delaware River above the excess release requirements at Montague. (See table 8 for November).

The hydrograph on plate 1 for the period June 1 to September 30, 1960 shows the total discharge at Montague, the portion derived from uncontrolled runoff, the portion contributed by the power reservoirs, and the portion contributed by Pepacton and Neversink Reservoirs.

The following tabulation summarizes diversions, releases made under the provisions of the Montague Release Formula, and other contributions to the flow of Delaware River at Montague during the period July 24 to September 11 (Montague dates), which includes most of the directed releases:

	Advance estimates		1960 operations	
	Cfs-days	Million gallons	Cfs-days	Million gallons
Diverted to Rondout Reservoir	-	-	35,949	23,238
Pepacton & Neversink release	7,273[a]	4,701	7,299[b]	4,718
Wallenpaupack & Rio power releases	33,468	21,634	38,914	25,154
Runoff from uncontrolled area	79,972	51,695	105,270	68,048
Excess release credit (Nov.30)	-	-	6,821	4,409

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

In the year December 1, 1959 to November 30, 1960 (reservoir dates) diversions to Rondout Reservoir totalled 286,429 cfs-days (185,151 million gallons) and all releases to the Delaware River totalled 17,447 cfs-days (11,278 million gallons). Flow over the spillways of Pepacton and Neversink Reservoirs amounted to 55,278 cfs-days (35,732 million gallons).

Definitions of Terms and Procedures

The River Master has found it necessary, in connection with river operations and water budgeting, to define various terms and procedures as follows:

Rate of flow.--Mean discharge for any stated 24-hour period, eastern standard time.

Rate of flow at Montague.--Daily mean discharge at Montague on a midnight-to-midnight basis, eastern standard time.

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

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

Maximum reservoir depletion.--The minimum water surface level or elevation below which a reservoir ceases to make delivery of quantities of water for all purposes for which the reservoir was designed. Sometimes this is referred to as minimum full-operating level.

Date of beginning of seasonal period for releases of excess water.--Each year the seasonal period begins at the Delaware River at Montague stream gaging station on June 15. The design rate, computed as prescribed by the Decree, becomes effective at Montague on June 15 of each year and continues in effect until the following March 15, unless terminated earlier in accordance with provisions of the Decree.

Daily storage credits and deficits and excess-release credit.--The seasonal period for release of excess water begins on June 15 of each year and ends on the following March 14, or when the cumulative total of credits becomes equal to the seasonal excess release quantity, whichever occurs first. Daily storage credits and deficits are equal to the mean daily discharge at Montague in cubic feet per second minus 1,525, computed algebraically, however, the daily credit can not exceed the 24-hour period releases in cubic feet per second, made in accordance with direction, from Pepacton and Neversink Reservoirs, routed to Montague. During the seasonal period credits are also made for part or all of other prior releases from Pepacton

and Neversink Reservoirs contributing to mean daily discharges at Montague between 1,525 and the excess release rate.

Components of Flow, Delaware River at Montague, N.J.

Discharge of the Delaware River at Montague, N.J. is made up of the following source components:

1. Controlled releases from Wallenpaupack Reservoir on Wallenpaupack Creek in the production of hydroelectric power.
2. Controlled releases from Rio Reservoir on Mongaup River in the production of hydroelectric power.
3. Uncontrolled runoff from the area above Montague, including spillway overflow at upstream dams.
4. Controlled releases from New York City reservoirs (Pepacton and Neversink).

In carrying out the provisions of the Decree in connection with the Montague Release Formula and in computing daily credits for excess releases, a water budget of the various components of flow routed to Montague is maintained by the River Master. The water budget consists essentially of two parts: (1) Segregation of the average daily flow at Montague among its various source components; and (2) advance estimates of the average daily flow at Montague, exclusive of controlled releases from New York City's reservoirs, for determining the amount of release necessary from these reservoirs to maintain the applicable rates of flow at Montague. In these water budget computations, the time intervals which are required for water to travel from the various sources to Montague are taken into account.

Time of Transit

The following schedule of average time for transit of water from the various sources of controlled supply to Montague has been used commencing December 1, 1955:

Rio Reservoir	8 hours
Wallenpaupack Reservoir	16 hours
Neversink Reservoir	33 hours
Pepacton Reservoir	60 hours

This schedule was used throughout the 1960 report year in routing the 24-hour period discharges from the various sources of controlled supply to Montague. Observations during the year confirmed that these average time elements of flow were generally applicable for stream system conditions when the discharge at Montague was between 1,500 and 2,200 cfs. This is the range in flow that generally occurs when releases from Pepacton and Neversink Reservoirs are required to maintain the applicable rates of flow at Montague.

Because of practical operating considerations the adopted time of transit from the Neversink Reservoir to Montague has been taken as 33 hours, although the observed time has been found to be approximately 28 hours. The 33-hour period was arbitrarily adopted, because of personnel considerations, in order that gate changes could be made at the reservoir during the hours of the normal working day.

Basic Data

The following presentations of basic data have been separately delineated as records of U. S. G. S. gaging stations and River Master daily operation records. The U. S. G. S. gaging station records are collected, computed and furnished by the District offices of the U. S. Geological Survey at Albany, N.Y., Harrisburg, Pa., and Trenton, N.J. in cooperation respectively with the State of New York and New York City and the States of Pennsylvania and New Jersey. These records are computed on a midnight-to-midnight basis, eastern standard time.

The River Master daily operation records are prepared by the Milford office of the Delaware River Master from data collected principally on a day-to-day basis. Data for these records are collected and computed by the Milford office or are furnished by the New York City Board of Water Supply, and, after June 30, 1960, by the New York City Department of Water Supply, Gas and Electricity, the Pennsylvania Power & Light Company, and Orange and Rockland Utilities, Inc. Many of these data are for 24-hour periods other than midnight-to-midnight.

Records at U. S. G.S. Gaging Stations

The following streamflow records were computed and furnished by the district offices of the Geological Survey. These records were computed on a midnight-to-midnight basis, eastern standard time.

East Branch Delaware River at Downsville, N.Y.

Discharge shown in table 1 includes releases and spills from Pepacton Reservoir, a small amount of seepage entering the channel between the dam and gage site, and during storms, a small amount of runoff originating between the dam and gage site.

Neversink River at Neversink, N.Y.

Discharge shown in table 2 includes releases and spills from Neversink Reservoir and, during storms, a small amount of runoff originating between the dam and gage site.

Wallenpaupack Creek at Wilsonville, Pa.

Discharge shown in table 3 is the flow through the turbines of the Pennsylvania Power & Light Company powerplant. No water was spilled from Lake Wallenpaupack during the report year.

Delaware River at Montague, N.J.

Table 4 shows daily discharge of Delaware River at Montague, N.J.

Delaware & Raritan Canal at Kingston, N.J.

Table 5 shows daily discharge of the Delaware & Raritan Canal at Kingston, N.J. This gaging station is located in the Raritan River basin and 6.6 miles beyond the Delaware River basin divide. According to the terms of the Decree, the State of New Jersey may divert for use outside of the Delaware River basin, without compensating releases, not to exceed 154.7 cfs (100 mgd) as a monthly average with the diversion on any day not to exceed 185.6 cfs (120 mgd). The tabulation shows that the Decree limitation was not exceeded at any time.

Delaware River at Trenton, N.J.

Table 6 shows daily discharge of Delaware River at Trenton, N.J.

River Master Daily Operation Records

Reservoir Releases and Segregation of Flow at Montague

The River Master daily operation record of reservoir releases and daily segregation of flow among the various source components contributing to the flow of Delaware River at Montague, N.J. is shown in table 7. The tabulation also shows daily and cumulative storage credits and deficits. This tabulation, together with table 8, forms the basic record of the River Master's operations in carrying out his specific responsibilities with respect to the Montague Release Formula.

In his daily operations it is necessary that the River Master utilize: (1) Discharges computed from recorded or reported gage heights for various 24-hour periods without benefit of current specific information that changes in stage-discharge relations may have occurred; (2) advance estimates of power demand converted to daily discharge; (3) actual powerplant operations converted to daily discharge; (4) advance estimates of anticipated uncontrolled runoff at Montague; and (5) daily discharge obtained from precalibrated venturi meters. Certain minor inaccuracies are inherent in such provisional data. Nevertheless, such data must be used on a day-to-day basis in the design and direction of releases from the New York City reservoirs and in determining credits for excess releases.

Preliminary data on daily releases from Pepacton and Neversink reservoirs were furnished by the New York City Board of Water Supply, and, after June 30, 1960 by the New York City Department of Water Supply, Gas and Electricity. Wallenpaupack Reservoir power operations were furnished by the Pennsylvania Power & Light Company. Rio Reservoir release data were furnished by the Orange and Rockland Utilities, Inc. The uncontrolled runoff was computed by subtracting the sum of the contributions of the several sources from the total discharge at Montague.

The arrangement of data in table 7 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 following schedule for travel time of water:

From Pepacton Reservoir to Montague	60 hours
From Neversink Reservoir to Montague	33 hours
From Wallenpaupack Reservoir to Montague	16 hours
From Rio Reservoir to Montague	8 hours

The contribution from Rio Reservoir is shown on the same date as the Montague flow, on which it usually occurs.

The computations of the daily storage credits and deficits were made as outlined in the definition of terms and procedures (page 12) and further explained in the footnote at the bottom of table 7.

Advance Estimates of Components of Flow at Montague

Pepacton Reservoir is at present the principal source of supply to meet New York City's obligations in maintaining prescribed rates of flow at Montague. For this reason the timing of daily directed releases to maintain prescribed rates of flow at Montague is based on the time of transit of water from Pepacton to Montague. For operation purposes, it is assumed that the daily directed releases will be made from Pepacton Reservoir. However, New York City has the right to assign any portion of the directed release for delivery from Neversink Reservoir. Releases from Neversink Reservoir are timed to arrive at Montague concurrently with releases from Pepacton Reservoir. Daily directed releases begin at Pepacton at 12 noon, eastern standard time, and the portion assigned to Neversink begins at Neversink at 3 p.m. the following day, eastern standard time.

The determination of the amount of release required from the City's reservoirs to maintain specified rates of flow at Montague is based on expected releases from the Wallenpaupack and Rio Reservoirs as well as the anticipated uncontrolled runoff at Montague. Taking into account time of transit from these sources to Montague, this determination requires that during periods of deficient runoff, advance estimates of the following components must be made on the morning of each day: (1) The expected release of water from Wallenpaupack Reservoir for power production for a 24-hour period beginning at 8 a.m. two days later; (2) expected release of water from Rio Reservoir for power production for a 24-hour period beginning at 4 p.m. two days later; and (3) expected uncontrolled runoff at Montague three days later. Table 8 shows River Master daily operation record for computing the daily directed release during periods of low flow.

For advance estimates of powerplant operation, the River Master must depend upon the power companies. The powerplant release forecasts furnished by the power companies are shown in columns 1 and 2 in table 8.

Information on expected Wallenpaupack power operations was furnished by the Pennsylvania Power & Light Company and the Rio Reservoir release forecasts were furnished by the Orange and Rockland Utilities, Inc. As the hydroelectric plants are used chiefly for meeting peak-power demands of the systems, these advance estimates are subject to many modifying factors, such as the influences of all the vagaries of weather upon peak-power demand and unpredictable transmission and mechanical difficulties in electric system operation. During the present year the electric power companies cooperated fully in furnishing estimates of expected operation. However, it is impractical for the companies to estimate their probable operation on any period other than on a daily basis. In the estimates for the Wallenpaupack plant this is not a matter of concern as power operation during periods of low flow is usually during the hours between 8 a.m. and 10 p.m. In routing the Rio Reservoir release estimates some error is introduced at times as the power operation during the periods of low flow is usually between 7 a.m. and 10 p.m., which spans the daily 4 p.m. to 4 p.m. routing period.

For computation purposes the estimate of uncontrolled runoff at Montague three days in advance can best be treated as two items: (1) Runoff from 2,587 square miles of uncontrolled drainage area above Montague, based on conditions existing over the drainage area as of 8 a.m. on the morning the estimate is made; and (2) estimated increase in runoff from precipitation forecasted to occur on the day the estimate is made and the two following days. Estimated quantities for these items are shown in columns 4 and 5 of table 8.

The advance estimate of uncontrolled runoff (present conditions) column 4 is based on discharges as of 8 a.m. at the following gaging stations having drainage areas as indicated:

Beaver Kill at Cooks Falls, N.Y. (241 square miles)
West Branch Delaware River at Hale Eddy, N.Y. (593 square miles)
Callicoon Creek at Callicoon, N.Y. (111 square miles)
Lackawaxen River at Hawley, Pa. (290 square miles)
Shohola Creek near Shohola, Pa. (85 square miles)
Bush Kill at Oakland Valley, N.Y. (20 square miles)

The procedure for computing the advance estimate combines a routing of the 8 a.m. discharges of the Beaver Kill, West Branch Delaware, Callicoon, and Lackawaxen gaging stations (1,235 square miles) to Montague with a computed average yield from the remaining 1,352 square miles. The average yield from the 1,352 square-mile area is computed on the basis of the 8 a.m. discharges at the Callicoon, Lackawaxen, Shohola, and Bush Kill gaging stations with allowance for a three-day normal recession.

The advance estimate of increase in runoff from precipitation is shown in column 5, table 8 under the heading of "weather adjustment". The U. S. Weather Bureau office in Harrisburg, Pa. cooperated throughout the low-flow period by furnishing to the River Master's office, each morning, quantitative estimates of average precipitation over the drainage area

above Montague. Precipitation estimates were furnished for each day of the three-day period.

The procedure for converting three-day precipitation forecasts into runoff at Montague three days later was based on a study of past storms. The former study was replaced by a new procedure, except for a few days when combinations of the two procedures were used. In the present study the uncontrolled runoff at Montague (present conditions) was first computed and its normal recession deducted from the total uncontrolled runoff at Montague to obtain incremental increases at Montague due to storms. The increment was considered as derived from the portion of the uncontrolled drainage area within three-day transit time of Montague. In the relation of rainfall and resulting incremental increase in streamflow, the effect of antecedent conditions indicated increasing storm runoff corresponding to the range of "dry" to "wet" prior conditions. "Dry" antecedent conditions were investigated primarily because of greater use and more abundant and more readily distinguishable data. Seasonal effect showed in lessening increments of discharge from June 1 to mid-August followed by increasing amounts until October 31, when the increment became essentially that of June 1.

In tabulating the results of the study, runoff values were determined for 0.25 inch rainfall because of its definition, location in range of common occurrence, and frequent quotation by forecasters. Factors were computed for the ratio of runoff from other amounts of rainfall to runoff from 0.25 inch rainfall for storms from 0 to 2 inches rainfall. Consideration of daily components of storm runoff indicated the total at Montague might be apportioned over the three days following the rain, thus: 35 percent on the first day, 40 percent on the second day, and 25 percent on the third day. While it was not possible to develop precise correlations, the approximate relationships shown in the following skeleton tabulations were deduced from the study:

Incremental discharge in cubic feet per second at Montague on "n+3" day for 0.25 inch rainfall

Seasonal grouping	Antecedent watershed conditions	Day of precipitation "n"	"n+1"	"n+2"
June 1	Dry	105	120	75
	Moist	163	187	117
	Wet	238	272	170
July 1	Dry	92	106	66
	Moist	144	165	103
	Wet	210	240	150
August 1	Dry	49	56	35
	Moist	77	88	55
	Wet	112	128	80
September 1	Dry	41	46	29
	Moist	63	72	45
	Wet	92	105	66
October 1	Dry	73	83	52
	Moist	114	130	81
	Wet	166	190	118

General definition of antecedent watershed conditions:
Dry - No precipitation for previous 5 days
Moist - 0.3" to 0.5" average precipitation on previous 1 or more days
Wet - 0.6" or more precipitation on previous day

For other amounts of rainfall, the following factors are applied to the above tabular values:

Rainfall, in inches	Factor	Rainfall, in inches	Factor
0.1	0.28	0.6	5.1
.2	.71	.8	9.3
.3	1.37	1.0	15.3
.4	2.3	1.25	25
.5	3.6	1.5	37

For 1960 operations incremental discharges from the table were applied beginning June 12 with interpolations for successive dates. Tabular values for moist and wet antecedent conditions were not completed until several weeks later so combinations of the new and former procedures were used in the interim. Computations of expected flows during the latter part of November used the rate for June 1.

The total anticipated flow at Montague, exclusive of releases from the City's reservoirs, column 6, table 8, is the sum of the forecasted releases from the power reservoirs, the anticipated uncontrolled runoff under present conditions, and the weather adjustment. The amount by which the anticipated flow at Montague is less than the prescribed Montague rate is an indication of what the deficiency will be at Montague, column 7, table 8.

It is impossible, because of the many factors involved, to precisely predict in advance the resultant flow at Montague. However, over a period of time any cumulative error in the estimating procedure should be eliminated so far as possible. To accomplish this, a balancing adjustment is applied to the indicated deficiency or excess in computing the directed release. This adjustment is based on the amount by which the directed release is greater or less than the release actually required to maintain the prescribed rates of flow at Montague. As releases from the reservoirs are limited by the capacity of the reservoir outlet gates, this limitation must be taken into account and the directed release and the release actually required must be adjusted accordingly. During the 1960 report year the capacity of the release gates was adequate at all times. The mechanics of determining the balancing adjustment are accomplished in columns 10 to 15, table 8. In the 1960 operations the cumulative error in adjusted directed release was arbitrarily divided by 20 to spread the balancing factor over about 20 days. As the cumulative error can not be determined until actual flow at Montague is determined, the computed balancing factor adjustment in the table is entered in column 8 four days later than the cumulative error is determined in column 15. In 1960 operations the balancing factor was applied on most days and was helpful in reducing the cumulative errors resulting from the forecasting procedure. For conditions of adequate release capacity, particularly after Cannonsville is in operation, the balancing procedure will be a valuable tool in compensating for errors which may occur in the advance estimate.

Diversions to New York City Water Supply

Table 9 shows diversions from Pepacton and Neversink Reservoirs to the New York City water-supply system for 24-hour periods beginning at 9 a.m. of the day shown and ending at 9 a.m. on the following day. The tabulation includes a running account of the average of the combined diversions from the reservoirs computed as prescribed by the Decree. The prescribed maximum equivalent diversion rate is 490 mgd. As will be noted, the equivalent of this prescribed rate was not exceeded at any time.

Data on daily diversions from the reservoirs were obtained from pre-calibrated venturi meters and were furnished by the New York City Board of Water Supply and, after June 30, 1960, by the New York City Department of Water Supply, Gas and Electricity.

Storage in New York City Reservoirs

Tables 10 and 11 show storage in Pepacton and Neversink Reservoirs above minimum full-operating levels. Storage as shown is based on "conditions of maximum reservoir depletion". The New York City Board of Water Supply has determined that the minimum full-operating level for conditions of maximum reservoir depletion for Pepacton Reservoir is elevation 1,152 feet and for Neversink Reservoir is elevation 1,319 feet.

Pepacton Reservoir has a usable capacity of 140,190 million gallons above the point of maximum depletion. It contains 3,511 million gallons of stored water between the point of maximum depletion (elevation 1,152.00 feet) and the sill of the diversion tunnel (elevation 1,143.00 feet). In addition there are 4,200 million gallons of storage between the sill of the diversion tunnel and the sill of the river outlet tunnel (elevation 1,126.50 feet), making a total of 7,711 million gallons between the point of maximum reservoir depletion (elevation 1,152.00 feet) and the sill of the river outlet tunnel (elevation 1,126.50 feet). In Pepacton Reservoir there are 1,800 million gallons of dead storage below the sill of the river outlet tunnel. It is to be noted that the sill of the river outlet tunnel is 16.5 feet lower in elevation than the sill of the diversion tunnel.

Neversink Reservoir has a usable capacity of 34,941 million gallons above the point of maximum depletion. It contains 525 million gallons of stored water between the point of maximum depletion (elevation 1,319.00 feet) and the sill of the outlet-diversion tunnel (elevation 1,314.00 feet). In Neversink Reservoir there are 1,680 million gallons of dead storage below the sill of the outlet-diversion tunnel. It is to be noted that the elevation of the sill of the river outlet tunnel is the same as the sill of the diversion tunnel.

Daily gage readings at 9 a.m. of Pepacton and Neversink Reservoirs were furnished by the New York City Board of Water Supply, and, after June 30, 1960, by the New York City Department of Water Supply, Gas and Electricity. Rating tables of reservoir capacities were furnished by the Board of Water Supply.

Analysis of Estimating Procedures

In carrying out the provisions of the Montague Release Formula it is necessary to estimate in advance the quantities of water which will arrive at Montague each day from the various source components. On the basis of these estimates, the amount of water to be released from the New York City reservoirs to maintain the prescribed rates of flow at Montague is determined. If the estimates are too high, insufficient water will be released and downstream interests will not receive the full benefits to which they are entitled. Should the estimates be too low, more water will be released than necessary, resulting in the storage supplies being depleted, and the ability of the reservoirs to meet later commitments during sustained periods of drought may be placed in jeopardy. It is, therefore, necessary that the advance estimates of flow be as accurate as possible.

The purpose of this analysis is to examine the magnitude of the apparent errors in the advance estimates of flow the 1960 year of River Master operations, delineate the causes of error and program remedial measures to be followed in subsequent years in order to eliminate, insofar as possible or practicable, the sources of error. It should be kept in mind, however, that apparent errors may be more a case of unavoidable inaccuracy where

accuracy is impossible rather than errors resulting from inadequate procedures or mistakes in calculation.

Uncontrolled Runoff Estimates and Weather Adjustment Estimates

The anticipated uncontrolled runoff, present conditions, plus the weather adjustment based on forecasted precipitation was made three days in advance of actual runoff, i.e., on the morning of the day, three days prior to the day of design at Montague. In the procedure used during the 1960 low-flow season, the following information was available for the estimator:

1. The previous day's actual uncontrolled runoff at Montague

2. Discharges at the following stream gaging stations at approximately 8 a.m. of the day the estimate is made:

   a. Beaver Kill at Cooks Falls, N.Y.
   (Drainage area 241 square miles)

   b. West Branch Delaware River at Hale Eddy, N.Y.
   (Drainage area 593 square miles)

   c. Callicoon Creek at Callicoon, N.Y.
   (Drainage area 111 square miles)

   d. Lackawaxen River at Hawley, Pa.
   (Drainage area 290 square miles)

   e. Shohola Creek near Shohola, Pa.
   (Drainage area 85 square miles)

   f. Bush Kill at Oakland Valley, N.Y.
   (Drainage area 20 square miles)

3. Precipitation at the following points at approximately 8 a.m. the day the estimate is made:

   Downsville, N.Y.
   Cooks Falls, N.Y.
   Hale Eddy, N.Y.
   Callicoon, N.Y.
   Barryville, N.Y.
   Hawley, Pa.
   Neversink, N.Y.
   Oakland Valley, N.Y.
   Milford, Pa.

4. Forecasts of average precipitation over the drainage area above Montague for the day the estimate is made and for the two following days.

A general description of the procedure by which the four items are taken into account in making the advance estimate has been outlined on pages 18 - 20. Daily estimated quantities of uncontrolled runoff, present conditions, and weather adjustment are shown in columns 4 and 5, table 8.

A continuous check is maintained on the accuracy of the procedure for estimating in advance the uncontrolled runoff, including weather adjustment, by repeating the computation using average precipitation as observed at nine sites in the basin above Montague in combination with the uncontrolled runoff estimate under present conditions. During the low-flow period the precipitation forecasts generally were lower than amounts observed at the nine sites. Comparison of the estimate with the actual uncontrolled runoff hydrograph indicates that the weather adjustment procedure was generally adequate and that the major portion of error was due to the reduced transit time associated with "rises" of the River. The "wet" periods of the 1960 low-flow season produced recession flows somewhat higher than defined by recession curves as regularly computed.

On plate 2 are shown hydrographs of the following:

1. Computed actual uncontrolled runoff at Montague (shown by solid line).

2. Anticipated uncontrolled runoff under present conditions plus the weather adjustment based on forecasted precipitation (shown by dashed line).

3. Anticipated uncontrolled runoff, present conditions, plus a weather adjustment based on average precipitation as observed at nine sites in the basin above Montague (shown by dotted line).

The total uncontrolled runoff during the period July 24 to September 11 was 105,270 cfs-days. The forecast of uncontrolled runoff including weather adjustment was 79,972 cfs-days or 24 percent less than actual runoff. The forecast of uncontrolled runoff using observed precipitation was 86,093 cfs-days or 18 percent less than actual runoff.

Better accuracy was found in the lower flows than at the higher flows because the recession curves and transit times used in the computation of anticipated uncontrolled runoff were designed to apply to the lower flows. During the period July 24 to September 11, the omission of four days (August 20-23) wherein Montague flows were above 5,000 cfs-days would reduce the total uncontrolled runoff to 72,221 cfs-days. In this low-flow period the forecast of uncontrolled runoff including weather adjustment was 66,351 cfs-days or 8.1 percent less than actual runoff. In the same low-flow period the forecast of uncontrolled runoff, using observed precipitation, was 66,990 cfs-days or 7.2 percent less than actual runoff.

