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REPORT OF THE RIVER MASTER OF THE DELAWARE RIVER

FOR THE PERIOD DECEMBER 1, 2008–NOVEMBER 30, 2009

Open-File Report 2015–1231

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

CALENDAR FOR REPORT YEAR 2009

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Report of the River Master of the Delaware River for the period December 1, 2008–November 30, 2009

By Bruce E. Krejmas, Gary N. Paulachok, Robert. R. Mason, Jr., and Marie Owens

Open-File Report 2015–1231

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

U.S. Department of the Interior
SALLY JEWELL, Secretary

U.S. Geological Survey
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U.S. Geological Survey, Reston, Virginia: 2016

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Conversion Factors and Vertical Datum

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

Datum: Vertical coordinate information is referenced to the North American Vertical Datum of 1988. Horizontal coordinate information is referenced to the North American Datum of 1983.

Elevation, as used in this report, refers to the distance above a vertical datum.

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as follows:
°F=(1.8x°C)+32

CHEMICAL CONCENTRATIONS

In this report, concentrations of chloride and dissolved oxygen are given in milligrams per liter (mg/L). Milligrams per liter represents the mass of solute (milligrams) per unit volume (liter) of water.

RIVER MASTER LETTER OF TRANSMITTAL AND SPECIAL REPORT

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

March 1, 2016

The Honorable
John G. Roberts, Jr.
Chief Justice of the United States

The Honorable
Jack A. Markell
Governor of Delaware

The Honorable
Christopher J. Christie
Governor of New Jersey

The Honorable
Andrew M. Cuomo
Governor of New York

The Honorable
Tom Wolf
Governor of Pennsylvania

The Honorable
Bill de Blasio
Mayor of the City of New York

No. 5, Original.—October Term, 1950
State of New Jersey, Complainant,
v.
State of New York and City of New York, Defendants,
Commonwealth of Pennsylvania and State of Delaware, Intervenors.

Dear Sirs:

For the record, and in compliance with the provisions of the Amended Decree of the Supreme Court of the United States entered June 7, 1954, I am hereby transmitting the 56th Annual Report of the River Master of the Delaware River for the 12-month period from December 1, 2008, to November 30, 2009. In this report, this period is referred to as the River Master report year or the report year.

During the 2009 River Master report year, monthly precipitation in the upper Delaware River Basin ranged from 43 percent of the long-term average in November 2009 to 181 percent of the long-term average in December 2008 and August 2009. Total precipitation during the report year was 6.94 inches more than the long-term average. Precipitation during the December to May period, when reservoirs typically refill, was 1.22 inches more than the 68-year average. Precipitation during the report year was below normal in January, February, March, April, September, and November, and above normal in the other 6 months.

On December 1, 2008, when the report year began, combined storage in the New York City reservoirs in the upper Delaware River Basin was 224.309 billion gallons (Bgal) or 82.8 percent of combined storage capacity. Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs remained high from December 2008 to May 2009. Reservoir storage decreased slowly from June to mid-October, then fluctuated modestly through the end of November. During the report year, operations in the basin were conducted as stipulated by the Decree and the Flexible Flow Management Program (FFMP).

On May 27, 2009, the Delaware River Master Advisory Committee met at the U.S. Geological Survey (USGS) Water Science Center in West Trenton, New Jersey, to discuss hydrologic conditions in the basin and operational procedures for the 2009 reservoir-releases season. During the report year, the following individuals served as members of the Advisory Committee:

Delaware	John H. Talley
New Jersey	Mark N. Mauriello
New York	Mark Klotz
New York City	Paul Rush
Pennsylvania	Cathleen Curran Myers

The River Master informed the Advisory Committee that, on the basis of information provided by New York City, the interim excess-release quantity, beginning June 15, 2009, was 9.997 Bgal. During the report year, the interim excess-release quantity was used for several purposes authorized by the Decree Parties.