Powerplant Release Estimates

During the period June 24 to September 11 the total actual release from the powerplants was 38,914 cfs-days. The estimated powerplant releases were 33,468 cfs-days or 14 percent less than actual releases.

Summary

The actual uncontrolled runoff and actual powerplant releases during the period July 24 to September 11 totalled 144,184 cfs-days. The advance estimate for the same period was 113,440 cfs-days. The net cumulative error in the advance estimate was -30,744 cfs-days or -21 percent.

The actual uncontrolled runoff and actual powerplant releases during the period July 24 to September 11, except August 20-23 when the Montague flow was above 5,000 cfs daily, totalled 107,844 cfs-days. The advance estimate for the same period was 97,747 cfs-days or 9.4 percent less than actual runoff and powerplant releases.

The errors and cumulative errors discussed in this summary should not be confused with the cumulative error computed for determining the balancing adjustment discussed on page 20, and shown in table 8. The cumulative errors discussed in this section are errors in estimating, in advance, the discharge at Montague, exclusive of releases from the City's reservoirs. By annual reviews and revisions of techniques and procedures, it is hoped that the advance estimates to be made the following year can be further improved.

In an effort to delineate yields of small streams in the ungaged areas tributary to the Delaware River, a collaborative program was continued with the respective U. S. Geological Survey districts to obtain discharge measurements at base-flow conditions. Discharge measurements were obtained at all forty-three stations below Pepacton, Cannonsville, and Neversink, N.Y., and above Trenton, N.J. These stations are located on tributaries of the East and West Branches Delaware River, Neversink River, and Delaware River. It is expected that increased knowledge of the yields of these streams will aid in defining recession characteristics of the ungaged areas.

Summary Comparisons of River Master Operation Data and Other Streamflow Records

It has been explained that River Master Operations are essentially day-to-day operations for which it is necessary to use preliminary records of streamflow. The following summaries show comparison of the River Master operation records and U. S. Geological Survey records at the same stations after they have been reviewed for publication.

East Branch Delaware River at Downsville, N.Y.

Data on controlled releases from Pepacton Reservoir to the Delaware River for River Master operations are furnished to the River Master's office by the New York City Board of Water Supply, and, after June 30, 1960, by the New York City Department of Water Supply, Gas and Electricity. The data on controlled releases are obtained from calibrated instruments connected to venturi meters installed in the outlet conduits.

The U. S. G. S. gaging station on the East Branch Delaware River at Downsville, N.Y., located half a mile below the Pepacton Reservoir dam, is maintained by the Albany District of the U. S. Geological Survey in cooperation with the City of New York. This station is equipped with a water-stage recorder, has a concrete artificial control and is rated by current meter discharge measurements made in the channel below the concrete control.

There was general agreement between the River Master's operation record and the U. S. G. S. record, with the River Master's record indicating 3.8 percent less water for the year than the U. S. G. S. record.

In the range of conservation releases the daily flows as recorded by the venturi meter instruments indicated 1.5 percent more water being released from the reservoir than was determined concurrently by current meter measurements.

Neversink River at Neversink, N.Y.

Similar data to that previously noted on releases from the Pepacton Reservoir were collected for the Neversink Reservoir and Neversink River at Neversink, N.Y.

The U. S. G. S. gaging station on the Neversink River at Neversink, N.Y., located about a quarter of a mile below the Neversink dam, is maintained by the Albany District of the U. S. Geological Survey in cooperation with the City of New York. This station is equipped with a water-stage recorder, has a concrete artificial control, and is rated by current meter discharge measurements made in the channel below the concrete control at low stages, and in the channel above the control at high stages.

There was general agreement between the River Master's operation record and the U. S. G. S. record, with the River Master's record indicating 0.5 percent less water for the year than the U. S. G. S. record.

In the range of conservation releases, the daily flows as recorded by the venturi meter instruments indicated 2.0 percent more water being released from the reservoir than was determined concurrently by current meter measurements.

Wallenpaupack Creek at Wilsonville, Pa.

In the River Master daily operations it is necessary to use a short-cut method to compute the mean daily discharge through the Pennsylvania Power & Light Company's Wallenpaupack powerplant. A short-cut method was used throughout the report year whereby the net operating head was used to define the coefficient for conversion from power generated in kilowatt-hours to mean daily discharge in cubic feet per second. The net operating head is computed by converting the turbine casing pressure in pounds per square inch to feet of water and adding the water leg, which is the difference in elevation between the center of the turbine and the tailwater. The casing pressure for all periods of operation for each day is assumed to be equal to that for the main period of operation.

The method used by the U. S. G. S. in computing mean daily discharge for Wallenpaupack Creek at Wilsonville, Pa. requires detailed plant operation data and results in records of good accuracy. The procedure utilizes net head-discharge relation curves for the various operating loads, net head on the turbines for each power load, and time of operation for each load. The powerplant operation data required in applying this procedure is too detailed to be readily compiled and telephoned to the River Master's office at the time the information is needed.

For the period December 1959 through November 1960 the River Master's record indicated 0.4 percent more water than the U. S. G.S. record.

Delaware River at Montague, N.J.

The River Master's operation record indicated 0.09 percent more water for the year than did the U. S. G.S. record and daily records generally were in good agreement.

Pepacton and Neversink Diversion Tunnels

Records of diversion through the Pepacton and Neversink Tunnels were furnished to the River Master's office by the New York City Board of Water Supply, and, after June 30, 1960, by the New York City Department of Water Supply, Gas and Electricity. These records were obtained from calibrated instruments connected to venturi meters installed in the tunnel conduits.

Current meter discharge measurements were made during the report year to verify the accuracy of the reported diversions.

Pepacton Tunnel

When current meter measurements were made by the River Master's office concurrent readings were obtained on the venturi meter instruments. Current meter measurement conditions in the outlet channel are considered fair because of the rough, steep channel involved and surge waves originating in the tailrace pool. The number of current meter measurements was limited during the report year because for about eight months the water level of Rondout Reservoir submerged the channel used for measurements.

The results of the comparative data show that during the report year the venturi meter instruments indicated more water being diverted than current meter measurements indicated. The average relative over-registration of the venturi meter instruments was 10.7 percent for the manometer, 9.6 percent for the indicator needle, and 10.0 percent for the totalizer.

Some of the relative over-registration of the totalizer instrument is offset by non-registration of wicket gate leakage during times when the powerplant, which utilizes the discharge through the tunnel, is not in operation. It is concluded that the record of quantity of water diverted through the Pepacton Tunnel is substantially correct.

Neversink Tunnel

When current meter discharge measurements were made by the River Master's office, concurrent readings were obtained on the venturi meter instruments.

The results of the comparative data show that the venturi meter instruments indicated more water being diverted than the current meter measurements indicated. The relative over-registration of the venturi meter instruments averaged 8.6 percent for the manometer, 8.6 percent for the indicator needle, and 9.6 percent for the totalizer.

The powerplant utilizing the water diverted through the Neversink tunnel usually did not operate two days of each week and for the remaining five days normally operated about 12 hours each day. Discharge measurements on May 16, 1959 and December 9, 1960 indicated the rate of leakage through the wicket gates to be 12 and 12.6 cfs, respectively. The leakage was not recorded on the totalizer instrument which is used for reporting the quantity of water diverted. The net result is that for each week the total quantity of over-reported diversion is largely offset by the quantity that is not registered on the totalizer instrument. Because of these compensating factors it can, therefore, be concluded that the reported record of the quantity of water diverted through the Neversink tunnel is substantially correct.

Section III

COMPENSATING RELEASES DURING REPORT YEAR BEGINNING DECEMBER 1, 1960 AND ENDING NOVEMBER 30, 1961

On December 1, 1960, 6,821 cfs-days (4,409 million gallons) of the total quantity of excess release water which became available for release during the seasonal period which began on June 15, 1960 had been released to the Delaware River. This leaves a balance of 18,085 million gallons of excess water for release prior to March 15, 1961 should releases be required to contribute to the design rate of flow of 1,815 cfs at Montague. After this quantity of excess water has been released, or March 15, 1961, whichever occurs first, until June 14, 1961 the applicable minimum basic rate of flow at Montague will be 1,525 cfs.

On June 15, 1961 the next excess release season begins and will continue until the following March 15 or until such earlier date as the aggregate quantity of excess water released from the City's reservoirs is equal to 33,058 cfs-days (21,369 million gallons). As specified in the Amended Decree the excess release water in addition to that necessary to maintain a minimum basic rate of 1,525 cfs at Montague will provide a design rate of flow at Montague of 1,801 cfs during the excess release period beginning June 15, 1961. This design rate will be effective until the cumulative daily excess release credits total 33,058 cfs-days (21,369 million gallons), or until the following March 15. After this quantity of excess water has been released or March 15, 1962, whichever occurs first, until June 14, 1962, the applicable minimum basic rate of flow at Montague will be 1,525 cfs. The procedure for computing daily excess release credits is defined on page 12, and further explained in the footnote at the bottom of table 7.

The aggregate quantity of excess water is computed as follows: 83 percent of the amount by which the estimated consumption during 1961 (limited by the Decree to an increase of $7\frac{1}{4}$ billion gallons over actual consumption in any previous year) is less than New York City's estimate of safe yield during 1961, obtainable from all its sources without pumping (specified by the Decree as being not less than 1,355 mgd with present sources of supply).

The New York City Department of Water Supply, Gas and Electricity has supplied the River Master with the following data for the 1961 calendar year:

1. The estimated continuous safe yield from all the City's sources, obtainable without pumping, is 1,355 mgd, or a total during the calendar year 1961 of 494.575 billion gallons (1,355 mgd x 365 days).

2. The estimated consumption which the City must provide from all its sources of supply during the calendar year 1961 is 468.829 billion gallons (461.579 + 7.250).

On the basis of these data the aggregate quantity of excess release water is computed to be 21,369 million gallons (83% of (494.575 - 468.829)). The design rate of flow at Montague, during the excess release period, is equal to the minimum basic rate (1,525 cfs) plus the excess quantity of water divided by 120 days. However, it is not required that the prescribed rates of flow be maintained if the total release required exceeds the capacity of release works at the City's reservoirs.

Montague design rate during excess release period beginning June 15, 1961 =

$$1{,}525 + \frac{21{,}369}{120 \times 0.646} = 1{,}801 \text{ cfs}$$

Data on consumption of water by the City of New York for each calendar year since 1914 and safe yield from present sources of supply are shown in table 12.

Table 1

Daily discharge in cubic feet per second of EAST BRANCH DELAWARE RIVER AT DOWNSVILLE, N. Y.
for the year ending November 30, 1960

Preliminary U. S. G. S. gaging station record

Date	December	January	February	March	April	May	June	July	August	September	October	November
1	9.9	9.1	9.1	8.6	11	218	25	63	22	82	369	15
2	13	8.8	8.8	8.6	992	190	25	38	22	287	308	10
3	8.8	16	8.8	8.6	2,610	136	25	29	22	499	213	10
4	8.8	12	8.8	8.8	6,500	83	25	39	88	397	140	9.1
5	8.6	20	8.8	8.8	8,640	41	26	22	98	325	93	9.2
6	15	20	9.1	8.8	5,680	23	33	22	28	204	55	6.7
7	28	16	8.8	8.8	3,770	39	37	22	28	259	34	9.6
8	16	11	9.1	8.8	2,390	49	26	22	25	427	15	8.8
9	8.8	10	9.1	10	1,780	37	29	22	24	665	17	8.8
10	8.1	10	9.1	8.8	1,240	25	25	22	24	506	21	9.1
11	9.9	10	23	8.8	887	31	25	22	119	238	22	9.1
12	9.6	9.9	11	8.8	782	24	151	22	180	63	22	8.8
13	9.9	10	9.9	8.8	676	56	106	22	83	22	23	8.8
14	9.3	10	9.9	8.8	582	30	23	22	22	22	23	8.8
15	9.3	10	9.6	8.8	515	40	23	22	22	22	23	8.8
16	9.3	10	9.3	8.8	665	49	21	22	23	22	23	8.8
17	9.3	10	9.3	8.8	770	28	22	22	23	22	23	8.8
18	8.8	10	9.3	8.8	770	25	133	22	258	22	23	8.8
19	8.8	10	9.6	9.1	859	25	317	23	299	23	24	8.8
20	8.8	10	9.1	9.1	758	22	534	22	21	31	23	8.8
21	8.8	9.9	9.1	9.1	632	22	456	111	21	25	23	9.1
22	8.8	9.9	9.1	9.1	534	27	314	204	21	24	23	9.1
23	10	9.9	9.1	11	447	28	213	119	21	23	22	9.1
24	8.6	10	8.8	8.8	377	22	393	26	21	24	23	9.1
25	8.6	10	12	8.8	362	34	808	63	21	124	23	33
26	8.6	10	8.6	8.8	266	28	820	235	21	266	23	32
27	8.8	10	8.6	8.8	360	24	610	283	21	288	22	9.3
28	9.1	8.6	8.6	8.8	384	28	377	456	21	260	22	9.1
29	9.3	9.1	8.6	9.1	308	24	223	329	21	213	22	9.6
30	9.3	9.1	---	10	243	22	117	88	21	301	23	9.3
31	9.1	8.8	---	21	---	22	---	22	21	---	23	---
Total	317.0	338.1	282.0	290.5	44,790	1,452	5,962	2,458	1,662	5,686	1,743	323.3
Mean	10.2	10.9	9.72	9.37	1,493	46.8	199	79.3	53.6	190	56.2	10.8

Year total 65,303.9
Mean 178

Table 2

Daily discharge in cubic feet per second of NEVERSINK RIVER AT NEVERSINK, N.Y.
for the year ending November 30, 1960

Preliminary U. S. G. S. gaging station record

Date	December	January	February	March	April	May	June	July	August	September	October	November
1	7.1	7.2	6.9	7.2	7.2	17	16	17	16	17	16	11
2	8.2	7.2	7.3	7.9	7.2	12	16	16	16	66	16	7.1
3	6.9	8.4	6.9	7.2	7.6	8.0	17	17	16	160	16	10
4	6.9	7.4	6.9	7.2	8.3	16	16	25	17	160	16	6.7
5	6.9	7.4	6.9	7.2	8.1	16	17	35	17	129	16	6.9
6	7.1	7.4	7.2	7.2	7.4	16	16	17	16	72	17	7.1
7	7.6	7.2	7.1	7.1	10	16	17	17	16	79	16	7.1
8	7.1	7.9	6.9	7.1	17	17	16	16	16	125	16	7.1
9	8.6	6.7	7.1	7.5	17	17	15	16	16	204	16	7.2
10	7.1	6.7	7.6	6.9	17	17	15	16	16	272	16	8.1
11	6.9	6.7	8.5	6.9	9.2	17	15	16	17	144	16	7.2
12	7.6	6.7	7.4	6.9	.9	18	16	16	37	18	16	7.4
13	7.2	6.7	7.4	6.9	36	16	16	16	64	16	17	7.4
14	6.9	6.7	7.4	6.9	16	17	16	18	36	16	16	7.4
15	9.1	6.7	7.4	3.9	16	58	16	16	16	16	16	7.4
16	6.4	6.5	7.6	.6	293	82	16	16	17	16	16	7.4
17	6.5	6.5	7.8	1.2	594	17	41	16	16	16	16	8.2
18	6.7	8.1	7.4	6.5	549	17	601	16	17	16	16	7.2
19	6.5	6.9	7.4	6.7	382	16	442	16	19	17	17	7.1
20	6.5	6.7	7.2	6.7	226	17	324	16	17	18	17	7.1
21	7.9	6.7	7.2	6.7	117	16	54	17	17	17	16	7.1
22	7.2	6.7	7.2	6.9	93	16	17	35	17	16	16	7.1
23	7.2	6.7	7.2	6.9	37	16	17	69	17	17	17	7.6
24	7.1	6.7	7.8	7.2	18	23	18	53	17	17	16	6.7
25	7.2	6.7	7.2	7.2	42	17	118	16	16	16	16	22
26	7.2	6.7	7.2	7.2	16	16	27	16	17	9.0	16	36
27	7.2	6.7	7.2	7.2	17	16	17	16	17	15	18	7.2
28	7.4	7.5	7.2	7.4	17	16	17	17	17	16	17	7.2
29	7.4	6.9	7.2	4.5	16	16	17	63	17	18	17	7.2
30	7.2	6.9	---	2.5	16	16	19	64	17	17	16	7.1
31	8.0	6.9	---	7.8	--	17	--	16	18	--	16	---
Total	224.8	216.8	211.7	197.2	2,617.9	612.0	1,985	736	605	1,735.0	505	267.3
Mean	7.25	6.99	7.30	6.36	87.3	19.7	66.2	23.7	19.5	57.8	16.3	89.1

Year total 9,913.7
Mean 27.1

Table 3

Daily discharge in cubic feet per second of WALLENPAUPACK CREEK AT WILSONVILLE, PA.
for the year ending November 30, 1960

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

Day	December	January	February	March	April	May	June	July	August	September	October	November
1	256	0	897	796	514	0	508	914	868	881	162	942
2	482	0	1,030	951	71	404	910	0	836	608	0	896
3	492	0	1,000	799	0	443	1,000	0	983	0	945	944
4	204	766	881	902	914	572	0	0	504	0	966	895
5	0	663	975	664	1,060	471	0	162	863	0	987	134
6	0	827	171	0	1,030	428	994	240	0	0	997	0
7	549	767	0	984	1,030	0	993	340	0	347	781	985
8	106	587	906	941	1,050	0	994	251	911	599	144	820
9	191	0	652	989	846	519	418	0	886	685	0	919
10	106	0	812	1,010	778	457	295	0	822	0	986	951
11	129	897	700	1,030	1,020	394	0	601	735	0	970	757
12	0	924	683	531	1,070	570	0	679	767	440	949	153
13	0	891	0	0	1,610	514	423	866	0	392	982	0
14	459	788	0	1,010	1,610	0	0	582	0	219	960	896
15	479	876	911	1,020	1,610	0	0	304	797	31	0	908
16	373	93	914	1,010	1,500	367	0	0	495	62	0	887
17	492	0	915	1,020	1,020	421	748	0	16	0	958	925
18	597	822	930	1,010	1,130	415	533	515	237	0	972	966
19	0	810	908	547	1,620	460	0	533	284	908	1,000	212
20	0	864	326	0	1,500	320	301	341	0	909	1,000	0
21	833	865	0	963	1,030	0	256	219	0	941	976	928
22	546	941	761	1,010	1,030	0	530	516	416	761	0	975
23	778	0	957	991	0	296	715	0	620	820	0	939
24	0	0	823	1,010	0	365	660	0	362	0	978	0
25	0	870	1,040	1,040	350	148	0	581	166	0	978	580
26	0	897	985	413	0	178	0	713	198	832	941	187
27	0	919	190	0	0	451	570	754	0	940	961	0
28	856	905	0	892	376	0	630	844	0	963	982	534
29	831	930	870	855	382	0	617	810	959	972	168	678
30	774	148	---	881	0	0	1,010	0	856	978	0	463
31	329	0	---	764	---	508	---	0	897	---	946	---
Total	9,862	17,050	19,237	24,033	24,151	8,701	13,105	10,765	14,478	13,288	20,689	18,474
Mean	318	550	663	775	805	281	437	347	467	443	667	616

Year total 193,833
Mean 530

Table 4

Daily discharge in cubic feet per second of DELAWARE RIVER AT MONTAGUE, N. J.
for the year ending November 30, 1960

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

Date	December	January	February	March	April	May	June	July	August	September	October	November
1	15,100	7,350	3,200	4,320	55,900	4,220	5,720	5,580	2,700	2,630	7,080	3,510
2	11,900	6,200	3,900	3,620	36,500	4,460	5,900	4,380	2,880	2,630	5,690	3,830
3	9,800	11,700	3,530	4,000	25,900	4,460	5,630	4,150	2,670	2,040	5,320	3,990
4	8,200	31,400	3,400	3,000	49,000	4,080	4,860	4,580	2,460	1,480	5,370	3,710
5	7,080	19,700	3,140	4,000	72,800	3,800	3,670	4,320	2,060	1,700	4,960	3,440
6	6,150	13,700	3,670	3,700	53,900	3,530	3,940	3,850	4,740	1,960	4,740	2,740
7	9,810	10,900	4,250	3,000	35,300	3,180	4,980	3,310	2,900	1,520	4,440	2,680
8	16,000	9,520	4,510	3,870	23,900	2,590	4,510	2,940	2,480	1,680	3,830	3,270
9	12,600	7,660	4,980	3,710	18,500	3,200	3,760	2,550	2,630	2,080	2,940	3,080
10	10,100	6,580	4,580	3,690	15,800	4,580	2,940	1,940	2,880	2,160	3,220	3,180
11	8,680	6,040	15,900	3,440	13,600	4,880	2,510	1,920	3,100	1,960	3,740	3,470
12	8,100	6,180	44,800	3,400	11,900	4,660	2,270	2,420	2,680	8,140	3,440	3,440
13	20,500	5,530	23,400	2,860	11,600	6,840	3,080	2,610	2,510	38,000	3,330	2,700
14	22,000	5,550	15,400	2,330	10,900	8,810	3,530	3,420	1,940	23,900	3,250	2,380
15	15,200	5,580	12,000	3,060	10,300	6,750	6,500	5,110	1,890	14,200	2,700	3,130
16	12,000	5,160	9,940	3,060	9,830	6,010	9,040	4,180	2,630	9,760	1,960	3,110
17	10,600	4,270	9,110	3,270	9,980	5,320	7,320	2,980	2,080	7,440	2,190	3,140
18	9,310	4,220	8,520	3,020	9,830	5,040	8,170	2,460	1,460	6,340	3,000	3,100
19	7,970	4,610	8,620	3,060	9,700	4,880	9,040	2,590	3,730	6,400	3,060	2,960
20	6,690	4,510	8,100	2,650	8,980	4,580	7,410	2,480	15,500	23,100	3,360	2,180
21	5,480	4,270	6,720	2,170	7,410	3,760	7,050	2,290	10,300	33,800	3,600	1,970
22	5,580	4,250	6,090	2,980	6,660	3,940	6,010	1,920	6,120	18,600	3,330	2,810
23	5,270	3,670	6,150	2,800	5,800	5,960	5,270	2,110	5,140	13,300	2,380	2,850
24	4,610	2,720	5,630	2,880	4,660	7,480	7,550	1,540	4,270	10,500	2,670	2,730
25	3,690	2,840	5,270	2,880	4,610	7,570	15,900	1,680	3,470	7,570	3,360	1,800
26	4,150	3,400	5,580	2,760	4,340	6,490	11,900	1,920	2,940	6,870	3,440	2,360
27	4,560	3,400	5,660	2,060	4,320	5,500	8,450	1,970	2,700	6,630	3,440	1,870
28	4,910	4,030	4,680	1,900	5,450	4,560	6,900	2,170	2,290	6,230	3,690	1,670
29	10,100	4,150	4,390	4,540	5,370	3,830	5,630	2,220	2,110	5,880	3,360	2,260
30	12,800	4,200	---	8,420	4,580	3,620	5,420	3,310	2,840	6,520	2,700	3,770
31	9,350	3,400	---	34,400	---	4,270	---	3,760	2,650	---	2,630	---
Total	298,290	216,690	245,120	134,850	547,320	152,850	184,860	93,160	110,750	275,020	112,220	87,130
Mean	9,622	6,990	8,452	4,350	18,240	4,931	6,162	3,005	3,573	9,167	3,620	2,904

Year total 2,458,260
Mean 6,717

Table 5

Daily discharge in cubic feet per second of the DELAWARE & RARITAN CANAL AT KINGSTON, N.J.
for the year ending November 30, 1960

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

Day	December	January	February	March	April	May	June	July	August	September	October	November
1	67	53	68	68	75	84	82	88	88	80	82	79
2	67	52	68	68	75	83	82	92	80	80	82	97
3	67	54	68	67	75	83	85	91	80	80	82	102
4	67	53	67	66	82	83	85	91	80	80	82	82
5	67	52	67	66	84	84	85	91	80	79	80	70
6	67	51	67	66	84	84	85	91	80	79	79	70
7	70	51	68	66	83	83	84	90	80	79	79	71
8	71	51	68	65	82	83	84	88	80	79	78	71
9	70	51	68	65	80	83	84	88	80	79	78	71
10	70	51	68	65	79	83	83	88	79	79	78	74
11	68	51	68	65	79	83	84	88	79	79	78	75
12	70	50	68	65	79	83	84	88	79	84	78	74
13	58	49	68	63	78	83	84	88	78	84	78	72
14	44	48	67	63	78	84	83	92	78	82	76	72
15	52	47	67	65	75	84	83	96	68	82	76	72
16	49	49	67	65	72	84	84	94	51	80	76	72
17	46	51	67	66	72	84	84	92	62	80	78	74
18	47	51	67	67	78	84	85	92	79	79	78	75
19	49	61	74	67	79	84	84	92	82	79	78	76
20	51	68	70	65	78	85	84	91	82	80	78	76
21	51	68	68	71	78	85	84	88	82	80	78	83
22	52	68	67	78	76	84	84	85	80	80	78	84
23	52	68	67	76	76	83	84	85	80	80	76	84
24	53	67	67	75	78	80	83	84	80	80	75	83
25	53	68	67	74	80	83	85	84	79	80	75	82
26	52	68	68	72	82	83	85	80	79	80	75	79
27	52	68	68	72	84	83	85	78	79	80	75	78
28	52	70	68	78	84	83	85	82	79	82	61	78
29	54	70	68	80	83	82	84	79	78	82	53	78
30	54	70	--	79	83	82	84	79	78	82	53	80
31	53	70	--	78	--	82	--	91	79	--	71	--
Total	1,795	1,799	1,968	2,146	2,371	2,581	2,521	2,726	2,418	2,409	2,344	2,334
Mean	57.9	58.0	67.9	69.2	79.0	83.3	84.0	87.9	78.0	80.3	75.6	77.8