During the report year, the River Master and staff participated in a number of water-supply-related meetings of the Delaware River Basin Commission (DRBC). The Deputy Delaware River Master met periodically with representatives of the Decree Parties as a member of the Decree Parties Work Group and DRBC's Regulated Flow Advisory Committee. Issues of particular interest to the River Master involved management of reservoir releases and streamflow in the upper Delaware River Basin.

The USGS continued operation of its field office of the Delaware River Master at Milford, Pennsylvania. Gary N. Paulachok, Deputy Delaware River Master, continued in charge of the office, assisted by Bruce E. Krejmas, Hydrologist.

During the year, the River Master's office continued the weekly distribution of a summary hydrologic report. These reports contain provisional data on precipitation in the upper Delaware River Basin, releases and spills from New York City reservoirs to the Delaware River, diversions to the New York City water-supply system, reservoir contents, daily segregation of flow of the Delaware River at the USGS Montague, New Jersey gaging station, and diversions by New Jersey. The reports were distributed to members of the Delaware River Master Advisory Committee and to other parties interested in Delaware River operations. A monthly summary of hydrologic conditions also was provided to Advisory Committee members. The weekly and monthly hydrologic reports were also posted on the River Master's Web site at *http://water.usgs.gov/osw/odrm/*.

The first section of this report documents Delaware River operations during the report year (December 1, 2008 to November 30, 2009). During the year, the City of New York diverted 179.858 Bgal from the Delaware River Basin and released 262.10 Bgal from Pepacton, Cannonsville, and Neversink Reservoirs to the Delaware River. The River Master directed releases from these reservoirs to the Delaware River that totaled 9.062 Bgal.

The second section of this report describes water quality at various monitor sites on the Delaware Estuary. It includes basic data on chemical properties and physical characteristics of the water, and presents summary statistics on the data.

Throughout the year, diversions to New York City's water supply and releases designed to maintain the flow of the Delaware River at Montague were made as directed by the River Master. Diversions by New York City from its reservoirs in the Delaware River Basin did not exceed the limit stipulated by the Decree. Diversions by New Jersey also were within stipulated limits.

The River Master and staff are grateful for the continued cooperation and support of the Decree Parties. Also, the contributions of the PPL Corporation and Alliance Energy in informing the River Master of plans for power generation and furnishing data on reservoir releases and elevations are greatly appreciated.

Sincerely yours,

/Signed/

Robert R. Mason, Jr.
Delaware River Master

DELAWARE RIVER OPERATIONS

Abstract

A Decree of the Supreme Court of the United States, entered June 7, 1954, established the position of Delaware River Master within the U.S. Geological Survey (USGS). In addition, the Decree authorizes diversions of water from the Delaware River Basin and requires compensating releases from certain reservoirs, owned by New York City, to be made under the supervision and direction of the River Master. The Decree stipulates that the River Master will furnish reports to the Court, not less frequently than annually. This report is the 56th Annual Report of the River Master of the Delaware River. It covers the 2009 River Master report year, the period from December 1, 2008, to November 30, 2009.

During the report year, precipitation in the upper Delaware River Basin was 50.89 inches (in.) or 116 percent of the long-term average. Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs remained high throughout the year and did not decline below 80 percent of combined capacity at any time. Delaware River operations during the year were conducted as stipulated by the Decree and the Flexible Flow Management Program (FFMP).

Diversions from the Delaware River Basin by New York City and New Jersey were in full compliance with the Decree. Reservoir releases were made as directed by the River Master at rates designed to meet the flow objective for the Delaware River at Montague, New Jersey, on 25 days during the report year. Releases were made at conservation rates—rates designed to relieve thermal stress and protect the fishery and aquatic habitat in the tailwaters of the reservoirs—on all other days.

During the report year, New York City and New Jersey complied fully with the terms of the Decree, and directives and requests of the River Master.

As part of a long-term program, the quality of water in the Delaware Estuary between Trenton, New Jersey, and Reedy Island Jetty, Delaware, was monitored at various locations. Data on water temperature, specific conductance, dissolved oxygen, and pH were collected continuously by electronic instruments at four sites. In addition, selected water-quality data were collected at 22 sites on a monthly basis.

The Delaware River Basin Commission (DRBC) collects monthly samples from March through October at 22 sites between Biles Channel and South Brown Shoal. Samples were collected and analyzed by the State of Delaware for the DRBC. At each site, water samples were collected at a single point near the center of the channel near the surface and analyzed for selected physical properties, and chemical and biological constituents including routine chemical substances, nutrients and bacteria. These consist of analyses of field measurements and laboratory determinations.

Introduction

An Amended Decree of the Supreme Court of the United States, entered June 7, 1954, authorized diversions of water from the Delaware River Basin and provided for releases of water from three New York City reservoirs—Pepacton, Cannonsville, and Neversink—to the upper Delaware River. The Decree stipulates that these diversions and releases are to be made under the supervision and direction of the Delaware River Master. The Decree also stipulates that reports on Delaware River operations be made to the Court not less frequently than annually. This report documents operations from December 1, 2008, to November 30, 2009, or the 2009 River Master report year. This report also presents information on the quality of water in the Delaware Estuary during the report year.

Some hydrologic data presented in this report are records of streamflow and water quality for U.S. Geological Survey (USGS) data-collection stations. These records were collected, computed, and furnished by the offices of the USGS at Troy, New York; Exton and New Cumberland, Pennsylvania; and Lawrenceville, New Jersey, in cooperation with the States of New York and New Jersey, the Commonwealth of Pennsylvania, and the City of New York. The locations of major streams and reservoirs, and selected streamflow-gaging stations in the Delaware River Basin, are shown in figure 1.

Acknowledgments

The River Master's daily operation records were prepared from hydrologic data collected chiefly on a day-to-day basis. Data for these records were collected and computed by the Office of the Delaware River Master or were furnished by the following agencies and utilities: Data for Pepacton, Cannonsville, and Neversink Reservoirs by the New York City Department of Environmental Protection, Bureau of Water Supply; for Lake Wallenpaupack by the PPL Corporation; and for Rio Reservoir by Alliance Energy. Quantitative precipitation forecasts and some precipitation data (table 1[1]) were provided by the National Weather Service (NWS) office in Binghamton, New York.

Definition of Terms and Procedures

The following definitions apply to various terms and procedures used in the operations documented in this report. A table for converting inch-pound units to the International System of Units (SI) is given on page vi.

- **Balancing Adjustment**.—An operating procedure used by the River Master to correct for inaccuracies inherent in the design of releases from New York City reservoirs to meet the Montague flow objective. The balancing adjustment is computed as 10 percent of the difference between the cumulative adjusted directed release and the cumulative directed release required for exact forecasting. The balancing adjustment is applied to the following day's release design. The maximum daily balancing adjustment is intentionally limited to preclude unacceptably large variations in the adjusted flow objective.

- **Capacity**.—Total usable volume in a reservoir between the point of maximum depletion and the elevation of the lowest crest of the spillway.

- **Conservation releases**.—Controlled releases from Pepacton, Cannonsville, and Neversink Reservoirs designed to maintain specified minimum flows in stream channels immediately below the reservoirs (tailwaters). The conservation rates shown in table 2[1] are defined as follows:

  - **L1.—**Discharge Mitigation Releases are releases designed to help mitigate the effects of flooding immediately below the Delaware Basin Reservoirs. New York City shall make such controlled releases from the Delaware Basin Reservoirs in accordance with figures 1 and 2 and table 3 in the Flexible Flow Management Program (FFMP).

[1]All numbered tables in the section "Delaware River Operations" are grouped at the end of this section, beginning on page 25.