Year total 27,412
Mean 74.9

Table 6

Daily discharge in cubic feet per second of DELAWARE RIVER AT TRENTON, N.J.
for the year ending November 30, 1960

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

Day	December	January	February	March	April	May	June	July	August	September	October	November
1	32,700	17,600	9,380	11,000	72,800	10,400	10,800	8,450	9,260	13,900	12,200	6,100
2	23,600	14,900	8,600	10,600	74,500	10,100	11,300	9,500	7,080	10,400	13,300	7,450
3	19,400	19,800	8,750	9,560	51,100	9,620	11,200	8,800	5,860	8,500	11,300	7,700
4	16,700	40,300	8,200	8,700	57,700	9,380	10,800	8,300	5,500	7,000	10,000	7,400
5	14,800	47,700	7,900	8,000	107,000	8,750	12,400	8,800	5,780	5,780	10,000	7,300
6	12,900	32,400	9,620	8,900	112,000	8,350	9,800	8,450	6,020	5,140	9,500	7,000
7	15,900	25,000	12,400	9,150	76,000	7,800	9,200	7,200	7,450	5,100	9,050	6,260
8	23,400	21,100	12,100	8,050	53,600	7,350	9,500	6,550	6,880	4,780	8,750	5,860
9	26,500	18,700	11,600	8,250	41,700	7,000	8,950	5,900	5,780	4,380	8,050	6,140
10	21,500	16,000	12,000	8,250	33,900	7,900	8,000	5,300	5,620	4,560	7,040	7,300
11	18,100	13,800	15,100	8,100	28,800	9,850	6,920	4,820	6,400	5,260	6,220	8,550
12	18,200	12,500	50,300	7,550	25,000	10,000	6,220	4,320	6,700	22,500	6,960	7,800
13	29,200	13,200	60,100	7,450	22,100	10,700	5,980	4,420	6,180	57,000	6,650	7,500
14	40,900	13,400	40,800	7,120	20,800	13,500	6,800	5,500	5,460	59,400	6,260	6,700
15	34,900	13,800	26,800	6,600	19,600	15,400	8,350	7,000	4,820	38,100	6,180	6,020
16	26,700	14,300	22,300	6,960	18,300	13,100	12,700	9,440	4,600	25,700	6,020	6,180
17	22,200	12,500	19,600	7,400	17,500	11,600	14,700	8,600	6,220	19,400	5,220	6,350
18	19,600	11,000	18,600	7,650	17,200	11,100	13,100	6,880	5,820	15,900	4,660	6,220
19	17,800	11,700	23,500	8,250	17,000	12,000	14,600	5,620	4,820	15,100	5,260	6,060
20	15,700	11,500	21,500	8,650	16,300	11,400	14,600	5,340	4,920	22,700	6,840	5,980
21	13,700	9,900	18,400	8,300	15,200	10,700	12,100	5,020	20,400	47,300	8,800	5,380
22	12,300	9,500	15,600	7,700	13,400	10,200	11,300	4,630	16,400	44,600	8,300	4,940
23	11,500	9,100	14,000	7,600	12,200	13,400	10,200	4,180	12,400	29,700	7,700	5,100
24	10,200	8,750	13,600	7,650	11,400	17,200	9,320	4,070	10,000	23,200	6,350	5,580
25	10,100	7,400	12,800	8,000	9,900	17,800	10,400	3,790	8,500	18,700	5,860	5,540
26	9,200	6,840	14,300	7,400	9,680	16,600	18,700	3,380	7,080	15,300	6,550	4,940
27	9,560	7,550	14,700	7,160	10,300	14,400	15,100	3,620	6,060	13,700	6,800	4,560
28	10,900	8,800	13,700	7,080	11,300	12,400	11,600	4,420	5,500	13,100	6,800	4,630
29	19,600	10,700	12,100	7,750	11,100	11,200	10,200	4,660	5,100	12,200	6,840	4,380
30	21,600	11,000	----	11,300	11,000	10,200	8,950	6,800	5,900	11,900	6,920	5,700
31	22,000	10,600	----	26,100	----	10,200	----	8,350	11,900	----	5,940	----
Total	601,360	481,340	528,350	272,230	998,380	349,600	323,790	192,110	230,410	580,300	236,320	186,620
Mean	19,400	15,530	18,220	8,782	33,280	11,280	10,790	6,197	7,433	19,340	7,623	6,221

Year total 4,980,810
Mean 13,610

Table 7

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - DECEMBER 1959

River Master daily operation record

Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)							
		Controlled releases (a)			Controlled releases(b)								Controlled releases					Storage credits and deficits	
													Pepacton & Neversink		Power	Computed uncon-			
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(c)	Date	Controlled release(d)	Date	Directed	Other	plants	trolled	Total	Daily	Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	* 13	** 14
Nov.28	0	Nov. 28	0	8	Nov.29	0	6	Nov.30	68	Dec. 1	340	Dec. 1	0	14	408	14,178	14,600	0	29,724
29	0	29	0	8	30	0	6	Dec. 1	255	2	286	2	0	14	541	10,945	11,500	0	29,724
30	0	30	0	8	Dec.1	0	8	2	484	3	325	3	0	16	809	8,645	9,470	0	29,724
Dec. 1	0	Dec. 1	0	8	2	0	6	3	492	4	334	4	0	14	826	7,130	7,970	0	29,724
2	0	2	0	14	3	0	6	4	199	5	346	5	0	20	545	6,355	6,920	0	29,724
3	0	3	0	8	4	0	6	5	0	6	294	6	0	14	294	5,692	6,000	0	29,724
4	0	4	0	8	5	0	6	6	0	7	550	7	0	14	550	8,816	9,380	0	29,724
5	0	5	0	8	6	0	6	7	544	8	684	8	0	14	1,228	14,758	16,000	0	29,724
6	0	6	0	20	7	0	6	8	101	9	673	9	0	26	774	11,400	12,200	0	29,724
7	0	7	0	19	8	0	8	9	191	10	495	10	0	27	686	9,097	9,810	0	29,724
8	0	8	0	6	9	0	6	10	112	11	659	11	0	12	771	7,647	8,430	0	29,724
9	0	9	0	8	10	0	6	11	132	12	666	12	0	14	798	7,008	7,820	0	29,724
10	0	10	0	8	11	0	6	12	0	13	706	13	0	14	706	19,580	20,300	0	29,724
11	0	11	0	8	12	0	6	13	0	14	829	14	0	14	829	21,557	22,400	0	29,724
12	0	12	0	8	13	0	6	14	467	15	838	15	0	14	1,305	13,381	14,700	0	29,724
13	0	13	0	8	14	0	9	15	486	16	754	16	0	17	1,240	10,343	11,600	0	29,724
14	0	14	0	8	15	0	6	16	372	17	682	17	0	14	1,054	9,132	10,200	0	29,724
15	0	15	0	8	16	0	6	17	503	18	765	18	0	14	1,268	7,728	9,010	0	29,724
16	0	16	0	8	17	0	6	18	608	19	574	19	0	14	1,182	6,504	7,700	0	29,724
17	0	17	0	8	18	0	6	19	0	20	485	20	0	14	485	6,011	6,510	0	29,724
18	0	18	0	8	19	0	6	20	0	21	484	21	0	14	484	4,982	5,480	0	29,724
19	0	19	0	8	20	0	8	21	845	22	519	22	0	16	1,364	4,080	5,460	0	29,724
20	0	20	0	8	21	0	6	22	556	23	490	23	0	14	1,046	4,100	5,160	0	29,724
21	0	21	0	8	22	0	6	23	788	24	510	24	0	14	1,298	3,308	4,620	0	29,724
22	0	22	0	8	23	0	6	24	0	25	412	25	0	14	412	3,214	3,640	0	29,724
23	0	23	0	9	24	0	6	25	0	26	450	26	0	15	450	3,625	4,090	0	29,724
24	0	24	0	8	25	0	6	26	0	27	317	27	0	14	317	4,089	4,420	0	29,724
25	0	25	0	8	26	0	6	27	0	28	572	28	0	14	572	4,234	4,820	0	29,724
26	0	26	0	8	27	0	6	28	861	29	744	29	0	14	1,605	8,101	9,720	0	29,724
27	0	27	0	8	28	0	6	29	835	30	541	30	0	14	1,376	11,010	12,400	0	29,724
28	0	28	0	8	29	0	6	30	757	31	534	31	0	14	1,291	7,765	9,070	0	29,724
Total	0		0	276		0	195		9,656		16,858		0	471	26,514	264,415	291,400	0	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 4
Col. 9 = Col. 3 + Col. 5
Col.10 = Col. 6 + Col. 7
Col.11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
* Col.13 = Col. 12 - 1525, computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,951 and greater than 1,525.

**Note--Seasonal limit of cumulative credit ending March 14, 1960 = 51,054 cfs-days

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - JANUARY 1960

River Master daily operation record

Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)						
		Controlled releases(a)			Controlled releases(b)								Controlled releases			Computed uncontrolled		Storage credits and deficits
													Pepacton & Neversink		Power plants			
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(d)	Date	Controlled release(d)	Date	Directed	Other			Total	Daily
	1		2	3		4	5		6		7		8	9	10	11	12	* 13
Dec.29	0	Dec.29	0	8	Dec.30	0	8	Dec.31	330	Jan. 1	482	Jan. 1	0	16	812	6,292	7,120	0
30	0	30	0	8	31	0	6	Jan. 1	0	2	589	2	0	14	589	5,477	6,080	0
31	0	31	0	8	Jan. 1	0	6	2	0	3	645	3	0	14	645	10,641	11,300	0
Jan. 1	0	Jan. 1	0	8	2	0	6	3	0	4	785	4	0	14	785	31,701	32,500	0
2	0	2	0	8	3	0	6	4	769	5	797	5	0	14	1,566	18,120	19,700	0
3	0	3	0	8	4	0	6	5	661	6	676	6	0	14	1,337	11,649	13,000	0
4	0	4	0	17	5	0	6	6	827	7	694	7	0	23	1,521	8,856	10,400	0
5	0	5	0	19	6	0	6	7	776	8	467	8	0	25	1,243	7,802	9,070	0
6	0	6	0	19	7	0	8	8	594	9	500	9	0	27	1,094	6,229	7,350	0
7	0	7	0	11	8	0	6	9	0	10	600	10	0	17	600	5,723	6,340	0
8	0	8	0	9	9	0	6	10	0	11	610	11	0	15	610	5,245	5,870	0
9	0	9	0	9	10	0	6	11	877	12	576	12	0	15	1,453	4,562	6,030	0
10	0	10	0	9	11	0	6	12	932	13	517	13	0	15	1,449	3,976	5,440	0
11	0	11	0	9	12	0	6	13	897	14	572	14	0	15	1,469	3,926	5,410	0
12	0	12	0	9	13	0	6	14	797	15	554	15	0	15	1,351	4,094	5,460	0
13	0	13	0	9	14	0	6	15	881	16	309	16	0	15	1,190	3,855	5,060	0
14	0	14	0	9	15	0	6	16	90	17	304	17	0	15	394	3,841	4,250	0
15	0	15	0	9	16	0	6	17	0	18	532	18	0	15	532	3,613	4,160	0
16	0	16	0	9	17	0	8	18	823	19	398	19	0	17	1,221	3,322	4,560	0
17	0	17	0	9	18	0	6	19	815	20	480	20	0	15	1,295	3,130	4,440	0
18	0	18	0	9	19	0	6	20	871	21	476	21	0	15	1,347	2,888	4,250	0
19	0	19	0	9	20	0	6	21	887	22	499	22	0	15	1,386	2,819	4,220	0
20	0	20	0	9	21	0	6	22	951	23	331	23	0	15	1,282	2,313	3,610	0
21	0	21	0	9	22	0	6	23	0	24	226	24	0	15	226	2,439	2,680	0
22	0	22	0	9	23	0	6	24	0	25	410	25	0	15	410	2,425	2,850	0
23	0	23	0	9	24	0	6	25	830	26	180	26	0	15	1,010	2,395	3,420	0
24	0	24	0	9	25	0	6	26	894	27	218	27	0	15	1,112	2,293	3,420	0
25	0	25	0	9	26	0	6	27	927	28	407	28	0	15	1,334	2,661	4,010	0
26	0	26	0	9	27	0	6	28	911	29	168	29	0	15	1,079	3,046	4,140	0
27	0	27	0	8	28	0	6	29	940	30	168	30	0	14	1,108	3,008	4,130	0
28	0	28	0	8	29	0	6	30	147	31	150	31	0	14	297	3,069	3,380	0
Total	0		0	301		0	192		17,427		14,320		0	493	31,747	181,410	213,650	0

Directed release		Storage credits and deficits	
Date	Amount	Daily	Cumulative
	1	* 13	** 14
Dec.29	0	0	29,724
30	0	0	29,724
31	0	0	29,724
Jan. 1	0	0	29,724
2	0	0	29,724
3	0	0	29,724
4	0	0	29,724
5	0	0	29,724
6	0	0	29,724
7	0	0	29,724
8	0	0	29,724
9	0	0	29,724
10	0	0	29,724
11	0	0	29,724
12	0	0	29,724
13	0	0	29,724
14	0	0	29,724
15	0	0	29,724
16	0	0	29,724
17	0	0	29,724
18	0	0	29,724
19	0	0	29,724
20	0	0	29,724
21	0	0	29,724
22	0	0	29,724
23	0	0	29,724
24	0	0	29,724
25	0	0	29,724
26	0	0	29,724
27	0	0	29,724
28	0	0	29,724
Total	0	0	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 4
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
* Col. 13 = Col. 12 - 1,525, computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,951 and greater than 1,525.

**=Note--Seasonal limit of cumulative credit ending March 14, 1960 = 51,054 cfs-days

Table 7 (Cont.)

'RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - FEBRUARY 1960

'River Master daily operation record

'Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		'Rio Reservoir		Delaware River at Montague segregation of flow (e)						
		Controlled releases(a)			Controlled releases(b)								Controlled releases					Storage credits and deficits
													Pepacton & Neversink			Computed		
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(c)	Date	Controlled release(d)	Date	Directed	Other	Power plants	uncontrolled	Total	Daily / Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	* 13 / ** 14
Jan.29	0	Jan.29	0	8	Jan.30	0	6	Jan.31	0	Feb. 1	370	Feb. 1	0	14	370	2,826	3,210	0 / 29,724
30	0	30	0	8	31	0	6	Feb. 1	906	2	393	2	0	14	1,299	2,517	3,830	0 / 29,724
31	0	31	0	8	Feb. 1	0	6	2	1,030	3	360	3	0	14	1,390	2,146	3,550	0 / 29,724
Feb. 1	0	Feb. 1	0	8	2	0	6	3	997	4	353	4	0	14	1,350	2,056	3,420	0 / 29,724
2	0	2	0	8	3	0	6	4	886	5	275	5	0	14	1,161	1,955	3,130	0 / 29,724
3	0	3	0	8	4	0	6	5	981	6	209	6	0	14	1,190	2,466	3,670	0 / 29,724
4	0	4	0	8	5	0	6	6	173	7	219	7	0	14	392	3,844	4,250	0 / 29,724
5	0	5	0	8	6	0	6	7	0	8	347	8	0	14	347	4,149	4,510	0 / 29,724
6	0	6	0	8	7	0	6	8	903	9	232	9	0	14	1,135	3,831	4,980	0 / 29,724
7	0	7	0	8	8	0	6	9	669	10	370	10	0	14	1,039	3,627	4,680	0 / 29,724
8	0	8	0	8	9	0	6	10	833	11	797	11	0	14	1,630	13,956	15,600	0 / 29,724
9	0	9	0	8	10	0	6	11	692	12	827	12	0	14	1,519	44,367	45,900	0 / 29,724
10	0	10	0	8	11	0	6	12	672	13	808	13	0	14	1,480	22,306	23,800	0 / 29,724
11	0	11	0	8	12	0	6	13	0	14	817	14	0	14	817	14,369	15,200	0 / 29,724
12	0	12	0	8	13	0	6	14	0	15	818	15	0	14	818	11,268	12,100	0 / 29,724
13	0	13	0	8	14	0	6	15	922	16	798	16	0	14	1,720	8,366	10,100	0 / 29,724
14	0	14	0	8	15	0	6	16	925	17	663	17	0	14	1,588	7,748	9,350	0 / 29,724
15	0	15	0	8	16	0	6	17	932	18	651	18	0	14	1,583	7,023	8,620	0 / 29,724
16	0	16	0	8	17	0	6	18	943	19	651	19	0	14	1,594	7,072	8,680	0 / 29,724
17	0	17	0	8	18	0	6	19	910	20	674	20	0	14	1,584	6,572	8,170	0 / 29,724
18	0	18	0	8	19	0	6	20	331	21	670	21	0	14	1,001	5,675	6,690	0 / 29,724
19	0	19	0	8	20	0	6	21	0	22	668	22	0	14	668	5,388	6,070	0 / 29,724
20	0	20	0	8	21	0	6	22	764	23	666	23	0	14	1,430	4,676	6,120	0 / 29,724
21	0	21	0	8	22	0	6	23	945	24	477	24	0	14	1,422	4,194	5,630	0 / 29,724
22	0	22	0	8	23	0	6	24	800	25	479	25	0	14	1,279	3,947	5,240	0 / 29,724
23	0	23	0	8	24	0	6	25	1,004	26	672	26	0	14	1,676	3,890	5,580	0 / 29,724
24	0	24	0	8	25	0	6	26	981	27	682	27	0	14	1,663	3,983	5,660	0 / 29,724
25	0	25	0	9	26	0	6	27	207	28	657	28	0	15	864	3,801	4,680	0 / 29,724
26	0	26	0	8	27	0	6	28	0	29	697	29	0	14	697	3,629	4,340	0 / 29,724
27																		
Total	0		0	233		0	174		18,406		16,300		0	407	34,706	211,647	246,760	0

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 4
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 -Col. 8 - Col. 9 - Col. 10
* Col. 13 = Col. 12 - 1,525, computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,951 and greater than 1,525.

**Note -- Seasonal limit of cumulative credit ending March 14, 1960 = 51,054 cfs-days

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - MARCH 1960

River Master daily operation record

Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)							
		Controlled releases(a)			Controlled releases(b)								Controlled releases			Computed		Storage credits and deficits	
													Pepacton & Neversink		Power	uncon-			
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(c)	Date	Controlled release(d)	Date	Directed	Other	plants	trolled	Total	Daily	Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	* 13	** 14
Feb.27	0	Feb. 27	0	8	Feb. 28	0	6	Feb.29	877	Mar. 1	385	Mar. 1	0	14	1,262	3,024	4,300	0	29,724
28	0	28	0	8	29	0	6	Mar. 1	809	2	270	2	0	14	1,079	2,557	3,650	0	29,724
29	0	29	0	8	Mar. 1	0	8	2	961	3	400	3	0	16	1,361	2,723	4,100	0	29,724
Mar. 1	0	Mar. 1	0	8	2	0	6	3	799	4	211	4	0	14	1,010	2,176	3,200	0	29,724
2	0	2	0	8	3	0	6	4	913	5	526	5	0	14	1,439	2,547	4,000	0	29,724
3	0	3	0	8	4	0	6	5	659	6	383	6	0	14	1,042	2,744	3,800	0	29,724
4	0	4	0	8	5	0	6	6	0	7	194	7	0	14	194	2,862	3,070	0	29,724
5	0	5	0	8	6	0	6	7	956	8	167	8	0	14	1,123	2,783	3,920	0	29,724
6	0	6	0	8	7	0	6	8	940	9	206	9	0	14	1,146	2,590	3,750	0	29,724
7	0	7	0	8	8	0	8	9	1,012	10	184	10	0	16	1,196	2,508	3,720	0	29,724
8	0	8	0	8	9	0	6	10	1,010	11	207	11	0	14	1,217	2,219	3,450	0	29,724
9	0	9	0	9	10	0	6	11	1,044	12	168	12	0	15	1,212	2,333	3,560	0	29,724
10	0	10	0	8	11	0	6	12	530	13	162	13	0	14	692	2,154	2,860	0	29,724
11	0	11	0	8	12	0	6	13	0	14	218	14	0	14	218	2,138	2,370	0	29,724
12	0	12	0	8	13	0	6	14	1,023	15	124	15	0	14	1,147	1,959	3,120	0	0
13	0	13	0	8	14	0	5	15	1,030	16	218	16	0	13	1,248	1,899	3,160	0	0
14	0	14	0	8	15	0	0	16	1,000	17	325	17	0	8	1,325	1,967	3,300	0	0
15	0	15	0	8	16	0	0	17	1,026	18	168	18	0	8	1,194	1,898	3,100	0	0
16	0	16	0	8	17	0	6	18	1,013	19	177	19	0	14	1,190	1,916	3,120	0	0
17	0	17	0	8	18	0	6	19	538	20	135	20	0	14	673	2,003	2,690	0	0
18	0	18	0	8	19	0	6	20	0	21	179	21	0	14	179	2,007	2,200	0	0
19	0	19	0	8	20	0	6	21	980	22	231	22	0	14	1,211	1,835	3,060	0	0
20	0	20	0	8	21	0	6	22	1,019	23	202	23	0	14	1,221	1,615	2,850	0	0
21	0	21	0	8	22	0	6	23	990	24	180	24	0	14	1,170	1,746	2,930	0	0
22	0	22	0	8	23	0	6	24	1,018	25	207	25	0	14	1,225	1,681	2,920	0	0
23	0	23	0	9	24	0	6	25	1,047	26	289	26	0	15	1,336	1,149	2,800	0	0
24	0	24	0	8	25	0	6	26	415	27	184	27	0	14	599	1,467	2,080	0	0
25	0	25	0	8	26	0	6	27	0	28	148	28	0	14	148	1,768	1,930	0	0
26	0	26	0	8	27	0	6	28	898	29	164	29	0	14	1,062	3,504	4,580	0	0
27	0	27	0	8	28	0	5	29	850	30	231	30	0	13	1,081	7,536	8,630	0	0
28	0	28	0	8	29	0	0	30	880	31	258	31	0	8	1,138	34,454	35,600	0	0
Total	0		0	250		0	170		24,237		7,101		0	420	31,338	106,062	137,820	0	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 4
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col.12 - Col. 8 - Col. 9 - Col. 10
* Col. 13 = Col. 12 - 1,525, computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,951 and greater than 1,525.