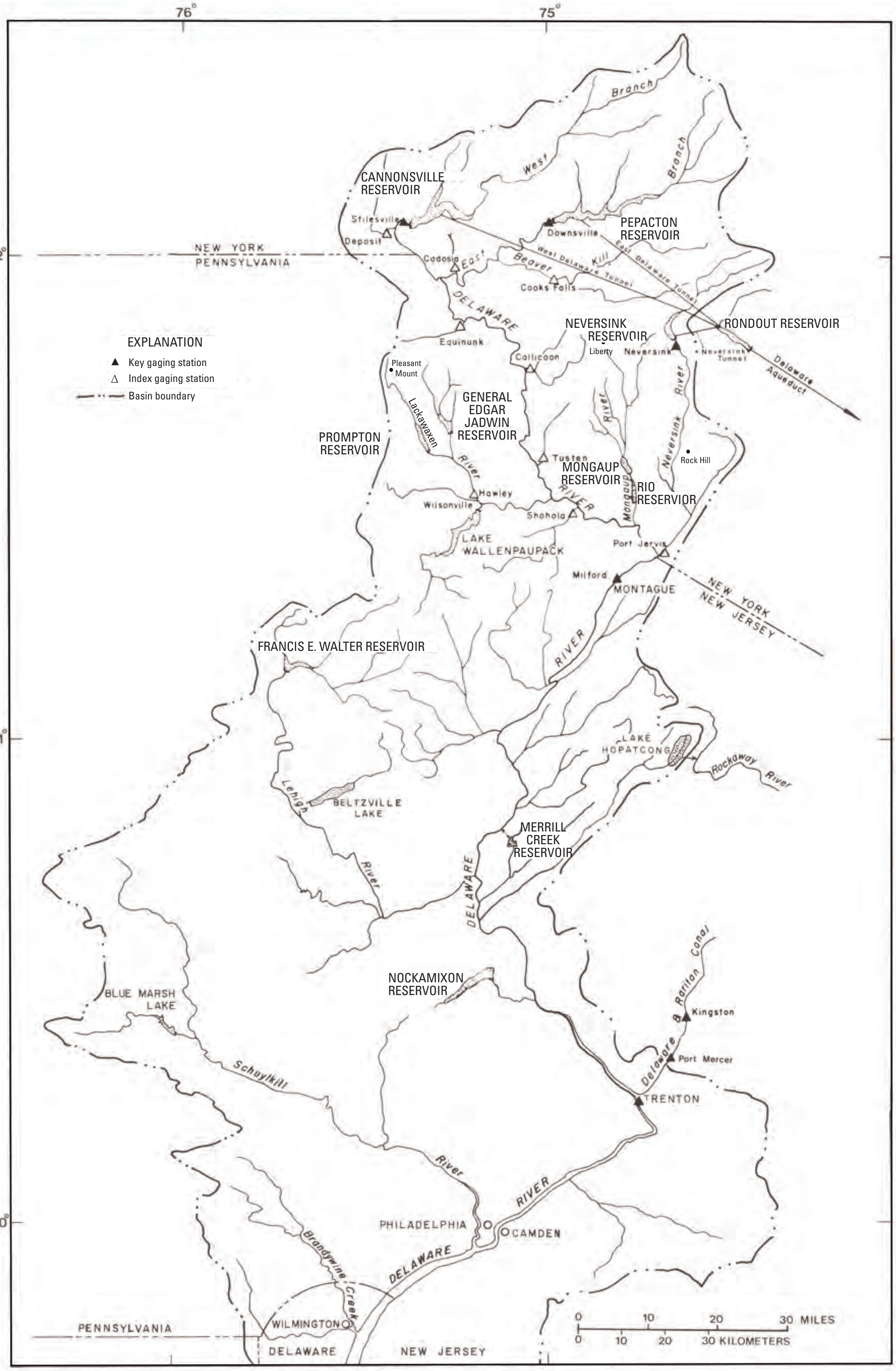


Figure 1. Delaware River Basin above Wilmington, Delaware.

- **Normal**.—Conservation releases when New York City combined reservoir storage is in the normal (L2) storage zone.
- **Watch**.—Conservation releases when New York City combined reservoir storage is in the drought watch (L3) storage zone.
- **Warning**.—Conservation releases when New York City combined reservoir storage is in the drought warning (L4) storage zone.
- **Drought.—**Conservation releases when New York City combined reservoir storage is in the drought (L5) storage zone (also referred to as Drought Emergency).

The combined storage zones for the New York City Delaware Basin reservoirs are shown in figure 2.

- **Directed releases**.—Controlled releases from New York City reservoirs in the upper Delaware River Basin, designed by the Delaware River Master to meet the Montague flow objective.
- **Diversions**.—The out-of-basin transfer of water by New York City from Pepacton, Cannonsville, and Neversink Reservoirs in the upper Delaware River Basin through the East Delaware, West Delaware, and Neversink Tunnels, respectively, to the City's water-supply system. Also, the out-of-basin transfer of water by New Jersey from the Delaware River through the Delaware and Raritan Canal.

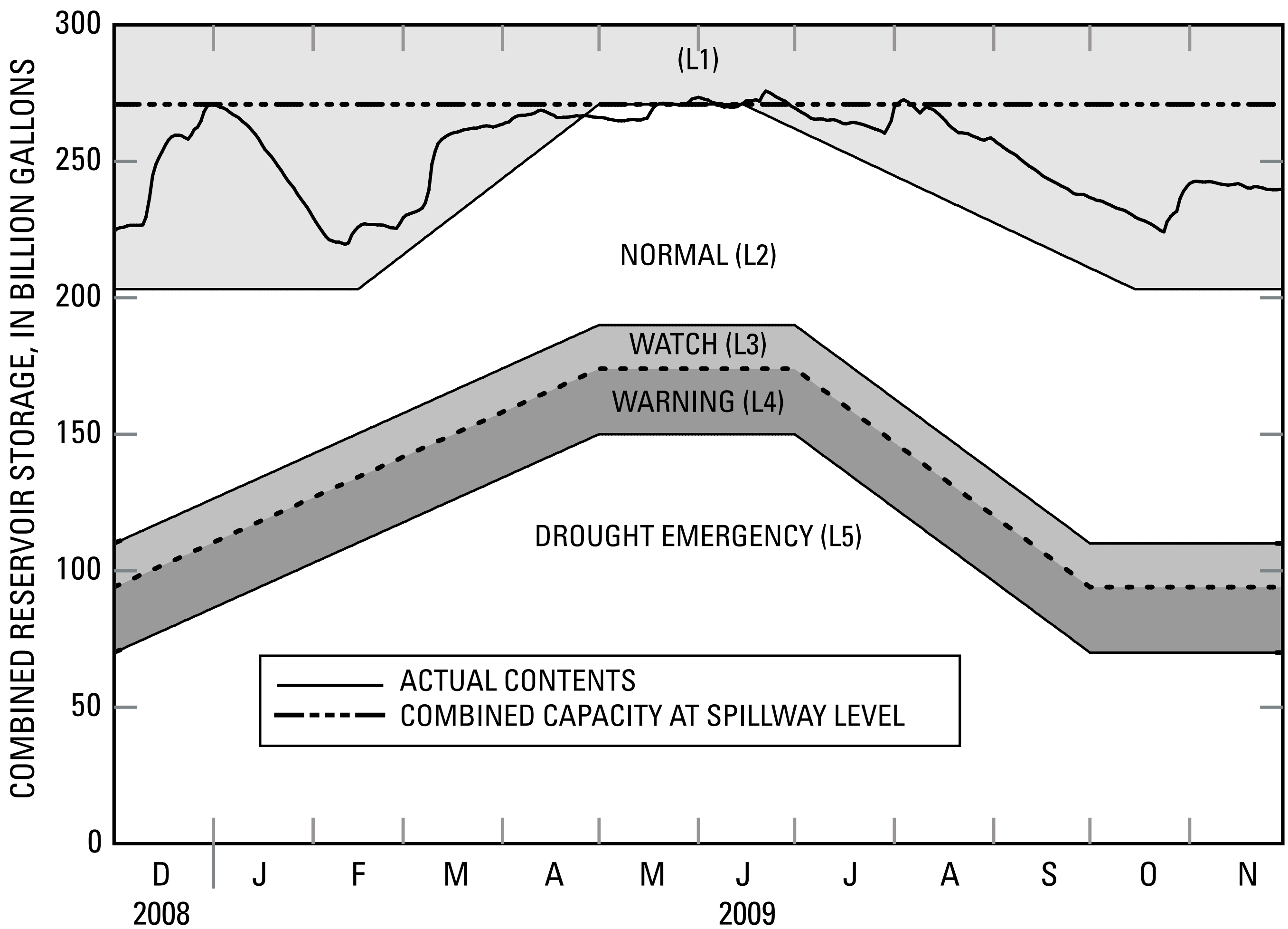


Figure 2. Operation curves and actual contents for New York City reservoirs in the Delaware River Basin, December 1, 2008, to November 30, 2009.

- **Excess quantity**.—As defined by the Decree, the excess quantity of water is equal to 83 percent of the amount by which the estimated consumption by New York City during the year is less than the City's estimate of continuous safe yield [1,665 million gallons per day (Mgal/d) stipulated by the 1954 Decree] from all its sources of supply obtainable without pumping, except that the excess quantity shall not exceed 70 Bgal. Each year, the seasonal period for release of the excess quantity begins on June 15.

- **Flexible Flow Management Program.**—A set of rules for the management of storage, diversions, releases, and flow targets relating to the apportioning of water from the Delaware River Basin under the 1954 U.S. Supreme Court Degree. The Flexible Flow Management Program (FFMP) replaced the interim fishery releases program (Delaware River Basin Commission [DRBC] Docket D-77-20 CP [Revision 7]) and the temporary spill mitigation program (DRBC Docket D-77-20 CP [Revision 9]). The FFMP also modified certain provisions of the DRBC Water Code relating to the Montague, New Jersey flow target and the New Jersey diversion during DRBC drought operations.

- **Index gaging stations**.—Specific sites on tributaries of the upper Delaware River where systematic observations of gage height and discharge are made. These stations are used mainly during the directed-releases season to help estimate inflows of surface water to the upper Delaware River.