**Note.--Seasonal limit of cumulative credit ending March 14, 1960 = 51,054 cfs-days

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - APRIL 1960

River Master daily operation record

Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)							
		Controlled releases(a)			Controlled releases(b)								Controlled releases					Storage credits and deficits	
													Pepacton & Neversink		Power	Computed uncon-			
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(c)	Date	Controlled release(d)	Date	Directed	Other	plants	trolled	Total	Daily	Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	13	14
Mar.29	0	Mar. 29	0	8	Mar.30	0	6	Mar.31	756	Apr.1	695	Apr.1	0	14	1,451	55,735	57,200	0	0
30	0	30	0	8	31	0	6	Apr. 1	511	2	744	2	0	14	1,255	36,031	37,300	0	0
31	0	31	0	8	Apr. 1	0	6	2	70	3	768	3	0	14	838	25,348	26,200	0	0
Apr. 1	0	Apr. 1	0	6	2	0	6	3	0	4	797	4	0	12	797	49,691	50,500	0	0
2	0	2	0	0	3	0	6	4	921	5	812	5	0	6	1,733	71,961	73,700	0	0
3	0	3	0	0	4	0	6	5	1,058	6	833	6	0	6	1,891	52,903	54,800	0	0
4	0	4	0	0	5	0	6	6	1,022	7	840	7	0	6	1,862	33,032	34,900	0	0
5	0	5	0	0	6	0	6	7	1,019	8	838	8	0	6	1,857	22,337	24,200	0	0
6	0	6	0	0	7	0	17	8	1,027	9	827	9	0	17	1,854	16,729	18,600	0	0
7	0	7	0	0	8	0	17	9	853	10	834	10	0	17	1,687	13,896	15,600	0	0
8	0	8	0	0	9	0	17	10	784	11	789	11	0	17	1,573	11,810	13,400	0	0
9	0	9	0	0	10	0	14	11	1,016	12	823	12	0	14	1,839	10,047	11,900	0	0
10	0	10	0	0	11	0	0	12	1,073	13	820	13	0	0	1,893	9,607	11,500	0	0
11	0	11	0	0	12	0	29	13	1,584	14	820	14	0	29	2,404	8,467	10,900	0	0
12	0	12	0	0	13	0	20	14	1,603	15	819	15	0	20	2,422	7,758	10,200	0	0
13	0	13	0	0	14	0	17	15	1,603	16	692	16	0	17	2,295	7,518	9,830	0	0
14	0	14	0	0	15	0	17	16	1,490	17	661	17	0	17	2,151	7,832	10,000	0	0
15	0	15	0	0	16	0	17	17	1,011	18	512	18	0	17	1,523	8,180	9,720	0	0
16	0	16	0	0	17	0	12	18	1,123	19	228	19	0	12	1,351	8,257	9,620	0	0
17	0	17	0	0	18	0	0	19	1,613	20	147	20	0	0	1,760	7,220	8,980	0	0
18	0	18	0	0	19	0	0	20	1,521	21	113	21	0	0	1,634	5,746	7,380	0	0
19	0	19	0	0	20	0	0	21	1,025	22	90	22	0	0	1,115	5,545	6,660	0	0
20	0	20	0	0	21	0	0	22	1,022	23	71	23	0	0	1,093	4,707	5,800	0	0
21	0	21	0	0	22	0	15	23	0	24	59	24	0	15	59	4,586	4,660	0	0
22	0	22	0	0	23	0	15	24	0	25	204	25	0	15	204	4,391	4,610	0	0
23	0	23	0	0	24	0	15	25	348	26	234	26	0	15	582	3,723	4,320	0	0
24	0	24	0	0	25	0	15	26	0	27	345	27	0	15	345	3,980	4,340	0	0
25	0	25	0	0	26	0	17	27	0	28	188	28	0	17	188	5,245	5,450	0	0
26	0	26	0	0	27	0	17	28	374	29	104	29	0	17	478	4,925	5,420	0	0
27	0	27	0	0	28	0	17	29	381	30	55	30	0	17	436	4,107	4,560	0	0
Total	0		0	30		0	336		24,808		15,762		0	366	40,570	511,314	552,250	0	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 4
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
Col. 13 = Col. 12 - 1,525, computed algebraically, but in no case greater than Col. 8

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - MAY 1960

River Master daily operation record

Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)							
		Controlled releases(a)			Controlled releases(b)								Controlled releases			Computed uncontrolled		Storage credits and deficits	
													Pepacton & Neversink		Power plants				
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(c)	Date	Controlled release(d)	Date	Directed	Other			Total	Daily	Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	13	14
Apr.28	0	Apr.28	0	0	Apr.29	0	17	Apr.30	0	May 1	187	May 1	0	17	187	3,996	4,200	0	0
29	0	29	0	0	30	0	17	May 1	0	2	151	2	0	17	151	4,272	4,440	0	0
30	0	30	0	0	May 1	0	12	2	394	3	135	3	0	12	529	3,919	4,460	0	0
May 1	0	May 1	0	0	2	0	3	3	434	4	152	4	0	3	586	3,471	4,060	0	0
2	0	2	0	3	3	0	17	4	573	5	103	5	0	20	676	3,044	3,740	0	0
3	0	3	0	20	4	0	17	5	483	6	120	6	0	37	603	2,840	3,480	0	0
4	0	4	0	20	5	0	17	6	444	7	123	7	0	37	567	2,496	3,100	0	0
5	0	5	0	20	6	0	17	7	0	8	71	8	0	37	71	2,462	2,570	0	0
6	0	6	0	20	7	0	17	8	0	9	267	9	0	37	267	2,896	3,200	0	0
7	0	7	0	20	8	0	17	9	523	10	320	10	0	37	843	3,680	4,560	0	0
8	0	8	0	20	9	0	17	10	459	11	260	11	0	37	719	4,104	4,860	0	0
9	0	9	0	25	10	0	17	11	398	12	291	12	0	42	689	3,909	4,640	0	0
10	0	10	0	20	11	0	20	12	568	13	348	13	0	40	916	6,024	6,980	0	0
11	0	11	0	20	12	0	17	13	517	14	222	14	0	37	739	8,034	8,810	0	0
12	0	12	0	20	13	0	17	14	0	15	219	15	0	37	219	6,434	6,690	0	0
13	0	13	0	20	14	0	17	15	0	16	244	16	0	37	244	5,679	5,960	0	0
14	0	14	0	20	15	0	17	16	366	17	235	17	0	37	601	4,712	5,350	0	0
15	0	15	0	20	16	0	17	17	414	18	416	18	0	37	830	4,173	5,040	0	0
16	0	16	0	20	17	0	17	18	413	19	288	19	0	37	701	4,122	4,860	0	0
17	0	17	0	20	18	0	17	19	458	20	320	20	0	37	778	3,725	4,540	0	0
18	0	18	0	20	19	0	19	20	320	21	235	21	0	39	555	3,126	3,720	0	0
19	0	19	0	20	20	0	17	21	0	22	131	22	0	37	131	3,732	3,900	0	0
20	0	20	0	20	21	0	17	22	0	23	319	23	0	37	319	5,464	5,820	0	0
21	0	21	0	20	22	0	17	23	294	24	330	24	0	37	624	6,749	7,410	0	0
22	0	22	0	20	23	0	17	24	364	25	337	25	0	37	701	6,832	7,570	0	0
23	0	23	0	20	24	0	17	25	150	26	206	26	0	37	356	6,067	6,460	0	0
24	0	24	0	20	25	0	17	26	171	27	220	27	0	37	391	5,052	5,480	0	0
25	0	25	0	39	26	0	17	27	428	28	50	28	0	56	478	4,006	4,540	0	0
26	0	26	0	20	27	0	17	28	0	29	22	29	0	37	22	3,741	3,800	0	0
27	0	27	0	20	28	0	17	29	0	30	82	30	0	37	82	3,481	3,600	0	0
28	0	28	0	20	29	0	17	30	0	31	333	31	0	37	333	3,790	4,160	0	0
Total	0		0	547		0	513		8,171		6,737		0	1,060	14,908	136,032	152,000	0	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 4
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
Col. 13 = Col. 12 - 1,525, computed albegraically, but in no case greater than Col. 8

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - JUNE 1960

River Master daily operation record

Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)							
		Controlled releases(a)			Controlled releases (b)								Controlled releases			Computed		Storage credits and deficits	
													Pepacton & Neversink		Power	uncon-			
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(c)	Date	Controlled release(d)	Date	Directed	Other	plants	trolled	Total	Daily	Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	* 13	** 14
May 29	0	May 29	0	20	May 30	0	19	May 31	507	June 1	393	June 1	0	39	900	4,721	5,660	0	0
30	0	30	0	20	31	0	17	June 1	506	2	265	2	0	37	771	5,042	5,850	0	0
31	0	31	0	20	June 1	0	17	2	905	3	450	3	0	37	1,355	4,188	5,580	0	0
June 1	0	June 1	0	25	2	0	17	3	1,000	4	468	4	0	42	1,468	3,330	4,840	0	0
2	0	2	0	22	3	0	17	4	0	5	140	5	0	39	140	3,441	3,620	0	0
3	0	3	0	22	4	0	17	5	0	6	140	6	0	39	140	3,741	3,920	0	0
4	0	4	0	22	5	0	17	6	987	7	70	7	0	39	1,057	3,884	4,980	0	0
5	0	5	0	22	6	0	19	7	989	8	64	8	0	41	1,053	3,416	4,510	0	0
6	0	6	0	22	7	0	17	8	984	9	69	9	0	39	1,053	2,688	3,780	0	0
7	0	7	0	22	8	0	17	9	397	10	37	10	0	39	434	2,467	2,940	0	0
8	0	8	0	22	9	0	17	10	305	11	15	11	0	39	320	2,181	2,540	0	0
9	0	9	0	23	10	0	17	11	0	12	73	12	0	40	73	2,157	2,270	0	0
10	0	10	0	23	11	0	17	12	0	13	73	13	0	40	73	3,007	3,120	0	0
11	0	11	0	23	12	0	17	13	410	14	201	14	0	40	611	2,899	3,550	0	0
12	227	12	210	0	13	17	0	14	0	15	165	15	227	0	165	6,068	6,460	227	227
13	0	13	0	20	14	0	17	15	0	16	114	16	0	37	114	8,929	9,080	0	227
14	0	14	0	20	15	0	19	16	0	17	289	17	0	39	289	7,052	7,380	0	227
15	0	15	0	20	16	0	17	17	744	18	324	18	0	37	1,068	7,065	8,170	0	227
16	0	16	0	20	17	0	17	18	529	19	143	19	0	37	672	8,301	9,010	0	227
17	0	17	0	20	18	0	17	19	0	20	194	20	0	37	194	7,279	7,510	0	227
18	0	18	0	20	19	0	17	20	288	21	151	21	0	37	439	6,634	7,110	0	227
19	0	19	0	20	20	0	17	21	240	22	330	22	0	37	570	5,483	6,090	0	227
20	0	20	0	20	21	0	17	22	514	23	202	23	0	37	716	4,647	5,400	0	227
21	0	21	0	20	22	0	19	23	696	24	415	24	0	39	1,111	6,620	7,770	0	227
22	0	22	0	20	23	0	17	24	646	25	325	25	0	37	971	14,892	15,900	0	227
23	0	23	0	20	24	0	17	25	0	26	655	26	0	37	655	11,408	12,100	0	227
24	0	24	0	20	25	0	17	26	0	27	565	27	0	37	565	8,018	8,620	0	227
25	0	25	0	20	26	0	17	27	563	28	447	28	0	37	1,010	6,003	7,050	0	227
26	0	26	0	20	27	0	17	28	639	29	333	29	0	37	972	4,761	5,770	0	227
27	0	27	0	20	28	0	17	29	611	30	333	30	0	37	944	4,649	5,630	0	227
Total	227		210	608		17	501		12,460		7,443		227	1,109	19,903	164,971	186,210	227	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 4
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
*Col. 13 = Col. 12 -1,525 computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,815 and greater than 1,525.

**Note.--Seasonal limit of cumulative credit beginning June 15, 1960 = 34,798 cfs-days

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - JULY 1960

River Master daily operation record

Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)							
		Controlled releases (a)			Controlled releases (b)								Controlled releases					Storage credits and deficits	
													Pepacton & Neversink		Power	Computed uncontrolled			
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(c)	Date	Controlled release(d)	Date	Directed	Other	plants		Total	Daily	Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	* 13	** 14
June 28	0	June 28	0	20	June 29	0	19	June 30	1,011	July 1	345	July 1	0	39	1,356	4,375	5,770	0	227
29	0	29	0	20	30	0	17	July 1	910	2	471	2	0	37	1,381	3,672	5,090	0	227
30	0	30	0	20	July 1	0	17	2	0	3	369	3	0	37	369	4,014	4,420	0	227
July 1	0	July 1	0	20	2	0	17	3	0	4	342	4	0	37	342	4,501	4,880	0	227
2	0	2	0	20	3	0	17	4	0	5	445	5	0	37	445	4,058	4,540	0	227
3	0	3	0	20	4	0	17	5	154	6	437	6	0	37	591	3,382	4,010	0	227
4	0	4	0	20	5	0	17	6	235	7	564	7	0	37	799	2,694	3,530	0	227
5	0	5	0	20	6	0	19	7	339	8	472	8	0	39	811	2,330	3,180	0	227
6	0	6	0	20	7	0	17	8	242	9	410	9	0	37	652	2,131	2,820	0	227
7	0	7	0	20	8	0	17	9	0	10	190	10	0	37	190	1,923	2,150	0	227
8	0	8	0	20	9	0	17	10	0	11	262	11	0	37	262	1,811	2,110	0	227
9	0	9	0	20	10	0	17	11	615	12	248	12	0	37	863	1,710	2,610	0	227
10	0	10	0	20	11	0	17	12	688	13	361	13	0	37	1,049	1,694	2,780	0	227
11	0	11	0	20	12	0	17	13	885	14	412	14	0	37	1,297	2,266	3,600	0	227
12	0	12	0	20	13	0	19	14	590	15	146	15	0	39	736	4,545	5,320	0	227
13	0	13	0	20	14	0	17	15	311	16	256	16	0	37	567	3,816	4,420	0	227
14	0	14	0	20	15	0	17	16	0	17	258	17	0	37	258	2,745	3,040	0	227
15	0	15	0	20	16	0	17	17	0	18	326	18	0	37	326	2,147	2,510	0	227
16	0	16	0	20	17	0	17	18	512	19	402	19	0	37	914	1,709	2,660	0	227
17	0	17	0	20	18	0	17	19	538	20	316	20	0	37	854	1,649	2,540	0	227
18	0	18	0	20	19	0	17	20	402	21	294	21	0	37	696	1,627	2,360	0	227
19	0	19	0	22	20	0	19	21	216	22	249	22	0	41	465	1,484	1,990	0	227
20	0	20	0	20	21	0	17	22	520	23	354	23	0	37	874	1,309	2,220	0	227
21	273	21	206	0	22	70	0	23	0	24	210	24	276	0	210	1,134	1,620	95	322
22	276	22	206	0	23	73	0	24	0	25	338	25	279	0	338	1,153	1,770	245	567
23	0	23	0	25	24	0	17	25	581	26	212	26	0	42	793	1,205	2,040	0	567
24	0	24	0	26	25	0	17	26	720	27	296	27	0	43	1,016	1,021	2,080	0	567
25	106	25	88	0	26	17	0	27	800	28	276	28	105	0	1,076	1,009	2,190	105	672
26	159	26	142	0	27	19	0	28	852	29	266	29	161	0	1,118	1,001	2,280	161	833
27	439	27	422	0	28	17	0	29	816	30	615	30	439	0	1,431	1,490	3,360	439	1,272
28	610	28	500	0	29	110	0	30	0	31	268	31	610	0	268	2,952	3,830	610	1,882
Total	1,863		1,564	513		306	433		11,937		10,410		1,870	946	22,347	72,557	97,720	1,655	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 4
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
* Col. 13 = Col. 12 - 1,525 computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,815 and greater than 1,525

**Note.--Seasonal limit of cumulative credit beginning June 15, 1960 = 34,798 cfs-days

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - AUGUST 1960

River Master daily operation record
Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)						
		Controlled releases(a)			Controlled releases(b)								Controlled releases			Computed		Storage credits and deficits
													Pepacton & Neversink		Power	uncon-		
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(c)	Date	Controlled release(d)	Date	Directed	Other	plants	trolled	Total	Daily / Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	* 13 / ** 14
July 29	193	July 29	176	0	July 30	17	0	July 31	0	Aug. 1	205	Aug. 1	193	0	205	2,362	2,760	193 / 2,075
30	0	30	0	23	31	0	17	Aug. 1	851	2	151	2	0	40	1,002	1,878	2,920	0 / 2,075
31	0	31	0	22	Aug. 1	0	17	2	832	3	358	3	0	39	1,190	1,491	2,720	0 / 2,075
Aug. 1	0	Aug. 1	0	20	2	0	17	3	968	4	278	4	0	37	1,246	1,227	2,510	0 / 2,075
2	0	2	0	20	3	0	19	4	501	5	139	5	0	39	640	1,411	2,090	0 / 2,075
3	0	3	0	20	4	0	17	5	883	6	138	6	0	37	1,021	3,692	4,750	0 / 2,075
4	179	4	162	0	5	17	0	6	0	7	111	7	179	0	111	2,610	2,900	179 / 2,254
5	0	5	0	26	6	0	17	7	0	8	354	8	0	43	354	2,023	2,420	0 / 2,254
6	0	6	0	26	7	0	17	8	911	9	205	9	0	43	1,116	1,521	2,680	0 / 2,254
7	0	7	0	26	8	0	17	9	890	10	356	10	0	43	1,246	1,491	2,780	0 / 2,254
8	0	8	0	23	9	0	17	10	830	11	510	11	0	40	1,340	1,660	3,040	0 / 2,254
9	0	9	0	22	10	0	19	11	745	12	405	12	0	41	1,150	1,479	2,670	0 / 2,254
10	0	10	0	22	11	0	17	12	747	13	310	13	0	39	1,057	1,404	2,500	0 / 2,254
11	304	11	232	0	12	77	0	13	0	14	444	14	309	0	444	1,147	1,900	309 / 2,563
12	187	12	142	0	13	48	0	14	0	15	449	15	190	0	449	1,211	1,850	190 / 2,753
13	0	13	0	20	14	0	17	15	805	16	390	16	0	37	1,195	1,358	2,590	0 / 2,753
14	0	14	0	20	15	0	17	16	492	17	293	17	0	37	785	1,238	2,060	0 / 2,753
15	0	15	0	22	16	0	17	17	11	18	301	18	0	39	312	1,069	1,420	-105 / 2,648
16	0	16	0	22	17	0	19	18	243	19	388	19	0	41	631	2,978	3,650	0 / 2,648
17	0	17	0	22	18	0	17	19	282	20	720	20	0	39	1,002	14,459	15,500	0 / 2,648
18	548	18	531	0	19	17	0	20	0	21	812	21	548	0	812	8,840	10,200	548 / 3,196
19	56	19	39	0	20	17	0	21	0	22	535	22	56	0	535	5,449	6,040	56 / 3,252
20	0	20	0	20	21	0	17	22	442	23	500	23	0	37	942	4,301	5,280	0 / 3,252
21	0	21	0	20	22	0	17	23	622	24	550	24	0	37	1,172	3,191	4,400	0 / 3,252
22	0	22	0	20	23	0	17	24	364	25	522	25	0	37	886	2,637	3,560	0 / 3,252
23	0	23	0	20	24	0	19	25	163	26	593	26	0	39	756	2,245	3,040	0 / 3,252
24	0	24	0	20	25	0	17	26	202	27	517	27	0	37	719	1,964	2,720	0 / 3,252
25	0	25	0	20	26	0	17	27	0	28	557	28	0	37	557	1,686	2,280	0 / 3,252
26	0	26	0	20	27	0	17	28	0	29	497	29	0	37	497	1,626	2,160	0 / 3,252
27	0	27	0	20	28	0	17	29	950	30	484	30	0	37	1,434	1,479	2,950	0 / 3,252
28	0	28	0	20	29	0	17	30	887	31	460	31	0	37	1,347	1,366	2,750	0 / 3,252
Total	1,467		1,282	536		193	433		13,621		12,532		1,475	969	26,153	82,493	111,090	1,370

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 3
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
* Col. 13 = Col. 12 - 1,525 computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,815 and greater than 1,525

**Note.--Seasonal limit of cumulative credit beginning June 15, 1960 = 34,798 cfs-days

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - SEPTEMBER 1960

River Master daily operation record
Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)						
		Controlled releases(a)			Controlled releases(b)								Controlled releases			Computed uncon-		Storage credits and deficits
													Pepacton & Neversink		Power			Daily	Cumulative
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release(c)	Date	Controlled release(d)	Date	Directed	Other	plants	trolled	Total	* 13	** 14
	1		2	3		4	5		6		7		8	9	10	11	12		
Aug.29	0	Aug.29	0	20	Aug.30	0	19	Aug.31	905	Sept.1	411	Sept.1	0	39	1,316	1,415	2,770	0	3,252
30	0	30	0	20	31	0	17	Sept.1	894	2	414	2	0	37	1,308	1,375	2,720	0	3,252
31	0	31	0	20	Sept.1	0	17	2	608	3	140	3	0	37	748	1,325	2,110	0	3,252
Sept.1	312	Sept.1	156	0	2	155	0	3	0	4	217	4	311	0	217	992	1,520	- 5	3,247
2	606	2	447	0	3	156	0	4	0	5	92	5	603	0	92	1,005	1,700	175	3,422
3	739	3	579	0	4	158	0	5	0	6	273	6	737	0	273	960	1,970	445	3,867
4	307	4	232	0	5	79	0	6	0	7	101	7	311	0	101	1,138	1,550	25	3,892
5	255	5	195	0	6	60	0	7	353	8	102	8	255	0	455	1,010	1,720	195	4,087
6	337	6	227	0	7	116	0	8	607	9	293	9	343	0	900	877	2,120	343	4,430
7	407	7	272	0	8	138	0	9	696	10	210	10	410	0	906	914	2,230	410	4,840
8	980	8	673	0	9	311	0	10	0	11	195	11	984	0	195	801	1,980	455	5,295
9	882	9	676	0	10	209	0	11	0	12	673	12	885	0	673	6,982	8,540	885	6,180
10	364	10	347	0	11	17	0	12	446	13	829	13	364	0	1,275	37,161	38,800	364	6,544
11	128	11	111	0	12	17	0	13	395	14	830	14	128	0	1,225	22,647	24,000	128	6,672
12	0	12	0	20	13	0	17	14	219	15	830	15	0	37	1,049	12,314	13,400	0	6,672
13	0	13	0	20	14	0	17	15	31	16	784	16	0	37	815	8,418	9,270	0	6,672
14	0	14	0	20	15	0	17	16	59	17	660	17	0	37	719	6,364	7,120	0	6,672
15	0	15	0	20	16	0	17	17	0	18	727	18	0	37	727	5,316	6,080	0	6,672
16	0	16	0	20	17	0	17	18	0	19	380	19	0	37	380	5,783	6,200	0	6,672
17	0	17	0	20	18	0	17	19	921	20	604	20	0	37	1,525	21,638	23,200	0	6,672
18	0	18	0	20	19	0	17	20	918	21	822	21	0	37	1,740	32,823	34,600	0	6,672
19	0	19	0	20	20	0	26	21	939	22	810	22	0	46	1,749	16,905	18,700	0	6,672
20	0	20	0	20	21	0	17	22	752	23	770	23	0	37	1,522	11,141	12,700	0	6,672
21	0	21	0	20	22	0	17	23	812	24	614	24	0	37	1,426	8,147	9,610	0	6,672
22	0	22	0	20	23	0	17	24	0	25	386	25	0	37	386	6,817	7,240	0	6,672
23	0	23	0	20	24	0	17	25	0	25	550	26	0	37	550	6,173	6,760	0	6,672
24	0	24	0	20	25	0	14	26	855	26	501	27	0	34	1,356	5,120	6,510	0	6,672
25	0	25	0	17	26	0	0	27	951	27	590	28	0	17	1,541	4,602	6,160	0	6,672
26	0	26	0	0	27	0	28	28	958	28	687	29	0	28	1,645	4,167	5,840	0	6,672
27	0	27	0	0	28	0	19	29	978	29	667	30	0	19	1,645	4,736	6,400	0	6,672
Total	5,317		3,915	337		1,416	327		13,297		15,162		5,331	664	28,459	239,066	273,520	3,420	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 3
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
* Col. 13 = Col. 12 - 1,525 computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,815 and greater than 1,525

**Note.--Seasonal limit of cumulative credit beginning June 15, 1960 = 34,798 cfs-days

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - OCTOBER 1960

River Master daily operation record
Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)							
		Controlled releases(a)			Controlled releases(b)								Controlled releases			Computed		Storage credits and deficits	
													Pepacton & Neversink		Power	uncon-			
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release (c)	Date	Controlled release(d)	Date	Directed	Other	plants	trolled	Total	Daily	Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	* 13	** 14
Sept.28	0	Sept.28	0	0	Sept.29	0	19	Sept.30	996	Oct. 1	540	Oct. 1	0	19	1,536	5,325	6,880	0	6,672
29	0	29	0	0	30	0	19	Oct. 1	159	2	402	2	0	19	561	5,000	5,580	0	6,672
30	0	30	0	0	Oct. 1	0	17	2	0	3	595	3	0	17	595	4,658	5,270	0	6,672
Oct. 1	0	Oct. 1	0	0	2	0	17	3	950	4	606	4	0	17	1,556	3,717	5,290	0	6,672
2	0	2	0	0	3	0	17	4	971	5	630	5	0	17	1,601	3,342	4,960	0	6,672
3	0	3	0	0	4	0	17	5	991	6	623	6	0	17	1,614	3,049	4,680	0	6,672
4	0	4	0	0	5	0	19	6	1,001	7	550	7	0	19	1,551	2,900	4,470	0	6,672
5	0	5	0	25	6	0	17	7	777	8	518	8	0	42	1,295	2,523	3,860	0	6,672
6	0	6	0	20	7	0	17	8	134	9	265	9	0	37	399	2,474	2,910	0	6,672
7	0	7	0	20	8	0	17	9	0	10	554	10	0	37	554	2,539	3,130	0	6,672
8	0	8	0	20	9	0	17	10	1,001	11	579	11	0	37	1,580	2,083	3,700	0	6,672
9	0	9	0	20	10	0	17	11	978	12	425	12	0	37	1,403	1,970	3,410	0	6,672
10	0	10	0	20	11	0	17	12	958	13	407	13	0	37	1,365	1,898	3,300	0	6,672
11	0	11	0	20	12	0	19	13	982	14	413	14	0	39	1,395	1,796	3,230	0	6,672
12	0	12	0	20	13	0	17	14	958	15	152	15	0	37	1,110	1,613	2,760	0	6,672
13	0	13	0	22	14	0	17	15	0	16	167	16	0	39	167	1,634	1,840	14	6,686
14	0	14	0	22	15	0	17	16	0	17	387	17	0	39	387	1,624	2,050	0	6,686
15	0	15	0	22	16	0	17	17	971	18	364	18	0	39	1,335	1,546	2,920	0	6,686
16	0	16	0	22	17	0	17	18	996	19	428	19	0	39	1,424	1,507	2,970	0	6,686
17	0	17	0	22	18	0	17	19	1,000	20	471	20	0	39	1,471	1,760	3,270	0	6,686
18	0	18	0	22	19	0	19	20	1,008	21	388	21	0	41	1,396	2,163	3,600	0	6,686
19	0	19	0	22	20	0	17	21	975	22	266	22	0	39	1,241	2,100	3,380	0	6,686
20	0	20	0	22	21	0	17	22	0	23	82	23	0	39	82	2,239	2,360	0	6,686
21	0	21	0	22	22	0	17	23	0	24	445	24	0	39	445	2,136	2,620	0	6,686
22	0	22	0	22	23	0	17	24	974	25	354	25	0	39	1,328	2,023	3,390	0	6,686
23	0	23	0	22	24	0	17	25	977	26	311	26	0	39	1,288	2,103	3,430	0	6,686
24	0	24	0	22	25	0	17	26	939	27	104	27	0	39	1,043	2,318	3,400	0	6,686
25	0	25	0	22	26	0	19	27	979	28	167	28	0	41	1,146	2,393	3,580	0	6,686
26	0	26	0	22	27	0	17	28	979	29	28	29	0	39	1,007	2,344	3,390	0	6,686
27	0	27	0	22	28	0	17	29	169	30	24	30	0	39	193	2,438	2,670	0	6,686
28		28	0	22	29	0	17	30	0	31	31	31	0	39	31	2,500	2,570	0	6,686
Total	0		0	517		0	539		20,823		11,276		0	1,056	32,099	77,715	110,870	14	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 3
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
* Col. 13 = Col. 12 - 1,525 computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,815 and greater than 1,525

**Note.--Seasonal limit of cumulative credit beginning June 15, 1960 = 34,798 cfs-days

Table 7 (Cont.)

RESERVOIR RELEASES AND SEGREGATION OF FLOW AT MONTAGUE, NEW JERSEY - NOVEMBER 1960

River Master daily operation record
Mean cubic feet per second for 24 hours

Directed release		Pepacton Reservoir			Neversink Reservoir			Wallenpaupack Reservoir		Rio Reservoir		Delaware River at Montague segregation of flow (e)							
		Controlled releases(a)			Controlled releases(b)								Controlled releases			Computed uncon-		Storage credits and deficits	
													Pepacton & Neversink		Power				
Date	Amount	Date	Directed	Other	Date	Directed	Other	Date	Controlled release (c)	Date	Controlled release(d)	Date	Directed	Other	plants	trolled	Total	Daily	Cumulative
	1		2	3		4	5		6		7		8	9	10	11	12	* 13	** 14
Oct.29	0	Oct. 29	0	22	Oct.30	0	17	Oct.31	944	Nov. 1	35	Nov. 1	0	39	979	2,452	3,470	0	6,686
30	0	30	0	22	31	0	14	Nov. 1	932	2	49	2	0	36	981	2,783	3,800	0	6,686
31	0	31	0	20	Nov. 1	0	6	2	891	3	77	3	0	26	968	3,026	4,020	0	6,686
Nov.1	0	Nov. 1	0	9	2	0	8	3	936	4	112	4	0	17	1,048	2,745	3,810	0	6,686
2	0	2	0	8	3	0	6	4	905	5	86	5	0	14	991	2,525	3,530	0	6,686
3	0	3	0	8	4	0	6	5	134	6	143	6	0	14	277	2,489	2,780	0	6,686
4	0	4	0	8	5	0	6	6	0	7	236	7	0	14	236	2,450	2,700	0	6,686
5	0	5	0	9	6	0	6	7	981	8	99	8	0	15	1,080	2,175	3,270	0	6,686
6	0	6	0	9	7	0	6	8	830	9	96	9	0	15	926	2,119	3,060	0	6,686
7	0	7	0	8	8	0	6	9	926	10	142	10	0	14	1,068	2,128	3,210	0	6,686
8	0	8	0	8	9	0	8	10	951	11	198	11	0	16	1,149	2,335	3,500	0	6,686
9	0	9	0	8	10	0	6	11	757	12	200	12	0	14	957	2,549	3,520	0	6,686
10	0	10	0	8	11	0	6	12	153	13	35	13	0	14	188	2,498	2,700	0	6,686
11	0	11	0	8	12	0	6	13	0	14	21	14	0	14	21	2,345	2,380	0	6,686
12	0	12	0	8	13	0	6	14	922	15	56	15	0	14	978	2,178	3,170	0	6,686
13	0	13	0	8	14	0	6	15	912	16	13	16	0	14	925	2,121	3,060	0	6,686
14	0	14	0	8	15	0	6	16	900	17	76	17	0	14	976	2,110	3,100	0	6,686
15	0	15	0	8	16	0	8	17	911	18	117	18	0	16	1,028	2,016	3,060	0	6,686
16	0	16	0	8	17	0	6	18	948	19	135	19	0	14	1,083	1,843	2,940	0	6,686
17	0	17	0	8	18	0	6	19	212	20	48	20	0	14	260	1,886	2,160	0	6,686
18	0	18	0	8	19	0	6	20	0	21	43	21	0	14	43	1,883	1,940	0	6,686
19	0	19	0	8	20	0	6	21	935	22	100	22	0	14	1,035	1,731	2,780	0	6,686
20	0	20	0	8	21	0	6	22	979	23	140	23	0	14	1,119	1,707	2,840	0	6,686
21	0	21	0	8	22	0	8	23	950	24	89	24	0	16	1,039	1,675	2,730	0	6,686
22	0	22	0	8	23	0	6	24	0	25	22	25	0	14	22	1,744	1,780	14	6,700
23	0	23	0	8	24	0	6	25	579	26	89	26	0	14	668	1,688	2,370	0	6,700
24	61	24	8	0	25	54	0	26	185	27	7	27	62	0	192	1,616	1,870	62	6,762
25	56	25	53	0	26	6	0	27	0	28	14	28	59	0	14	1,567	1,640	59	6,821
26	0	26	0	8	27	0	6	28	523	29	89	29	0	14	612	1,614	2,240	0	6,821
27	0	27	0	8	28	0	6	29	693	30	120	30	0	14	813	2,923	3,750	0	6,821
Total	117		61	267		60	195		18,989		2,687		121	462	21,676	64,921	87,180	135	

(a) 24 hours beginning at 12 M. of date shown.
(b) 24 hours beginning at 3 P.M. of date shown.
(c) 24 hours beginning at 8 A.M. of date shown.
(d) 24 hours ending at 4 P.M. of date shown.
(e) 24 hours midnight to midnight of date shown.

Col. 8 = Col. 2 + Col. 3
Col. 9 = Col. 3 + Col. 5
Col. 10 = Col. 6 + Col. 7
Col. 11 = Col. 12 - Col. 8 - Col. 9 - Col. 10
* Col. 13 = Col. 12 - 1,525 computed algebraically, but in no case greater than Col. 8 except during seasonal period that part or all of Col. 9 contributing to Col. 12 for quantities less than 1,815 and greater than 1,525

**Note.--Seasonal limit of cumulative credit beginning June 15, 1960 = 34,798 cfs-days

Table 8

RESERVOIR RELEASE DESIGN DATA

River Master daily operation record

Date of advance estimate and directed release	Power plant release forecasts: Wallenpaupack Reservoir Date	Wallenpaupack Reservoir cfs	Rio Reservoir Date	Rio Reservoir cfs	Delaware River at Montague Advance estimate exclusive of N.Y.C. Reservoir releases: Day of Montague discharge	Total power plants cfs	Uncontrolled runoff present conditions cfs	Weather adjustment cfs	Total at Montague cfs	Indicated deficiency cfs	Balancing adjustment cfs	Initial directed release cfs	Release capacity adjustment cfs	Adjusted directed release: Daily cfs	Adjusted directed release: Cumulative cfs	Release actually required: Daily cfs	Release actually required: Cumulative cfs	Cumulative error in adjusted directed release cfs
		1		2		3	4	5	6	7	8	9	10	11	12	13	14	15
					DECEMBER 1, 1959 to MARCH 14, 1960 MONTAGUE DESIGN RATE = 1,951 CFS														
					(December 1, 1959 to March 14, 1960 estimated Montague discharge greater than 1,951 cfs)													
					MARCH 15, 1960 to JUNE 14, 1960 MONTAGUE DESIGN RATE = 1,525 CFS														
					(March 15, 1960 to June 14, 1960 estimated Montague discharge greater than 1,525 cfs)													
					JUNE 15, 1960 to NOVEMBER 30, 1960 MONTAGUE DESIGN RATE = 1,815 CFS													
June 12	June 14	0	June 15	30	June 15	30	1,321	237	1,588	227	0	227	0	227	227	0	0	227
13	15	0	16	70	16	70	2,031	499	2,600	0	0	0	0	0	227	0	0	227
14	16	0	17	70	17	70	2,004	2,090	4,164	0	0	0	0	0	227	0	0	227
15	17	0	18	89	18	89	4,876	652	5,617	0	0	0	0	0	227	0	0	227
16	18	0	19	73	19	73	4,152	749	4,974	0	- 11	0	0	0	227	0	0	227
17	19	0	20	73	20	73	3,101	1,398	4,572	0	- 11	0	0	0	227	0	0	227
18	20	398	21	75	21	473	5,706	0	6,179	0	- 11	0	0	0	227	0	0	227
19	21	398	22	165	22	563	4,294	0	4,857	0	- 11	0	0	0	227	0	0	227
20	22	398	23	165	23	563	4,365	27	4,955	0	- 11	0	0	0	227	0	0	227
21	23	398	24	165	24	563	3,468	212	4,243	0	- 11	0	0	0	227	0	0	227
22	24	398	25	165	25	563	2,872	1,250	4,685	0	- 11	0	0	0	227	0	0	227
23	25	0	26	72	26	72	2,611	759	3,442	0	- 11	0	0	0	227	0	0	227
24	26	0	27	165	27	165	6,245	332	6,742	0	- 11	0	0	0	227	0	0	227
25	27	477	28	300	28	777	7,519	0	8,296	0	- 11	0	0	0	227	0	0	227
26	28	477	29	300	29	777	4,803	0	5,580	0	- 11	0	0	0	227	0	0	227
27	29	477	30	300	30	777	3,717	234	4,728	0	- 11	0	0	0	227	0	0	227
Total		3,421		2,277		5,698	63,085	8,439	77,222	227	-132	227	0	227		0		

Col. 1 = Furnished by Pennsylvania Power & Light Co.
Col. 2 = Furnished by Orange & Rockland Utilities Inc.
Col. 3 = Col. 1 + Col. 2
Col. 4 = Computed from index stations
Col. 5 = Computed increases in runoff based on precipitation forecasts
Col. 6 = Col. 3 + Col. 4 + Col. 5
Col. 7 = 1,815 - Col. 6 (June 15-Nov. 28)
Col. 8 = - Col. 15 (4 days earlier divided by 20)
Col. 9 = Col. 7 + Col. 8, positive or 0
Col. 10 = Amount initial directed release exceeds gate capacity
Col. 11 = Col. 9 - Col. 10
Col.12 = Summation of Col. 11
Col.13 = (From Cols. 10& 11,Table 7)= 1,815 - Col. 10 - Col. 11(June 15-Nov.28) but not more than release capacity
Col.14 = Summation of Col. 13
Col.15 = Col. 12 - Col. 14

Table 8 (Cont.)

RESERVOIR RELEASE DESIGN DATA

River Master daily operation record

Date of advance estimate and directed release	Power plant release forecasts				Delaware River at Montague Advance estimate exclusive of N. Y. C. Reservoir releases						Balancing adjustment	Initial directed release	Release capacity adjustment	Adjusted directed release		Release actually required		Cumulative error in adjusted directed release
	Wallenpaupack Reservoir		Rio Reservoir		Day of Montague discharge	Total power plants	Uncontrolled runoff present conditions	Weather adjustment	Total at Montague	Indicated deficiency				Daily	Cumulative	Daily	Cumulative	
	Date	cfs	Date	cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs
		1		2		3	4	5	6	7	8	9	10	11	12	13	14	15
June 28	June 30	477	July 1	250	July 1	727	3,092	67	3,886	0	- 11	0	0	0	227	0	0	227
29	July 1	477	2	309	2	786	2,596	896	4,278	0	- 11	0	0	0	227	0	0	227
30	2	0	3	300	3	300	2,716	0	3,016	0	- 11	0	0	0	227	0	0	227
July 1	3	0	4	289	4	289	2,298	490	3,077	0	- 11	0	0	0	227	0	0	227
2	4	0	5	447	5	447	2,481	111	3,039	0	- 11	0	0	0	227	0	0	227
3	5	480	6	333	6	813	2,162	208	3,183	0	- 11	0	0	0	227	0	0	227
4	6	480	7	345	7	825	2,854	138	3,817	0	- 11	0	0	0	227	0	0	227
5	7	480	8	350	8	830	2,389	0	3,219	0	- 11	0	0	0	227	0	0	227
6	8	160	9	470	9	630	1,915	109	2,654	0	- 11	0	0	0	227	0	0	227
7	9	0	10	350	10	350	1,642	0	1,992	0	- 11	0	0	0	227	0	0	227
8	10	0	11	350	11	350	1,481	0	1,831	0	- 11	0	0	0	227	0	0	227
9	11	398	12	350	12	748	1,317	24	2,089	0	- 11	0	0	0	227	0	0	227
10	12	398	13	350	13	748	1,227	99	2,074	0	- 11	0	0	0	227	0	0	227
11	13	398	14	350	14	748	1,199	61	2,008	0	- 11	0	0	0	227	0	0	227
12	12	398	15	269	15	667	1,280	24	1,971	0	- 11	0	0	0	227	0	0	227
13	15	398	16	250	16	648	1,107	69	1,824	0	- 11	0	0	0	227	0	0	227
14	16	0	17	231	17	231	1,600	773	2,604	0	- 11	0	0	0	227	0	0	227
15	17	0	18	191	18	191	2,856	171	3,218	0	- 11	0	0	0	227	0	0	227
16	18	652	19	150	19	802	2,115	212	3,129	0	- 11	0	0	0	227	0	0	227
17	19	652	20	150	20	802	1,640	179	2,621	0	- 11	0	0	0	227	0	0	227
18	20	652	21	320	21	972	1,360	660	2,992	0	- 11	0	0	0	227	0	0	227
19	21	652	22	320	22	972	1,182	56	2,210	0	- 11	0	0	0	227	0	0	227
20	22	652	23	320	23	972	1,295	0	2,267	0	- 11	0	0	0	227	0	0	227
21	23	0	24	160	24	160	1,245	126	1,531	284	- 11	273	0	273	500	471	471	29
22	24	0	25	160	25	160	1,089	279	1,528	287	- 11	276	0	276	776	324	795	- 19
23	25	440	26	160	26	600	1,041	561	2,202	0	- 11	0	0	0	776	0	795	- 19
24	26	440	27	320	27	760	1,013	50	1,823	0	- 11	0	0	0	776	0	795	- 19
25	27	440	28	320	28	760	913	35	1,708	107	- 1	106	0	106	882	0	795	87
26	28	440	29	320	29	760	845	52	1,657	158	+ 1	159	0	159	1,041	0	795	246
27	29	440	30	10	30	450	789	138	1,377	438	+ 1	439	0	439	1,480	0	795	685
28	30	0	31	35	31	35	1,019	152	1,206	609	+ 1	610	0	610	2,090	0	795	1,295
Total		10,004		8,529		18,533	51,758	5,740	76,031	1,883	- 295	1,863	0	1,863		795		

Col. 1 = Furnished by Pennsylvania Power & Light Co.
Col. 2 = Furnished by Orange & Rockland Utilities, Inc.
Col. 3 = Col. 1 + Col. 2
Col. 4 = Computed from index stations
Col. 5 = Computed increases in runoff based on precipitation forecasts
Col. 6 = Col. 3 + Col. 4 + Col. 5
Col. 7 = 1815 - Col. 6 (June 15 - Nov. 28)
Col. 8 = - Col. 15 (4 days earlier divided by 20)
Col. 9 = Col. 7 + Col. 8, positive or 0
Col.10 = Amount initial directed release exceeds gate capacity
Col. 11= Col. 9 - Col. 10
Col. 12 = Summation of Col. 11
Col. 13 (From Cols. 10 & 11, Table 7) = 1815 - Col. 10 - Col. 11 (June 15-Nov.28) but not more than release capacity
Col. 14 = Summation of Col. 13
Col. 15 = Col. 12 - Col. 14

Table 8 (Cont.)

RESERVOIR RELEASE DESIGN DATA

River Master daily operation record

Date of advance estimate and directed release	Power plant release forecasts: Wallenpaupack Reservoir Date	Wallenpaupack Reservoir cfs	Rio Reservoir Date	Rio Reservoir cfs	Delaware River at Montague Advance estimate exclusive of N.Y.C. Reservoir releases: Day of Montague discharge	Total power plants cfs	Uncontrolled runoff present conditions cfs	Weather adjustment cfs	Total at Montague cfs	Indicated deficiency cfs	Balancing adjustment cfs	Initial directed release cfs	Release capacity adjustment cfs	Adjusted directed release: Daily cfs	Adjusted directed release: Cumulative cfs	Release actually required: Daily cfs	Release actually required: Cumulative cfs	Cumulative error in adjusted directed release cfs
		1		2		3	4	5	6	7	8	9	10	11	12	13	14	15
July 29	July 31	0	Aug. 1	320	Aug. 1	320	884	414	1,618	197	- 4	193	0	193	2,283	0	795	1,488
30	Aug. 1	567	2	600	2	1,167	890	924	2,981	0	- 12	0	0	0	2,283	0	795	1,488
31	2	567	3	320	3	887	2,095	0	2,982	0	- 34	0	0	0	2,283	0	795	1,488
Aug. 1	3	567	4	320	4	887	1,925	42	2,854	0	- 65	0	0	0	2,283	0	795	1,488
2	4	567	5	150	5	717	1,309	816	2,842	0	- 74	0	0	0	2,283	0	795	1,488
3	5	567	6	160	6	727	1,051	1,311	3,089	0	- 74	0	0	0	2,283	0	795	1,488
4	6	0	7	210	7	210	1,109	243	1,562	253	- 74	179	0	179	2,462	0	795	1,667
5	7	0	8	210	8	210	2,707	276	3,193	0	- 74	0	0	0	2,462	0	795	1,667
6	8	800	9	210	9	1,010	1,953	68	3,031	0	- 74	0	0	0	2,462	0	795	1,667
7	9	800	10	320	10	1,120	1,623	315	3,058	0	- 74	0	0	0	2,462	0	795	1,667
8	10	800	11	320	11	1,120	1,309	134	2,563	0	- 83	0	0	0	2,462	0	795	1,667
9	11	800	12	320	12	1,120	1,129	17	2,266	0	- 83	0	0	0	2,462	0	795	1,667
10	12	800	13	320	13	1,120	1,076	165	2,361	0	- 83	0	0	0	2,462	0	795	1,667
11	13	0	14	105	14	105	1,323	0	1,428	387	- 83	304	0	304	2,766	224	1,019	1,747
12	14	0	15	320	15	320	1,225	0	1,545	270	- 83	187	0	187	2,953	155	1,174	1,779
13	15	805	16	320	16	1,125	992	236	2,353	0	- 83	0	0	0	2,953	0	1,174	1,779
14	16	805	17	320	17	1,125	889	40	2,054	0	- 83	0	0	0	2,953	0	1,174	1,779
15	17	805	18	355	18	1,160	835	28	2,023	0	- 87	0	0	0	2,953	434	1,608	1,345
16	18	805	19	355	19	1,160	1,214	0	2,374	0	- 89	0	0	0	2,953	0	1,608	1,345
17	19	518	20	355	20	873	1,077	19	1,969	0	- 89	0	0	0	2,953	0	1,608	1,345
18	20	0	21	105	21	105	891	182	1,178	637	- 89	548	0	548	3,501	0	1,608	1,893
19	21	0	22	320	22	320	788	584	1,692	123	- 67	56	0	56	3,557	0	1,608	1,949
20	22	324	23	450	23	774	9,889	191	10,854	0	- 67	0	0	0	3,557	0	1,608	1,949
21	23	324	24	450	24	774	4,495	410	5,679	0	- 67	0	0	0	3,557	0	1,608	1,949
22	24	324	25	443	25	767	2,538	151	3,456	0	- 95	0	0	0	3,557	0	1,608	1,949
23	25	324	26	443	26	767	2,114	60	2,941	0	- 97	0	0	0	3,557	0	1,608	1,949
24	26	324	27	320	27	644	1,757	0	2,401	0	- 97	0	0	0	3,557	0	1,608	1,949
25	27	0	28	440	28	440	1,447	0	1,887	0	- 97	0	0	0	3,557	0	1,608	1,949
26	28	0	29	500	29	500	1,253	23	1,776	39	- 97	0	0	0	3,557	0	1,608	1,949
27	29	492	30	390	30	882	1,127	24	2,033	0	- 97	0	0	0	3,557	0	1,608	1,949
28	30	492	31	495	31	987	1,058	119	2,164	0	- 97	0	0	0	3,557	0	1,608	1,949
Total		13,177		10,266		23,443	53,972	6,792	84,207	1,906	- 2,372	1,467	0	1,467		813		

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Col. 5 = Computed increases in runoff based on precipitation forecasts
Col. 6 = Col. 3 + Col. 4 + Col. 5
Col. 7 = 1815 - Col. 6 (June 15-Nov. 28)
Col. 8 = - Col. 15 (4 days earlier divided by 20)
Col. 9 = Col. 7 + Col. 8, positive or 0
Col.10 = Amount initial directed release exceeds gate capacity
Col.11 = Col. 9 - Col. 10
Col.12 = Summation of Col. 11
Col.13 = (From Cols. 10 & 11, Table 7) = 1815 - Col. 10 - Col. 11 (June 15-Nov.28) but not more than release capacity
Col.14 = Summation of Col. 13
Col.15 = Col. 12 - Col. 14

Table 8 (Cont.)