- **Interim Excess Release Quantity**.**—**For an interim period from October 1, 2007, to May 31, 2011, an Interim Excess Release Quantity (IERQ) shall be applicable. The IERQ is computed as 83 percent of the difference between the highest year's consumption of the New York City water-supply system during the period 2002–2006—1,257 Mgal/d—and New York City's current estimate of continuous safe yield of the New York City water-supply system of 1,290 Mgal/d, obtainable without pumping. During the 2009 report year, the IERQ was available for release 15,468 cubic feet per second-days (cfs-days). New York City shall release the IERQ provided for above at rates designed to increase the flow at Montague from 1,750 ft^3/s to 1,850 ft^3/s for the period commencing on June 15 and continuing through September 15, and to maintain a flow at Trenton of 3,000 ft^3/s during basin-wide normal conditions for the period commencing on June 15 and continuing through March 15, referred to as the "seasonal-period." The IERQ required to be released in any seasonal period shall in no event exceed 70 billion gallons.

- **Interim excess release quantity extraordinary needs bank**—In addition to the hydrologic criteria described in Section 2.5.6 A. of the Delaware River Basin Water Code and subject to other provisional uses of the IERQ as provided herein, including Section 6.b, the Decree Parties, the DRBC, and the Delaware River Master may at any time review extraordinary water needs to support such research, aquatic life, or other water-use activity as may be approved by the DRBC. Upon unaimous agreement, the Decree Parties may bank all or a portion of the IERQ remaining at such time, and such portion shall be placed in an "IERQ Extraordinary Needs Bank" and used to provide for such extraordinary water needs. Such banked quantity shall be deducted from the IERQ.

- **Key gaging stations**.—Specific sites on the East Branch Delaware River, West Branch Delaware River, Neversink River, Delaware and Raritan Canal, and mainstem Delaware River where continuous, systematic observations of gage height and discharge are made. These stations are used on a year-round basis in River Master operations.

- **Maximum reservoir depletion**.—The minimum water-surface level or elevation below where a reservoir ceases to continue making delivery of quantities of water for all purposes for which the reservoir was designed. This also is referred to as minimum full-operating level.