RESERVOIR RELEASE DESIGN DATA

River Master daily operation record

Date of advance estimate and directed release	Power plant release forecasts				Delaware River at Montague Advance estimate exclusive of N. Y. C. Reservoir releases						Balancing adjustment	Initial directed release	Release capacity adjustment	Adjusted directed release		Release actually required		Cumulative error in adjusted directed release
	Wallenpaupack Reservoir		Rio Reservoir		Day of Montague discharge	Total power plants	Uncontrolled runoff present conditions	Weather adjustment	Total at Montague	Indicated deficiency				Daily	Cumulative	Daily	Cumulative	
	Date	cfs	Date	cfs		cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs
		1		2		3	4	5	6	7	8	9	10	11	12	13	14	15
Aug. 29	Aug. 31	492	Sept. 1	500	Sept. 1	992	995	171	2,158	0	- 97	0	0	0	3,557	0	1,608	1,949
30	Sept. 1	492	2	500	2	992	930	120	2,042	0	- 97	0	0	0	3,557	0	1,608	1,949
31	2	492	3	495	3	987	901	241	2,129	0	- 97	0	0	0	3,557	0	1,608	1,949
Sept. 1	3	0	4	355	4	355	1,051	0	1,406	409	- 97	312	0	312	3,869	606	2,214	1,655
2	4	0	5	200	5	200	912	0	1,112	703	- 97	606	0	606	4,475	718	2,932	1,543
3	5	0	6	200	6	200	779	0	979	836	- 97	739	0	739	5,214	582	3,514	1,700
4	6	396	7	300	7	696	715	0	1,411	404	- 97	307	0	307	5,521	576	4,090	1,431
5	7	396	8	210	8	606	871	0	1,477	338	- 83	255	0	255	5,776	350	4,440	1,336
6	8	396	9	210	9	606	785	10	1,401	414	- 77	337	0	337	6,113	38	4,478	1,635
7	9	396	10	210	10	606	707	10	1,323	492	- 85	407	0	407	6,520	0	4,478	2,042
8	10	0	11	100	11	100	663	0	763	1,052	- 72	980	0	980	7,500	819	5,297	2,203
9	11	0	12	100	12	100	640	126	866	949	- 67	882	0	882	8,382	0	5,297	3,085
10	12	394	13	200	13	594	680	95	1,369	446	- 82	364	0	364	8,746	0	5,297	3,449
11	13	394	14	195	14	589	722	274	1,585	230	- 102	128	0	128	8,874	0	5,297	3,577
12	14	394	15	210	15	604	3,840	24,000	28,444	0	- 110	0	0	0	8,874	0	5,297	3,577
Total (1-15)		4,242		3,985		8,227	15,291	25,047	48,465	6,273	- 1,357	5,317		5,317		3,689		
					(September 16 to November 26, 1960 estimated Montague discharge greater than 1,815 cfs)													
					Nov. 25									0	8,874	49	5,346	3,528
Nov. 24	Nov.26	0	Nov. 27	15	Nov. 27	15	1,560	0	1,575	240	- 179	61	0	61	8,935	7	5,353	3,582
25	27	0	28	50	28	50	1,530	0	1,580	235	- 179	56	0	56	8,991	234	5,587	3,404
					(November 29, 30, 1960 estimated discharge greater than 1,815 cfs)													
Total		0		65		65	3,090	0	3,155	475	- 358	117	0	117		290		

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Col. 3 = Col. 1 + Col. 2
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Col. 6 = Col. 3 + Col. 4 + Col. 5
Col. 7 = 1,815 - Col. 6 (June 15-Nov. 28)
Col. 8 = - Col. 15 (4 days earlier divided by 20)
Col. 9 = Col. 7 + Col. 8, positive or 0
Col. 10 = Amount initial directed release exceeds gate capacity
Col. 11 = Col. 9 - Col. 10
Col. 12 = Summation of Col. 11
Col. 13 = (From Cols. 10 & 11, Table 7)=1,815 - Col. 10 - Col. 11(June 15-Nov.28) but not more than release capacity
Col. 14 = Summation of Col. 13
Col. 15 = Col. 12 - Col. 14

Table 9

Diversion to New York City water supply in MGD for 24-hour periods beginning at 9 a.m. daily

River Master daily operation record

Date 1959	Pepacton Tunnel	Neversink Tunnel	* Average June 1, 1959 to date	Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1, 1959 to date
Dec. 1	98.4	291.0	400.3	Jan. 1	357.7	37.7	406.0
2	73.6	264.9	400.0	2	348.6	232.5	406.8
3	124.5	295.9	400.1	3	339.4	47.5	406.7
4	93.9	298.7	400.1	4	399.7	309.4	408.1
5	124.0	0	398.6	5	379.6	293.4	409.3
6	92.7	14.3	397.0	6	378.1	286.0	410.5
7	202.8	282.6	397.5	7	255.8	297.8	411.1
8	225.2	277.9	398.1	8	243.7	292.2	411.7
9	219.9	267.9	398.5	9	214.0	266.9	412.0
10	239.4	283.9	399.2	10	138.8	37.8	411.0
11	200.9	277.2	399.6	11	378.7	317.6	412.2
12	191.7	0	398.5	12	377.0	320.5	413.5
13	142.0	143.5	397.9	13	377.3	309.4	414.7
14	214.1	300.9	398.5	14	255.8	329.1	415.4
15	214.6	274.9	399.0	15	259.7	331.8	416.2
16	215.5	266.6	399.4	16	229.7	281.6	416.6
17	215.6	205.8	399.5	17	286.9	202.4	416.9
18	294.8	295.4	400.5	18	377.8	334.8	418.2
19	325.0	227.4	401.2	19	378.6	322.8	419.4
20	343.6	125.0	401.6	20	376.9	328.2	420.6
21	9.8	268.2	400.9	21	378.7	318.6	421.8
22	0	299.5	400.5	22	381.9	298.1	422.9
23	210.8	293.3	401.0	23	369.6	124.9	423.2
24	386.6	164.7	401.7	24	365.6	22.2	423.1
25	393.9	0	401.6	25	382.2	199.5	423.7
26	395.3	0	401.6	26	382.5	198.1	424.4
27	406.8	17.0	401.7	27	389.6	232.0	425.2
28	389.5	282.1	403.0	28	406.2	197.5	425.9
29	382.2	302.2	404.3	29	371.4	0	425.7
30	398.6	300.9	405.7	30	390.0	52.1	425.8
31	186.0	294.6	406.1	31	287.4	8.9	425.3
Totals	7,011.7	6,616.3			10,458.9	6,831.3	

*Average of combined diversions, computed by dividing aggregate total quantity diverted by number of days elapsed since preceding May 31.

Table 9 (Cont.)

Diversion to New York City water supply in MGD for 24-hour periods beginning at 9 a.m. daily

River Master daily operation record

Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1, 1959 to date	Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1, 1959 to date
Feb. 1	378.0	134.6	425.6	Mar. 1	429.4	280.2	438.2
2	377.9	125.0	425.9	2	423.6	285.0	439.2
3	377.2	133.7	426.3	3	427.0	264.0	440.1
4	388.6	152.2	426.7	4	422.1	246.3	440.9
5	375.4	159.1	427.2	5	421.2	28.3	441.0
6	380.0	0	427.0	6	420.9	11.4	440.9
7	384.1	3.5	426.8	7	423.3	282.4	441.9
8	412.6	144.5	427.3	8	416.9	266.8	442.7
9	409.7	139.8	427.8	9	417.4	287.1	443.7
10	411.9	141.3	428.3	10	419.3	288.3	444.6
11	419.6	139.9	428.8	11	414.5	268.8	445.4
12	403.1	132.3	429.2	12	402.7	0	445.3
13	405.0	0	429.1	13	399.2	13.4	445.2
14	412.1	0	429.1	14	412.7	216.4	445.8
15	421.1	0	429.0	15	420.9	214.1	446.4
16	419.5	0	429.0	16	421.1	295.8	447.4
17	418.1	0	429.0	17	420.2	244.4	448.1
18	418.5	0	428.9	18	420.2	76.4	448.3
19	404.1	127.2	429.3	19	398.2	0	448.1
20	403.4	101.0	429.6	20	401.4	7.2	448.0
21	407.2	29.2	429.6	21	421.6	148.7	448.4
22	427.4	236.3	430.5	22	415.9	149.6	448.8
23	410.5	321.5	431.6	23	418.6	143.0	449.2
24	423.9	325.6	432.8	24	423.6	130.7	449.5
25	429.5	325.6	434.0	25	425.4	115.0	449.8
26	422.5	297.6	435.0	26	419.9	0	449.7
27	419.8	230.3	435.8	27	405.5	8.6	449.6
28	416.2	118.1	436.2	28	377.7	103.3	449.7
29	422.0	295.4	437.2	29	426.1	90.9	449.9
				30	425.1	93.6	450.2
				31	416.7	77.3	450.3
Total	11,798.9	3,813.7			12,908.3	4,637.0	

*Average of combined diversions, computed by dividing aggregate total quantity diverted by number of days elapsed since preceding May 31.

Table 9 (Cont.)

Diversion to New York City water supply in MGD for 24-hour periods beginning at 9 a.m. daily

River Master daily operation record

Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1,1959 to date	Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1,1959 to date
Apr. 1	411.0	155.6	450.7	May 1	404.0	210.1	460.4
2	402.0	0	450.5	2	415.7	204.8	460.9
3	411.8	6.2	450.4	3	417.2	188.1	461.3
4	416.6	259.1	451.2	4	417.1	145.1	461.6
5	417.0	417.9	452.4	5	415.8	207.6	462.1
6	418.9	415.0	453.6	6	400.0	231.0	462.6
7	421.7	416.3	454.9	7	360.0	191.8	462.9
8	417.2	296.4	455.7	8	315.6	28.9	462.5
9	300.5	2.9	455.2	9	401.7	297.3	463.2
10	416.1	3.4	455.1	10	266.0	330.8	463.6
11	276.9	201.1	455.2	11	257.1	245.6	463.7
12	286.2	197.8	455.2	12	263.7	248.3	463.8
13	312.4	205.3	455.4	13	413.0	232.3	464.4
14	427.1	239.6	456.1	14	210.6	145.9	464.1
15	416.0	258.2	456.8	15	234.7	27.6	463.5
16	403.0	231.1	457.3	16	385.8	197.1	463.8
17	395.0	0	457.1	17	371.5	201.9	464.1
18	302.2	150.4	457.1	18	372.8	212.0	464.5
19	288.6	148.8	457.1	19	370.1	208.8	464.8
20	297.1	149.8	457.0	20	250.7	191.4	464.7
21	295.5	163.4	457.0	21	208.5	40.8	464.1
22	302.0	231.3	457.3	22	151.1	20.2	463.3
23	281.1	268.1	457.6	23	393.7	130.4	463.5
24	276.3	168.1	457.5	24	362.5	200.2	463.7
25	383.2	202.4	457.9	25	369.8	290.5	464.3
26	412.9	214.4	458.4	26	375.7	298.6	464.9
27	407.9	169.7	458.8	27	260.9	287.4	465.1
28	401.3	196.7	459.2	28	273.1	292.5	465.4
29	404.0	178.9	459.6	29	263.3	0	464.8
30	404.0	190.0	460.0	30	377.4	17.6	464.6
				31	302.3	275.9	464.9
Total	11,005.5	5,737.9			10,281.4	5,800.5	

*Average of combined diversions, computed by dividing aggregate total quantity diverted by number of days elapsed since preceding May 31.

Table 9 (Cont.)

Diversion to New York City water supply in MGD for 24-hour periods beginning at 9 a.m. daily

River Master daily operation record

Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1, 1960 to date	Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1, 1960 to date
June 1	298.6	135.2	433.8	July 1	406.0	202.6	462.8
2	292.5	128.0	427.2	2	287.0	0	457.3
3	280.8	132.9	422.7	3	309.0	0	452.8
4	275.2	117.9	415.3	4	407.2	0	451.4
5	270.4	103.6	407.0	5	404.8	193.6	455.6
6	286.2	133.8	409.2	6	404.0	204.7	459.9
7	296.6	133.2	412.1	7	404.2	208.7	464.0
8	300.1	123.4	413.6	8	404.0	186.9	467.4
9	299.2	117.6	413.9	9	281.7	0	462.6
10	271.9	110.7	410.8	10	293.1	12.1	458.7
11	262.0	127.9	408.9	11	298.2	203.5	459.7
12	286.6	129.9	409.5	12	315.9	206.3	461.2
13	300.5	0	401.1	13	312.6	212.3	462.7
14	295.0	15.8	394.7	14	298.5	222.3	464.0
15	292.3	0	387.9	15	309.1	218.7	465.4
16	296.0	0	382.1	16	276.0	0	461.3
17	297.6	0	377.1	17	260.7	9.8	457.2
18	267.0	0	371.0	18	282.6	221.9	458.2
19	294.7	0	367.0	19	321.9	216.4	459.9
20	399.8	182.0	377.7	20	327.1	210.1	461.4
21	404.2	242.8	390.6	21	326.5	199.9	462.7
22	406.5	247.9	402.6	22	305.0	197.5	463.4
23	409.0	281.5	415.1	23	290.3	0	460.2
24	406.8	288.3	426.7	24	382.3	11.6	459.0
25	280.0	162.1	427.4	25	363.4	163.9	460.2
26	311.3	250.9	432.5	26	367.6	170.4	461.6
27	409.2	259.6	441.3	27	383.0	171.1	463.2
28	402.2	206.3	447.3	28	385.9	181.3	465.0
29	410.1	192.9	452.6	29	391.0	181.5	466.8
30	410.4	199.9	457.9	30	264.2	5.6	463.5
				31	382.0	0	462.2
Total	9,712.7	4,024.1			10,444.8	4,012.7	

*Average of combined diversions, computed by dividing aggregate total quantity diverted by number of days elapsed since preceding May 31.

Table 9 (Cont.)

Diversion to New York City water supply in MGD for 24-hour periods beginning at 9 a.m. daily

River Master daily operation record

Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1,1960 to date	Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1,1960 to date
Aug. 1	366.8	177.5	463.5	Sept.1	383.6	281.5	464.2
2	370.8	176.4	464.9	2	387.7	269.1	466.2
3	379.1	190.7	466.5	3	390.0	0	465.4
4	367.4	168.4	467.6	4	207.2	0	462.7
5	360.0	180.2	468.7	5	281.9	8.9	460.9
6	268.1	0	465.7	6	346.1	197.4	461.8
7	371.0	8.3	464.4	7	350.9	213.2	462.8
8	370.1	181.2	465.7	8	366.5	206.8	463.9
9	371.9	183.0	466.9	9	354.7	169.8	464.5
10	376.2	178.4	468.2	10	364.9	0	463.5
11	379.7	171.3	469.3	11	346.2	0	462.4
12	394.5	169.5	470.6	12	348.2	196.4	463.2
13	378.5	0	469.4	13	370.2	162.2	463.9
14	272.8	9.8	466.9	14	210.1	161.2	463.0
15	310.9	140.0	466.7	15	383.5	177.2	463.9
16	284.3	144.5	466.2	16	377.5	179.5	464.8
17	327.9	146.0	466.3	17	375.3	0	463.9
18	306.9	145.9	466.1	18	377.0	10.3	463.2
19	301.9	122.9	465.6	19	385.1	93.7	463.4
20	297.1	0	463.5	20	372.0	209.2	464.4
21	264.5	10.4	461.2	21	362.9	111.6	464.5
22	306.3	134.0	461.0	22	257.9	13.6	462.8
23	306.3	140.3	460.8	23	253.9	0	461.0
24	309.5	146.3	460.7	24	244.1	69.0	459.7
25	315.0	131.3	460.6	25	202.0	4.3	457.6
26	311.7	127.0	460.3	26	270.3	104.9	456.9
27	284.2	0	458.3	27	272.4	111.9	456.3
28	296.6	9.2	456.6	28	268.8	102.7	455.6
29	320.6	238.7	457.7	29	280.1	98.0	454.9
30	375.1	284.9	460.0	30	253.0	102.1	454.1
31	378.1	267.3	462.0				
Total	10,323.8	3,983.4			9,644.0	3,254.5	

*Average of combined diversions, computed by dividing aggregate total quantity diverted by number of days elapsed since preceding May 31.

Table 9 (Cont.)

Diversion to New York City water supply in MGD for 24-hour periods beginning at 9 a.m. daily

River Master daily operation record

Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1, 1960 to date	Date 1960	Pepacton Tunnel	Neversink Tunnel	*Average June 1, 1960 to date
Oct. 1	233.2	0	452.3	Nov. 1	400.0	265.9	464.9
2	224.3	0	450.5	2	400.0	266.3	466.2
3	270.5	97.4	449.8	3	419.0	263.7	467.5
4	285.1	103.8	449.3	4	403.4	270.8	468.9
5	297.2	102.9	448.9	5	380.0	20.5	468.4
6	295.8	119.2	448.7	6	381.3	0	467.9
7	283.3	53.8	447.8	7	400.0	272.3	469.2
8	263.2	44.2	446.7	8	411.9	291.3	470.6
9	248.9	17.0	445.3	9	404.2	266.3	471.8
10	286.0	110.3	445.0	10	381.3	267.9	472.9
11	413.9	100.4	445.5	11	410.3	246.5	474.1
12	413.0	154.1	446.4	12	428.8	43.3	474.0
13	413.8	143.8	447.2	13	430.0	0	473.8
14	423.1	152.4	448.2	14	426.1	250.2	475.0
15	419.4	0	448.0	15	430.0	265.9	476.3
16	407.3	10.1	447.7	16	426.0	274.1	477.6
17	418.5	273.3	449.5	17	425.8	242.0	478.7
18	422.1	302.5	451.5	18	399.0	249.0	479.7
19	422.1	302.1	453.4	19	374.0	116.1	479.8
20	422.1	304.0	455.3	20	370.4	4.4	479.2
21	419.2	314.2	457.3	21	386.3	216.5	479.9
22	404.8	0	456.9	22	379.5	241.1	480.7
23	376.8	11.3	456.4	23	383.2	123.4	480.9
24	379.7	285.9	457.8	24	377.5	35.8	480.5
25	385.3	253.1	459.1	25	375.2	202.0	481.0
26	374.8	284.2	460.4	26	362.5	99.7	480.9
27	376.2	277.7	461.7	27	163.3	120.7	479.8
28	372.6	276.9	463.0	28	366.7	243.3	480.5
29	386.7	0	462.5	29	364.4	286.2	481.5
30	375.0	19.1	462.0	30	364.7	257.6	482.2
31	425.0	269.5	463.5				
Total	11,138.9	4,383.2			11,624.8	5,702.8	

*Average of combined diversions, computed by dividing aggregate total quantity diverted by number of days elapsed since preceding May 31.

Table 10

Storage in Pepacton Reservoir, New York, for year ending November 30, 1960

(Storage in millions of gallons above elevation 1152.00 ft. Add 7,711 million gallons for total contents above sill of outlet tunnel, elevation 1126.50 ft.)

River Master daily operation record; gage reading at 9:00 A.M.

Day	December	January	February	March	April	May	June	July	August	September	October	November
1	97,268	116,914	124,292	133,024	137,804	140,375	139,914	140,264	133,527	126,098	140,727	136,055
2	98,522	117,165	124,049	132,862	140,709	140,375	139,987	140,227	133,258	125,749	140,653	136,037
3	99,475	118,530	123,860	132,630	141,654	140,301	139,969	140,246	132,952	125,333	140,560	136,001
4	100,079	121,249	123,773	132,363	143,499	140,227	139,914	140,246	132,720	124,465	140,449	135,964
5	100,730	122,740	123,601	132,148	144,418	140,209	139,896	140,116	132,398	124,049	140,357	135,783
6	101,117	123,498	123,463	131,988	143,443	140,098	140,209	139,859	132,041	123,687	140,283	135,692
7	101,977	124,066	123,274	131,845	142,435	139,987	140,227	139,638	131,934	123,308	140,227	135,638
8	103,436	124,691	123,084	131,649	141,802	139,933	140,190	139,381	131,684	122,826	140,153	135,511
9	104,240	125,159	122,912	131,345	141,543	139,841	140,006	139,234	131,363	122,053	140,043	135,330
10	104,859	125,471	122,757	131,149	141,265	139,914	139,896	138,884	131,096	121,368	140,006	135,258
11	105,431	125,784	125,437	130,883	141,005	140,024	139,804	138,829	130,972	120,770	139,896	135,203
12	106,244	125,749	127,723	130,635	140,931	140,116	139,712	138,627	130,653	121,112	139,620	135,095
13	108,750	125,836	129,660	130,369	140,913	140,190	139,528	138,425	130,227	126,010	139,326	134,931
14	110,030	125,940	131,185	130,121	140,839	140,209	139,381	138,369	129,837	128,251	139,050	134,786
15	111,253	126,045	132,220	129,713	140,727	140,116	139,730	138,388	129,625	129,501	138,737	134,570
16	112,251	126,133	132,630	129,465	140,820	140,227	139,859	138,278	129,394	130,086	138,498	134,426
17	113,058	126,237	132,988	129,166	140,876	140,209	139,896	138,077	129,201	130,245	138,278	134,247
18	113,717	126,342	133,096	128,937	140,839	140,006	140,246	137,913	128,937	130,334	138,004	134,049
19	114,163	126,237	133,563	128,691	141,005	139,914	140,505	137,712	128,550	130,688	137,676	133,923
20	114,346	126,115	133,635	128,409	140,931	139,785	140,968	137,512	128,743	133,276	137,566	133,743
21	114,496	126,028	133,707	128,128	140,820	139,675	140,746	137,238	128,585	136,727	137,274	133,581
22	114,927	125,958	133,761	127,917	140,764	139,620	140,598	136,891	128,550	138,223	136,982	133,330
23	115,309	125,784	133,815	127,618	140,672	139,822	140,394	136,472	128,339	139,160	136,709	133,150
24	115,459	125,593	133,761	127,303	140,560	139,933	140,486	136,381	128,180	139,987	136,435	132,970
25	115,326	125,419	133,617	126,989	140,524	139,969	140,839	135,964	127,864	140,283	136,327	132,809
26	115,193	125,263	133,527	126,692	140,449	139,933	141,005	135,620	127,635	140,560	136,290	132,577
27	115,243	125,055	133,473	126,412	140,560	139,877	140,931	135,221	127,390	140,616	136,236	132,523
28	115,309	124,864	133,383	126,167	140,598	139,859	140,709	134,606	127,198	140,560	136,200	132,363
29	115,960	124,708	133,258	125,958	140,524	139,822	140,486	133,995	126,989	140,542	136,182	132,131
30	116,362	124,534	---	126,220	140,430	139,841	140,357	133,330	126,727	140,598	136,127	132,541
31	116,663	124,413	---	131,488	---	139,822	---	133,725	126,412	---	136,091	---
Change	+19,646	+ 7,378	+ 8,732	+ 4,780	+ 2,571	- 461	+ 350	- 6,737	- 7,429	+14,629	- 4,672	- 3,353
Equiv.mgd	+ 633.7	+ 238.0	+ 301.1	+ 154.2	+ 85.7	- 14.9	+ 11.7	- 217.3	- 239.6	+ 487.6	- 150.7	- 111.8
Equiv.cfs	+ 980.3	+ 368.2	+ 465.8	+ 238.5	+ 132.6	- 23.1	+ 18.1	- 336.2	- 370.7	+ 754.3	- 233.1	- 173.0

Change for period +35,434 million gallons Equiv. for period +96.8 mgd Equiv. for period +149.7 cfs

Table 11

Storage in Neversink Reservoir, New York, for year ending November 30, 1960

(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 9:00 A.M.

Day	December	January	February	March	April	May	June	July	August	September	October	November
1	25,184	28,022	26,337	27,563	27,412	34,828	34,389	34,586	32,947	30,947	32,852	30,529
2	25,192	28,097	26,265	27,348	28,258	34,813	34,360	34,556	32,828	30,712	32,947	30,392
3	25,188	28,171	26,194	27,141	28,875	34,783	34,321	34,675	32,700	30,419	33,038	30,227
4	25,122	29,106	26,114	26,970	30,864	34,739	34,331	34,818	32,571	30,341	33,019	30,050
5	25,035	29,164	26,030	26,812	32,995	34,719	34,336	34,902	32,495	30,286	32,995	29,855
6	25,213	29,142	25,955	26,859	33,823	34,630	34,360	34,798	32,401	30,232	32,971	29,905
7	25,533	29,029	26,043	26,894	33,998	34,527	34,336	34,670	32,434	30,036	32,938	29,959
8	25,816	28,990	26,097	26,689	34,013	34,443	34,277	34,547	32,472	29,792	32,947	29,756
9	25,824	28,884	26,051	26,477	34,071	34,586	34,228	34,438	32,340	29,544	32,966	29,531
10	25,804	28,769	25,976	26,265	34,360	34,882	34,174	34,492	32,207	29,235	33,009	29,569
11	25,729	28,884	26,030	26,039	34,581	34,847	34,120	34,522	32,113	29,124	32,966	29,235
12	25,695	28,698	27,331	25,837	34,635	34,872	34,057	34,409	32,005	29,244	32,928	29,079
13	27,494	28,548	27,624	25,896	34,739	34,857	34,018	34,257	31,859	30,570	32,814	29,115
14	28,162	28,376	27,892	25,934	34,793	34,847	34,091	34,179	31,864	30,813	32,728	29,173
15	28,302	28,189	28,105	25,774	34,916	34,902	34,340	34,115	31,878	30,859	32,628	28,999
16	28,381	28,005	28,267	25,616	35,130	34,981	34,695	33,983	31,780	30,827	32,671	28,822
17	28,407	27,836	28,429	25,403	35,199	34,916	34,867	34,037	31,672	30,753	32,700	28,628
18	28,456	27,741	28,579	25,230	35,214	34,847	35,194	34,081	31,550	30,855	32,477	28,460
19	28,403	27,537	28,777	25,205	35,165	34,798	35,155	33,906	31,443	30,942	32,226	28,285
20	28,372	27,331	28,786	25,250	35,115	34,719	35,120	33,746	31,766	31,457	32,000	28,232
21	28,390	27,098	28,817	25,292	35,080	34,660	35,001	33,586	31,916	31,967	31,784	28,289
22	28,302	26,876	28,893	25,188	35,065	34,734	34,911	33,427	31,986	32,165	31,536	28,140
23	28,145	26,672	28,751	25,110	35,001	34,823	34,798	33,259	31,916	32,368	31,578	27,966
24	27,983	26,633	28,561	25,006	34,941	34,926	34,749	33,254	31,836	32,538	31,625	27,914
25	27,970	26,663	28,320	24,928	34,906	34,936	34,902	33,254	31,733	32,609	31,443	27,931
26	28,101	26,553	28,136	24,846	34,847	34,803	34,906	33,115	31,644	32,724	31,266	27,766
27	28,232	26,439	27,944	24,883	34,813	34,640	34,833	32,976	31,559	32,752	31,058	27,715
28	28,346	26,304	27,814	24,920	34,902	34,473	34,719	32,857	31,592	32,724	30,836	27,645
29	28,372	26,198	27,762	24,895	34,877	34,311	34,621	32,719	31,616	32,714	30,634	27,455
30	28,306	26,270	---	24,908	34,852	34,409	34,650	32,529	31,420	32,757	30,684	27,468
31	28,162	26,291	---	25,733	---	34,527	---	32,866	31,164	---	30,707	---
Change	+2,838	-1,685	+1,226	- 151	+7,416	- 439	+ 197	-1,639	-2,000	+1,905	-2,323	-3,138
Equiv.mgd	+ 91.5	- 54.4	+ 42.3	- 4.9	+247.2	- 14.2	+ 6.6	- 52.9	- 64.5	+ 63.5	- 74.9	-104.6
Equiv.cfs	+141.6	- 84.2	+ 65.4	- 7.6	+382.4	- 22.0	+ 10.2	- 81.8	- 99.8	+ 98.2	-115.9	-161.8

Change for period + 2,207 million gallons Equiv. for period + 6.0 mgd Equiv. for period + 9.3 cfs

Table 12

NEW YORK CITY CONSUMPTION OF WATER - 1914 to 1959

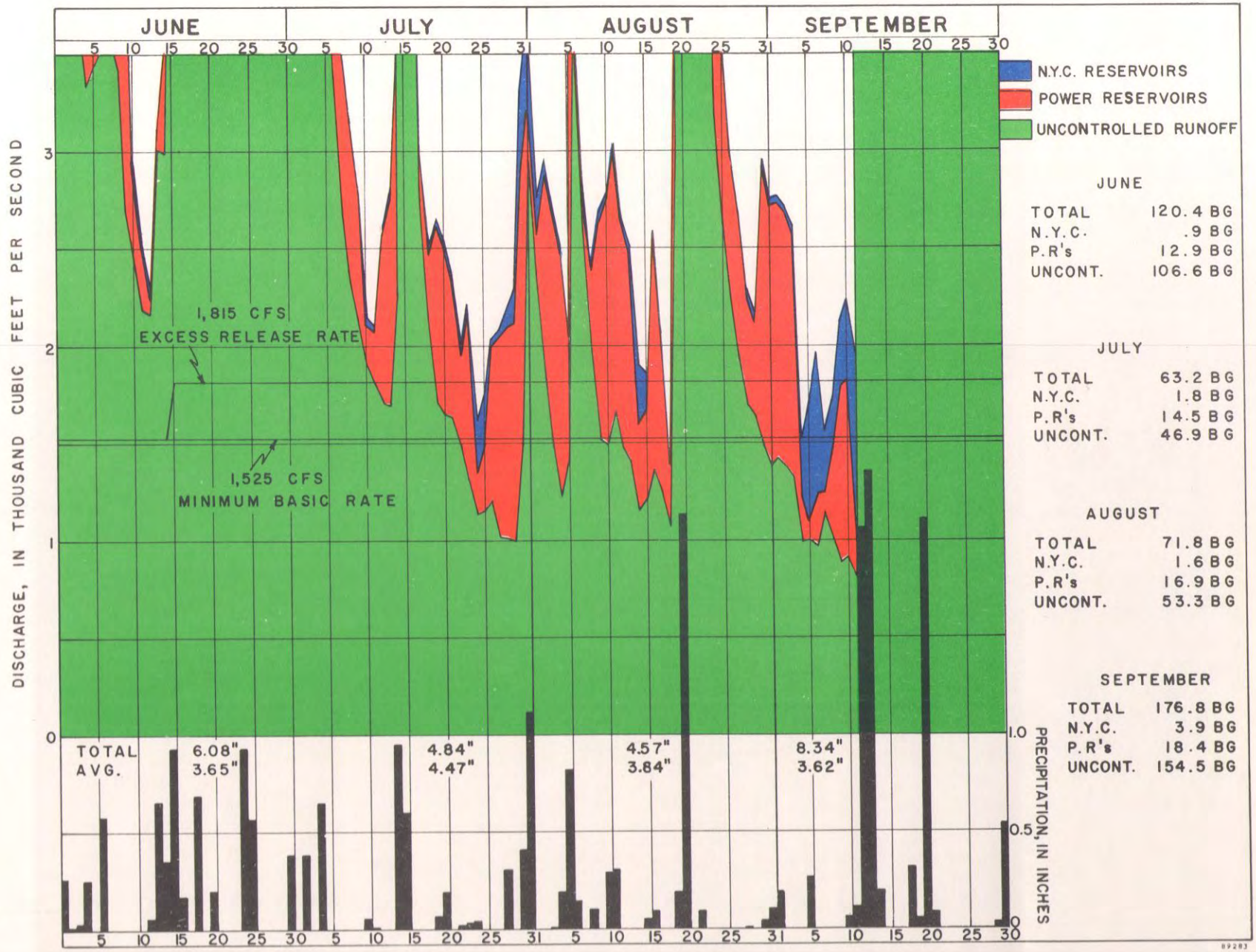
Year	Consumption in City proper M.g.d.	Consumption in City proper Gallons per capita per day	Required to be furnished to outside communities m.g.d.	Total m.g.d.	Annual billion gallons
1914	544.4	106	----	544.4	198.706
1915	528.2	101	----	528.2	192.793
16	566.2	107	----	566.2	207.229
17	584.6	108	1.0 ±	585.6	213.744
18	659.2	120	3.0 ±	662.2	241.703
19	660.2	118	0.6 ±	660.8	241.192
1920	734.9	129	0.4	735.3	269.120
21	731.3	126	0.7	732.0	267.180
22	742.5	125	0.6	743.1	271.232
23	761.6	126	4.1	765.7	279.480
24	780.2	126	4.0	784.2	287.017
1925	839.6	133	6.7	846.3	308.900
26	863.3	134	9.0	872.3	318.390
27	868.1	132	8.0	876.1	319.776
28	877.8	131	10.7	888.5	325.191
29	943.7	138	19.0	962.7	351.386
1930	985.3	142	21.5	1006.8	367.482
31	940.6	135	20.6	961.2	350.838
32	935.7	133	21.6	957.3	350.372
33	938.5	132	16.8	955.3	348.684
34	960.7	134	17.0	977.7	356.860
1935	950.1	132	19.5	969.6	353.904
36	972.5	134	19.5	992.0	363.072
37	975.3	133	17.4	992.7	362.336
38	980.3	133	17.9	998.2	364.343
39	1002.1	135	22.9	1025.0	374.125
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	1004.9	144	26.5	1031.4	377.492
1945	1056.2	146	22.0	1078.2	393.543
46	1117.1	146	24.1	1141.2	416.538
47	1159.0	149	30.4	1189.4	434.131
48	1172.3	150	31.5	1203.8	440.591
49	1166.9	149	36.2	1203.1	439.132
1950	953.3	121	29.1	982.4	358.576
51	1041.9	131	28.1	1070.0	390.550
52	1087.0	136	32.7	1119.7	409.810
53	1093.9	135	44.6	1138.5	415.552
54	1063.4	131	46.3	1109.7	405.040
1955	1109.9	136	45.3	1155.2	421.648
56	1111.3	136.2	48.9	1160.2	424.633
57	1169.0	143	57.2	1226.2	447.563
58	1152.9	140.8	49.6	1202.5	438.912
59	1204.3	146.8	60.3	1264.6	461.579
1960	1199.4	153.9	58.9	1258.3	460.529

The estimated continuous safe yield of all New York City's sources of supply obtainable without pumping is 1,355 m.g.d.

Data furnished by
Department of Water
Supply, Gas and Electricity
City of New York

PLATE I

COMPONENTS OF FLOW, DELAWARE RIVER AT MONTAGUE, N.J. 1960



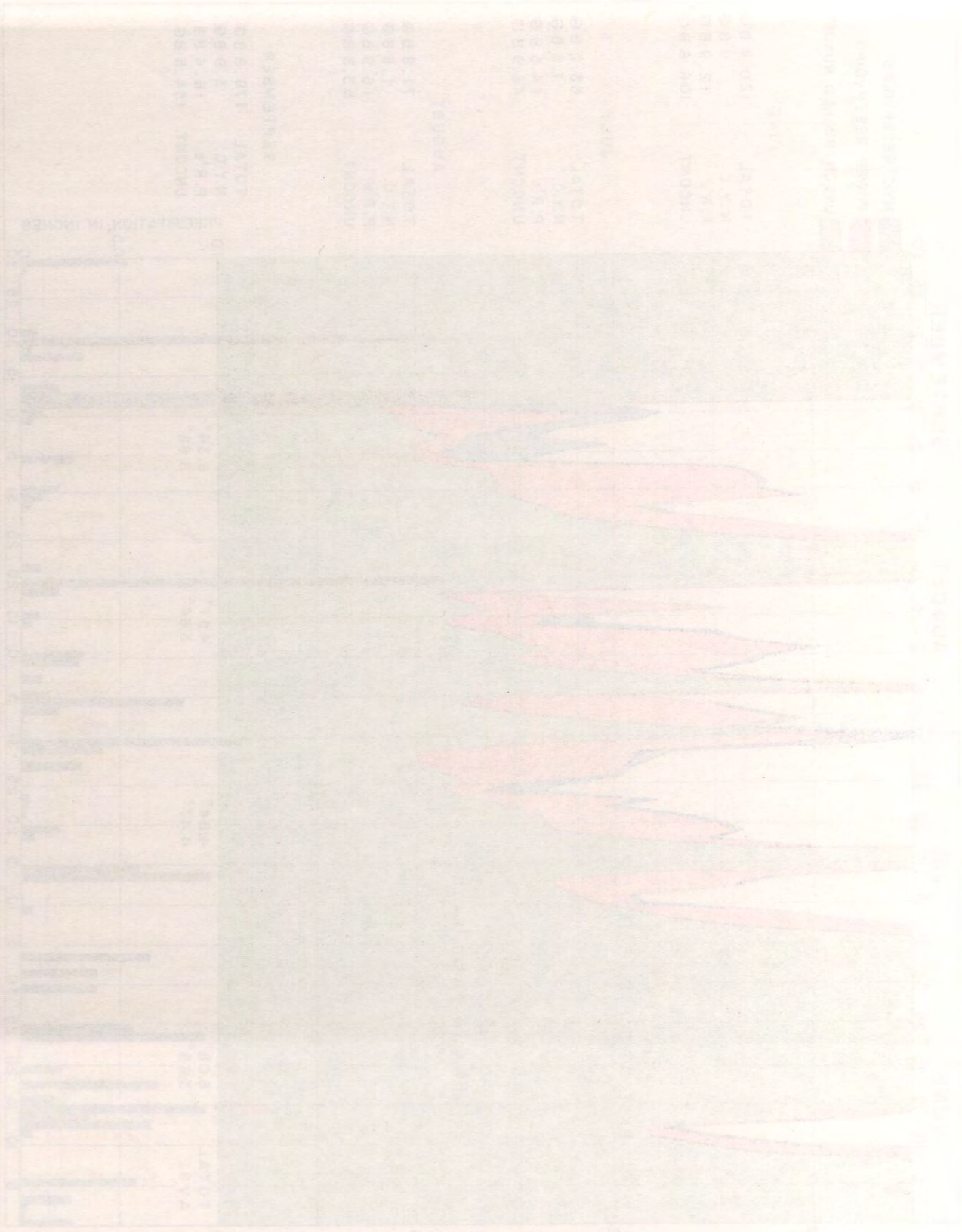
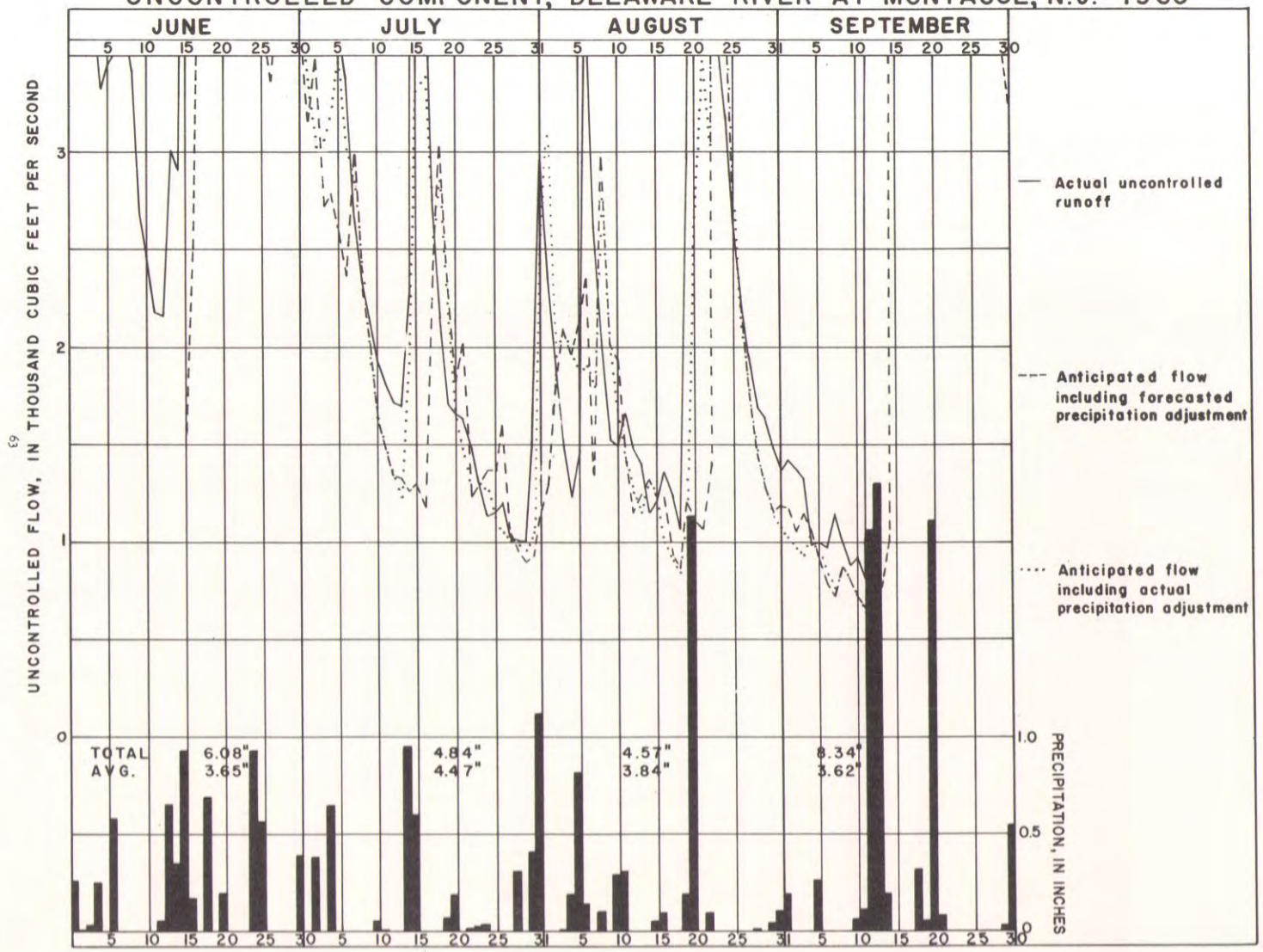


PLATE 2

HYDROGRAPHS OF UNCONTROLLED COMPONENT, DELAWARE RIVER AT MONTAGUE, N.J. 1960



Section IV

REPORT ON SALINITY INVESTIGATION

IN

DELAWARE RIVER ESTUARY

River Master Function and Quality of Water Interests

Of widespread interest is the effect of developments in the Delaware River basin on the quality of the waters of the basin. Industrial and municipal water use and regulation of flow of the Delaware River and its tributaries have a varying influence on the quality of the waters of the basin. Developments may be beneficial or harmful depending on the particular interest involved. One of the functions of the Delaware River Master is to observe, record, and study the effect of developments on the Delaware River and its tributaries.

Because changes in salinity of the lower Delaware Estuary may occur from natural or man-made causes, a program of investigation of salinity of the Delaware River Estuary from Philadelphia, Pa., to Reedy Island Jetty, Del., was established in 1955 by the Quality of Water Branch, U. S. Geological Survey in cooperation with: The State of Delaware; the City of Philadelphia; and the River Master. This salinity program includes (1) frequent sampling and analyses of the water of the estuary, (2) continuous measurement of salinity at selected locations, and (3) evaluation and interpretation of the basic data.

Of particular interest to many federal, state, and local authorities is the beneficial effect of low-flow augmentation in maintaining the sanitary and chemical quality of Delaware River water at desirable levels. Low-flow augmentation, increased abatement of pollution, and other recommended developments may assure water of adequate quality and in sufficient quantity for all interested parties. To adequately study the many variables involved and to establish cause and effect relationships the need for basic data becomes of paramount importance. In 1960 a major step was taken to acquire basic data in the Delaware tidal estuary on a continuous basis.

In November 1960 the Quality of Water Branch, U. S. Geological Survey, in cooperation with the Water Department, City of Philadelphia, established water-quality recording stations at Torresdale (Station 4) and Philadelphia (Station 7) (see map - plate 3). At these stations instruments were installed to continuously sample, measure, and record the dissolved oxygen concentration, temperature, and specific conductance of river water. These recording stations are an outgrowth of, and in addition to, the salinity (specific conductance) records operated in the lower estuary. Basic data collected at recording stations will supplement and augment data previously collected at these points and presently collected elsewhere on a less frequent basis. In the near future it is proposed to expand the present system to include measurements of other water-quality characteristics, such as pH and turbidity. The basic water-quality data collected at this time and in the future will be of inestimable worth in evaluating properly the effects of the present and future developments for the Delaware River basin on the quality of the water.

Salinity in Delaware River Estuary

Estuarine Zones and Salinity

The Delaware Estuary may be divided into a fresh-water zone, an intermediate zone, and a salt-water zone. The fresh-water zone of the estuary begins at the head of tidewater at Trenton, N.J., and extends to the upstream limit of the intermediate zone. The intermediate zone contains a mixture of fresh and salt waters and exhibits a sharp longitudinal gradient in salinity concentrations. The salt-water zone contains waters from the Atlantic Ocean and Delaware Bay and has a high salinity. Except for the head of tidewater at Trenton, the boundaries of these zones are constantly shifting upstream or downstream through the influence of freshwater discharge and tidal action.

At times of very high discharge of the Delaware River, the fresh-water zone extends below Reedy Island Jetty, Del. However, during extended periods of low fresh-water discharge, the extent of the fresh-water zone is decreased as the intermediate and salt-water zones advance upstream. Generally, the most extensive and prolonged upstream advance of salt water occurs in the summer and fall months. This period corresponds to the low-flow period of the Delaware River and its tributaries. During periods of relatively constant fresh-water discharge, tidal action becomes a major factor in determining the advance or retreat of salt water in the estuary.

Measuring Salinity

Conductivity, dissolved solids, and chloride concentration of the river water are a few of the determinations that may be employed to measure the extent of salt water encroachment in the Delaware Estuary. Since the conductivity of water increases in proportion to the concentration of dissolved solids, i.e., the total salt content, data obtained from an instrument that continuously records conductivity of the river water can be interpreted in terms of dissolved solids or chloride concentration, or both. To obtain data on salinity concentrations, continuous conductivity recorders were operated at three strategic locations along the estuary in 1960. Other salinity data were furnished by industries along the estuary.

Locations of stations in the comprehensive sampling program are shown on the map on plate 3. To illustrate salinity in the Delaware Estuary during 1960, data are presented in this report for the following stations:

Chester, Pa., - Station 13

Daily maximum and minimum chloride data available for the period June 1 to December 21, 1960 are shown in table 13. Data were furnished by the Scott Paper Company.

Delaware Memorial Bridge, Del., - Station 15

Daily maximum and minimum chloride data available for the period of this report are shown in table 14 and on plate 4.

Reedy Point, Del., - Station 18

River level data were furnished by the U. S. Coast and Geodetic Survey, Washington, D.C.

Reedy Island Jetty, Del., - Station 19

Daily maximum and minimum chloride data available for the period of this report are shown in table 15 and on plate 5.

Salinity Conditions in 1960

In the year December 1, 1959 to November 30, 1960 only a mild salinity invasion occurred in the Delaware Estuary. During the summer and fall months the total fresh-water flows below Philadelphia and favorable tidal action were sufficient to retain the salt front, i.e., the 50 parts per million (ppm) isochlor, in the Marcus Hook, Pa., area. The salt front did not reach Chester, Pa., during this period.

To illustrate the effects of discharge and tidal action on salinity in the estuary during the report period, a hydrograph of the sum of the discharges of the Delaware River at Trenton, N.J., and the Schuylkill River at Philadelphia, Pa., and the mean river level at Reedy Point, Del., have been plotted on the graphs of chloride concentrations on plates 4 and 5. Additional data of average monthly discharge and mean river level are listed in the following table:

Sum of monthly average discharges of Delaware River at Trenton, N.J. and Schuylkill River at Philadelphia, Pa., and monthly average river level at Reedy Point, Del. (Preliminary data)

Date	Discharge (cfs)	River level (feet)
December 1959	24,012	7.79
January 1960	19,451	7.70
February	22,146	7.46
March	11,601	7.50
April	38,657	7.95
May	13,895	8.34
June	12,711	8.28
July	7,442	8.37
August	8,400	8.86
September	24,203	8.51
October	8,900	8.23
November	7,463	7.87

Tidal Action and Salinity

The effect of erratic tidal action on salinity conditions in the Delaware Estuary is manifested by comparing the rapid increases and decreases in maximum chloride concentrations at the Delaware Memorial Bridge (plate 4) for the period March 6-31, 1960 with the more orderly increases and decreases in chloride concentrations for the period April 20 to September 13, 1960.

In the Delaware Estuary and Bay area a sharp decrease or increase in the daily mean river level is mainly the result of wind action suppressing or increasing the normal heights of daily high and low tides, while also decreasing or increasing the duration of flood and ebb tides.

A sharp decrease in daily mean river level results in more water being displaced seaward from the estuary than can be replaced by upland discharge upon the following rise of the river level to normal conditions. Also much fresh water from above the salt front on the river is rapidly assimilated by the more saline water of the lower river and bay area during this time. Because of the overall loss and assimilation of fresh water from the estuary, there exists a deficit of fresh water in the estuarine system over that which existed previously. As the river level again rises, upland discharge is not sufficient to make up this deficit, therefore, more saline water advances upstream than prior to the decrease in daily mean river level. As a result, the salinity of the estuary increases while the extent of the fresh-water zone is decreased and the salt front advances upstream.

An abrupt increase in daily mean river level produces somewhat different effects on salinity. As the river level rises, the salinity rises. However, there is an upstream displacement of both fresh and saline waters, resulting in an overall increase in the total amount of water in the estuarine system. As the river level returns to normal, the fresh water that has been backed up in the upper reach of the estuary flows downstream, flushing the more saline waters seaward. During such times the salinity of the estuary generally reverts to that which existed prior to the abrupt rise in mean river level.

During March abrupt increases and decreases in river level, together with the unseasonally low discharge for this month, resulted in a salinity invasion below Marcus Hook during which the maximum chloride concentrations for the period of this report occurred. For the other winter months the high discharges of the Delaware River below Philadelphia were sufficient to overcome the erratic tidal action and the chloride concentrations were low (plate 4). This was not so, however, during the other winter months at Reedy Island Jetty where the considerably larger tidal area assimilated more readily the high discharges and the chloride concentrations were unseasonally high (plate 5).

For March the sum of the discharges of the Delaware and Schuylkill Rivers was 11,601 cfs, and the monthly mean river level was 7.50 feet (table on page 68). The highest chloride concentrations for the report year occurred at this time in the Delaware Estuary below the Marcus Hook area (plate 4). This unseasonal salinity invasion was completely flushed seaward by the high discharges of March 30 to April 30, 1960. At this time the salt front was displaced downstream to the Reedy Island Jetty, Del., area (plate 5).

As the high discharges of early April decreased and the monthly mean river level continued to increase, the chloride concentrations at Reedy Island Jetty began to increase as the salt front began to advance upstream. As the average monthly discharge decreased from a high in April to lows in July and August, and the monthly mean river level continued to increase to a high in August, the chloride concentrations at Delaware Memorial Bridge (plate 4) increased.

Although the average monthly discharges of July and August were lower than that of March by 4,157 and 3,201 cfs respectively, and the monthly mean river levels for July and August were 0.87 and 1.36 feet higher than that of March, the maximum chloride concentrations were lower for the later period. The higher chloride concentrations for the middle of March resulted from wind action producing erratic tidal action and salinity conditions, while the variations in chloride concentrations from April 20 to September 13 can be explained mainly by variations in the discharge, as reflected by the hydrographs (plates 4 and 5).

For the 51-day period, July 1 to August 19, the average discharge, as plotted on plates 4 and 5, was 7,336 cfs, and the average for the following 14-day period, August 20 to September 3, was 11,076 cfs. This increase in discharge of 3,740 cfs for the latter period had no significant effect on chloride concentrations at Chester, Pa., (table 4) or at Delaware Memorial Bridge. The chloride concentrations decreased at Reedy Island Jetty during this time. However, this decrease is probably the result of the decreasing river level for this period and not the result of the increased discharge.

The salt front was flushed downstream to the vicinity of Reedy Island Jetty by high discharge beginning September 12. This high discharge was the result of runoff of precipitation from Hurricane Donna that passed through the Delaware River basin area at this time. Hurricane Donna also produced measurable effects on river level conditions. For most years the river level is highest in September. For the period August 30 to September 7 the daily mean river level was relatively stable, averaging 8.7 feet. However, from a high of 8.8 feet on September 6 the daily mean river level decreased to a low of 7.9 feet on September 13 and 14, and the average for September 7 to 19 was 8.1 feet. This decrease was probably the result of the many and varied natural forces associated with Hurricane Donna affecting sea level and river level conditions. Following September 19, and for the remainder of the month, the river level again increased, averaging 8.8 feet.

As the high discharges of September decreased, the salt front again began to advance upstream, reaching the Delaware Memorial Bridge area on October 5. The salt front continued to advance upstream thereafter as the discharge decreased through October and November.

Yearly Comparison of Duration of Salt Water Invasion

The following tabulation compares the days per year when selected chloride concentrations were exceeded at three locations in the Delaware Estuary from 1949 to 1960:

Year	Bridesburg, Phila., Pa. Days per year when maximum daily chloride concentration exceeded 50 ppm	Chester, Pa. Days per year when maximum daily chloride concentration exceeded 400 ppm	Marcus Hook, Pa. Days per year when average daily chloride concentration exceeded 400 ppm
1949	no data	50	120
1950	0	0	17
1951	0	0	22
1952	0	0	17
1953	9	no data	98
1954	32	83	128
1955	0	3	36
1956	0	0	0
1957	86	99	144
1958	0	0	0
1959	0	0	0
1960	0	0	0

The Marcus Hook chloride data used to prepare the above table represent the analyses of daily composites of hourly samples and were furnished by Sun Oil Company.

Table 13

CHLORIDE CONCENTRATION, DELAWARE RIVER AT CHESTER, PA.

(DAILY MAXIMUM AND MINIMUM CHLORIDE CONCENTRATIONS IN PARTS PER MILLION)

JUNE 1, 1960 TO DECEMBER 21, 1960

	JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER		DECEMBER	
DAY	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.
1	17	15	--	--	25	22	--	--	16	10	20	19	24	22
2	--	--	--	--	25	22	--	--	15	12	21	19	24	23
3	17	16	--	--	28	23	--	--	17	12	22	19	25	22
4	17	16	--	--	27	23	--	--	16	12	23	19	25	22
5	18	17	18	17	26	23	--	--	14	13	22	19	25	23
6	17	16	20	17	25	23	23	20	15	13	22	20	25	23
7	17	16	21	18	25	23	27	20	16	14	22	19	25	23
8	18	16	21	19	25	22	27	22	15	13	23	21	25	23
9	19	17	21	19	25	22	--	--	16	14	--	--	--	--
10	18	17	22	19	25	23	--	--	19	15	24	20	--	--
11	18	17	21	18	25	23	--	--	19	15	22	20	--	--
12	18	16	21	18	26	24	24	17	20	17	23	21	--	--
13	19	17	24	18	26	23	18	14	--	--	22	21	--	--
14	19	16	23	18	25	22	15	13	17	16	23	20	27	24
15	20	17	23	20	25	23	15	12	17	16	22	20	--	--
16	20	17	21	19	25	23	18	11	18	17	22	20	45	23
17	20	17	21	19	26	23	12	11	20	17	23	20	40	24
18	18	15	23	20	25	22	12	10	19	17	21	20	37	25
19	25	17	23	19	25	24	13	10	20	17	21	20	--	--
20	20	18	21	19	27	24	12	9	19	15	21	20	72	28
21	20	15	23	20	25	24	15	11	20	16	--	--	100	29
22	20	18	22	20	26	23	17	12	20	17	21	20		
23	20	18	23	21	25	23	15	12	20	17	24	20		
24	19	17	25	21	25	23	15	12	20	17	24	20		
25	20	18	28	21	25	23	15	12	19	17	25	20		
26	19	18	28	22	25	22	14	12	20	18	23	20		
27	20	18	29	22	25	22	13	12	20	18	23	20		
28	20	19	28	21	25	23	15	12	21	19	24	20		
29	20	18	32	23	27	23	14	12	21	19	24	20		
30	20	18	33	22	27	23	14	12	21	19	24	20		
31			26	22	32	24			20	19				

Table 15

CHLORIDE CONCENTRATION, DELAWARE RIVER
AT REEDY ISLAND JETTY, DEL.

(DAILY MAXIMUM AND MINIMUM CHLORIDE CONCENTRATIONS
IN PARTS PER MILLION)

DECEMBER 1, 1959 TO NOVEMBER 22, 1960

	DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER	
DAY	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	2060	240	2130	350	3530	1460			3200	1270	1320	230	1690	330	2700	800	1200	710	3330	1200			4170	1860
2	2270	200	2030	360	3050	1470			2070	490	1040	170	2370	370	2920	780	1080	750	3330	1360			3880	1860
3	1920	190	1730	630	2950	1260			1430	190	1580	160	2500	430	3200	890	1030	740	3380	1340			3330	1460
4	2060	190	890	200	3860	1200			1320	60	1660	170	2190	400	3120	920	1320	800	2790	1400			2660	1320
5	2070	220	550	100	3830	1320			240	50	1860	300	2620	450	3260	920	1250	870	2450	1390			3190	1360
6	2180	240	520	70	4630	1730			130	*	2460	410	2800	470	3450	900	1560	910	3130	1510	1660	270	3500	1330
7	1930	260	350	60	--	--			490	*	2620	490	3050	540	3420	890	1400	1050	3000	1590	1240	220	3360	1380
8	390	60	1010	70	3200	820			580	*	2420	650	3060	600	--	970	3200	1360	2560	1530	1200	240	3600	1540
9	750	60	850	60	3960	1300			350	*	2400	720	2500	710	3650	1110	2990	1300	2520		1360	290	3140	1480
10	300	50	1860	190	4200	1520			1040	*	2200	640	3060	860	3480	1230	3200	1500			1760	330	3170	1280
11	830	50	2230	360	3730	1500			1040	*	2540	620	3400	980	3470	1270	3370	1440			2000	360	3400	1080
12	1730	60	2360	360	2330	500			1420	10	2370	600	3400	1070	3370	1370	3330	1520			2410	320	3600	1400
13	1300	30	2330	500	1680	250			330	20	2660	640	2870	1000	3270	1400	2860	1500			2610	570	3590	1380
14	600	10	1870	500	1400				620	30	2480	650	2940	1090	3040	1370	3160	1410			2730	860	3740	1360
15	950	10	2340	450			5290	3200	480	30	2130	580	2810	1050	3200	1440	3590	1520			3260	940	3740	1330
16	350	30	1640	240			5590	3110	540	30	2220	580	2670	980	3190	1270	3740	1480			3540	930	3870	1560
17	470	30	920	130			5790	3000	630	30	2140	560	2520	960	3160	1400	3930	1750			3470	1240	3210	1350
18	1110	40	1380	140			5360	3000	490	30	2100	600	2290	870	3200	1400	4210	1930			3350	1320	3520	1290
19	1000	40	1800	390			5030	2990	150	20			2610	690	3200	960	4460	1950			3260	1360	3990	1540
20	1660	70	690	70			4460	2540	510	30			2560	720	3200	1280	4320	1920			3190	1040	3930	1620
21	1610	100	1960	70			4530	2460	400	40			2680	700	3520	1320	3460	1800			3060	1080	3670	1450
22	2250	110	3300	430			4795	2220	460	40			2910	730	2760	1400	4000	1390			3190	1050	3400	1400
23	--	370	4130	830			4460	1930	1030	50			2860	760	3500	1360	3930	1270			3250	1250		
24	2750	410	4460	1310			4890	2050	930	50			2950	800	3460	1360	3860	1620			2260	1090		
25	2920	520	4360	1400			4000	1740	900	70			2740	760	3530	1510	4000	1740			2020	800		
26	3230	600	3960	1400			4460	1680	940	100			2830	740	3600	1610	3320	1590			3230	700		
27	3360	630	4000	1340			4260	1760	1370	110			2830	700	3420	1640	3330	1620			3450	980		
28	3660	830	3860	1410			3960	1680	1010	120		390	2020	730	2660	1440	3400	1560			4010	1100		
29	3730	920	3730	1380			3900	1780	1540	130	1430	310	2730	740	2930	1500	3660	1660			4270	1800		
30	2630	670	3460	1300			4260	1800	1360	200	1500	290	2460	970	2830	1630	3350	1560			4260	2040		
31	2440	440	3500	1300			3800	1750			1500	420			2050	960	3510	1530			4260	2100		

*LESS THAN 10 PARTS PER MILLION.

Table 14

CHLORIDE CONCENTRATION, DELAWARE RIVER
AT DELAWARE MEMORIAL BRIDGE, DEL.

(DAILY MAXIMUM AND MINIMUM CHLORIDE CONCENTRATIONS
IN PARTS PER MILLION)

DECEMBER 15, 1959 TO NOVEMBER 30, 1960

	DECEMBER		JANUARY		FEBRUARY		MARCH		APRIL		MAY		JUNE		JULY		AUGUST		SEPTEMBER		OCTOBER		NOVEMBER	
DAY	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			140	10	390	30	20	10	390	30	--	--	50	20	240	30	580	40	910	60	20	*	1380	90
2			70	10	320	30	20	10	60	20	20	10	60	20	320	30	700	50	940	40	50	*	1080	70
3			70	20	160	30	90	10	30	20	30	10	70	20	480	30	700	40	580	50	20	*	790	50
4			20	10	290	30	60	20	30	*	30	10	70	20	380	20	890	50	1040	50	40	*	530	40
5			10	10	260	30	30	20	*	*	--	--	100	20	440	30	650	50	950	50	50	*	840	50
6			20	10	590	40	430	20	*	*	70	20	130	20	570	30	950	60	1060	30	80	10	800	50
7			20	10	210	30	1090	20	*	*	110	20	250	20	280	30	890	70	1210	40	50	*	600	60
8			20	*	120	10	860	20	*	*	240	20	160	20	620	40	1010	60	1010	40	70	*	660	80
9			10	*	220	30	1530	20	*	*	190	30	370	20	700	30	900	70	950	50	60	10	590	70
10			20	*	290	30	2100	50	*	*	180	20	450	20	780	40	980	60	840	60	60	10	440	70
11			20	*	300	30	1560	30	*	*	280	20	640	30	880	60	880	70	870	80	60	10	500	40
12			30	10	90	30	1830	70	*	*	280	30	730	30	860	80	830	70	620	90	70	10	430	50
13			50	10	30	20	1690	110	*	*	340	30	640	30	960	70	720	70	30	*	120	20	510	50
14			40	10	30	20	1650	150	*	*	360	30	640	40	830	90	690	70	30	*	170	20	530	40
15	10	*	60	10	20	10	1750	220	*	*	260	30	600	40	770	70	820	70	20	*	230	20	640	50
16	10	10	20	10	40	10	1730	240	*	*	250	30	460	40	850	50	770	70	20	*	370	20	860	50
17	10	10	10	10	60	10	2140	280	*	*	220	30	340	30	740	50	1070	90	20	*	350	20	460	40
18	10	10	30	10	40	10	1860	200	*	*	210	30	250	20	680	60	1210	100	30	*	520	30	890	40
19	10	*	40	10	60	*	1540	170	*	*	160	30	360	20	640	60	1050	100	30	*	830	30	1000	60
20	10	*	20	10	*	*	1120	90	10	*	160	30	210	20	640	60	820	100	40	*	750	20	1090	60
21	10	10	10	10	50	*	1250	90	20	*	150	30	160	20	460	70	1100	50	30	*	610	20	1220	60
22	10	10	20	10	70	*	1330	70	10	*	110	30	270	30	860	80	860	50	20	*	740	40	1000	60
23	20	10	130	10	40	*	900	30	20	*	180	30	310	30	880	80	830	50	10	*	780	40	1040	70
24	20	10	420	10	40	*	1040	60	20	*	120	20	340	30	800	90	800	50	10	*	470	20	980	90
25	30	10	500	20	130	*	350	40	30	10	100	20	380	20	910	100	920	50	10	*	210	30	900	100
26	110	10	420	20	150	10	1000	50	20	10	100	20	280	30	1050	120	950	50	10	*	440	30	910	100
27	270	10	580	20	40	*	830	50	60	10	80	20	310	30	1020	130	890	60	20	*	620	40	830	100
28	430	20	580	20	20	*	720	50	30	10	70	20	260	30	800	100	1050	60	20	*	670	50	870	100
29	460	20	520	30	50	*	700	60	40	10	80	20	290	30	890	130	1080	70	20	*	1080	70	1120	140
30	320	10	400	30			830	70	--	--	70	20	250	30	860	110	1040	60	20	*	1050	90	650	70
31	140	10	410	30			710	40			50	20			650	50	1100	70			1210	80		

*LESS THAN 10 PARTS PER MILLION

Plate 3

MAP SHOWING SAMPLING STATION LOCATIONS

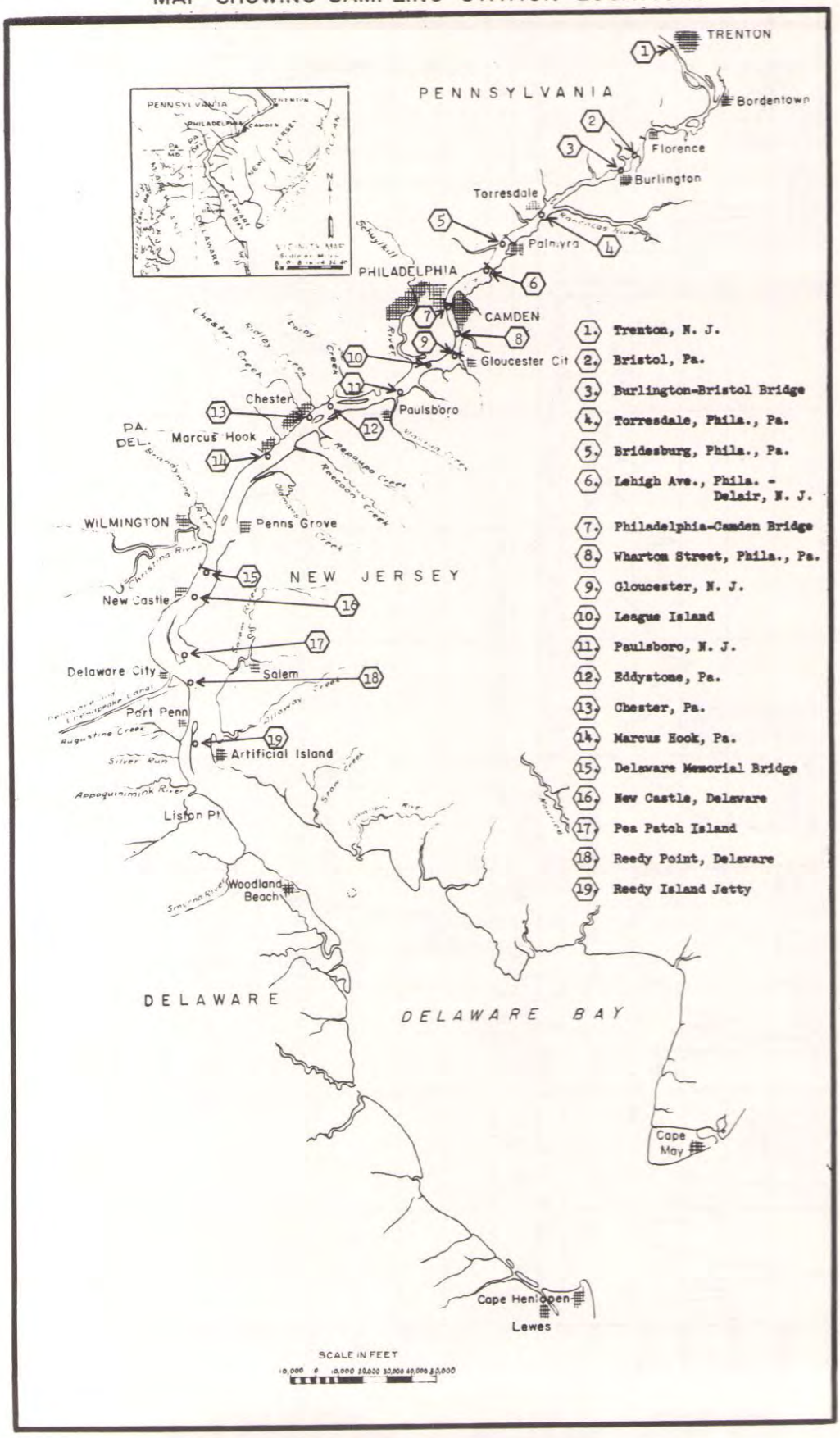
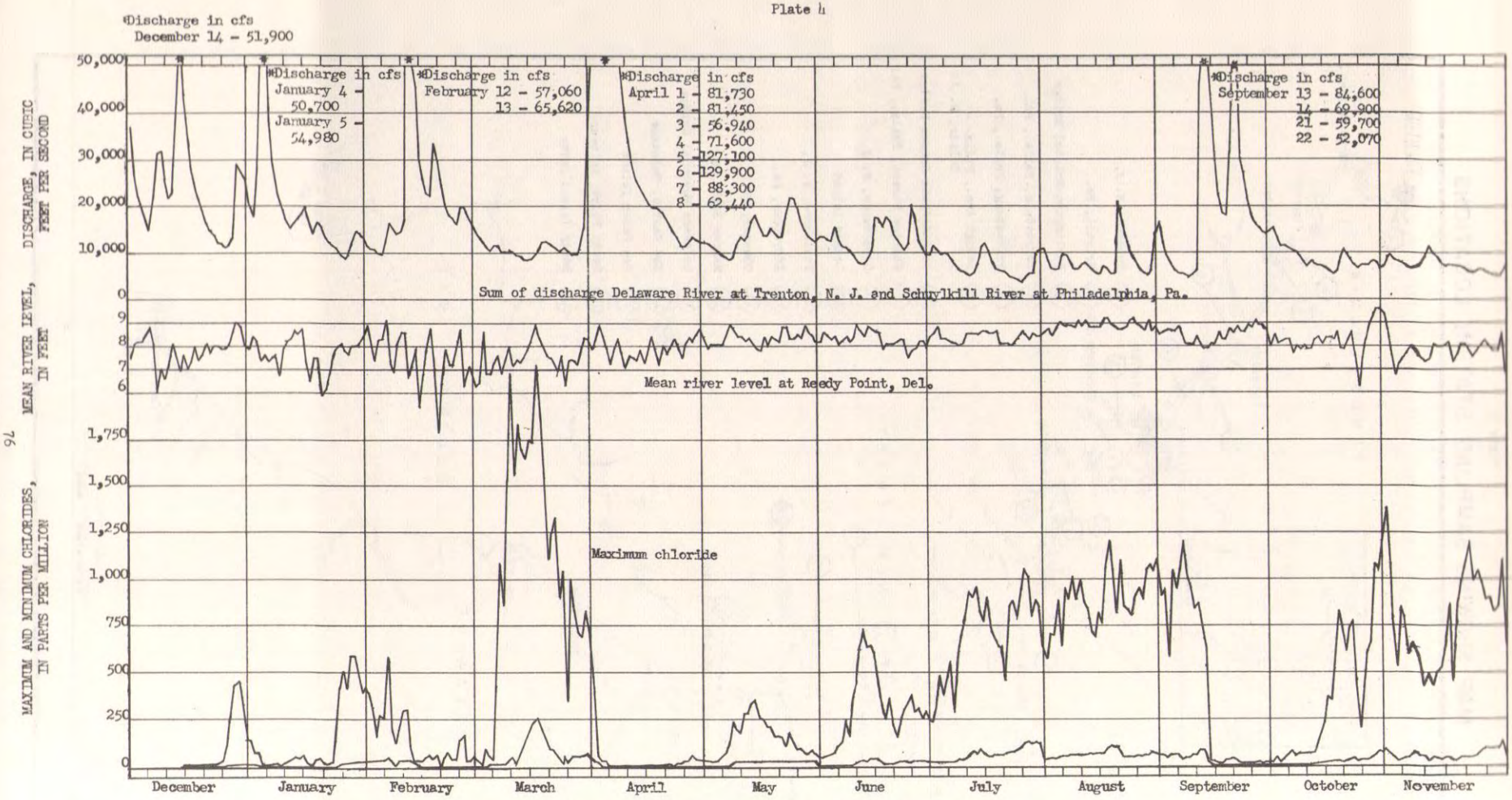


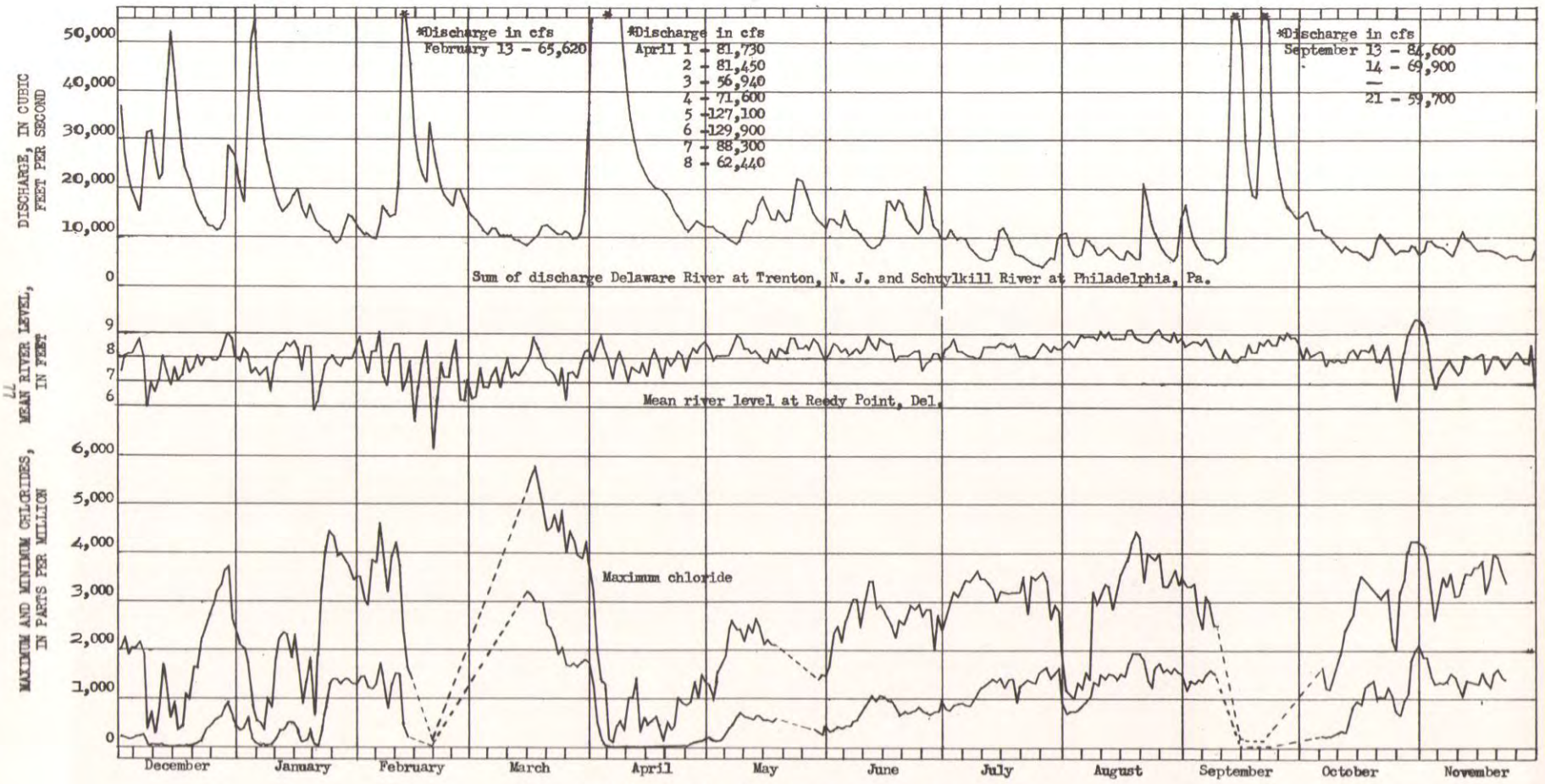
Plate 4



DAILY MAXIMUM AND MINIMUM CHLORIDE CONCENTRATIONS, DELAWARE RIVER
AT DELAWARE MEMORIAL BRIDGE, DEL., DECEMBER 15, 1959 to NOVEMBER 30, 1960

93908

Plate 5



DAILY MAXIMUM AND MINIMUM CHLORIDE CONCENTRATIONS, DELAWARE RIVER AT REEDY ISLAND JETTY, DEL., DECEMBER 1, 1959 to NOVEMBER 22, 1960

Broken lines indicate period of no record

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