- **Rate of flow**.—Mean discharge for a specified 24-hour period, in cubic feet per second or million gallons per day.
- **Rate of flow at Montague**.—Daily mean discharge of the Delaware River at Montague, New Jersey, computed on a calendar-day basis.
- **Reservoir-controlled releases**.—Controlled releases from reservoirs passed through outlet valves in the dams or through turbines in powerplants. These releases do not include spillway overflow at the reservoirs.
- **Salt Front**.—The salt front is defined as the 250 parts-per-million isochlor, or line of equal chloride concentration, in the Delaware Estuary. One part per million is one part of solute (in this case, chloride) per one million parts solvent (river water). The 7-day average location of the salt front is used as an indicator of salinity intrusion in the Delaware Estuary.
- **Storage or contents**.—Usable volume of water in a reservoir. Unless otherwise indicated, volume is computed on the basis of level pool and above the point of maximum depletion.
- **Time of day**.—Time of day is expressed in 24-hour Eastern Standard Time, which during the report year included a 23-hour day on March 8 and a 25-hour day on November 1.
- **Uncontrolled runoff at Montague**.—Runoff from the 3,480-square-mile (mi^2) drainage area above Montague, New Jersey, excluding the drainage area above Pepacton, Cannonsville, Neversink, Wallenpaupack, and Rio Dams, but including spillway overflow at these dams.

Precipitation

Precipitation in the Delaware River Basin above Montague, New Jersey, totaled 50.89 in. during the 2009 report year and was 116 percent of the long-term (68-year) average. Monthly precipitation ranged from 43 percent of the long-term average in November 2009 to 181 percent of the long-term average in December 2008 and August 2009. Data on monthly precipitation during the report year and long-term average precipitation are presented in table 1. These data were computed from records for 10 geographically distributed stations operated by the NWS; the New York City Department of Environmental Protection, Bureau of Water Supply; and the USGS River Master office.

The seasonal period from December to May typically is when surface-water and groundwater reservoirs refill. During this period in 2008–2009, total precipitation was 21.62 in., which is 106 percent of the 68-year average. During June to November, total precipitation was 29.27 in., which is 124 percent of the long-term average. The maximum monthly precipitation was 9.62 in. in August 2009, measured at Liberty, New York; the minimum monthly precipitation was 1.51 in. in February 2009, measured at Downsville, New York (locations shown on fig. 1).

Operations

December to May

Operations on December 1, 2008, were conducted as described by the FFMP (two different FFMPs were in place during this period), whereby the Decree Parties shall manage diversions and releases under the Decree. The Montague flow objective was 1,750 ft^3/s (on June 1, 2009 [Appendix A], the 1,850 ft^3/s target was eliminated from use), and the allowable diversions to New York City and New Jersey were 800 Mgal/d and 100 Mgal/d, respectively. Conservation releases from New York City reservoirs were made at the rates shown in table 2, which are incorporated in the FFMP.

From December 2008 to May 2009, the first half of the report year, total precipitation was 1.22 in. above the long-term average. Monthly precipitation ranged from 57 percent of the long-term average in February 2009 to 181 percent in December 2008 (table 1). Runoff in the upper basin was normal in January, February, March, and May, above normal in December, and below normal in April.

On December 1, 2008, when the 2009 report year began, Pepacton Reservoir contained 123.032 Bgal of water in storage above the point of maximum depletion, or 87.8 percent of the 140.190 Bgal storage capacity. Cannonsville Reservoir contained 71.345 Bgal, or 74.5 percent of the 95.706 Bgal storage capacity. Neversink Reservoir contained 29.932 Bgal, or 85.7 percent of the 34.941 Bgal storage capacity. Combined storage in these reservoirs on December 1, 2008, was 224.309 Bgal, or 82.8 percent of combined capacity. Daily storage in Pepacton, Cannonsville, and Neversink Reservoirs is given in tables 3, 4, and 5, respectively, and combined storage during the report year is shown in figure 2.

From December to May, inflow to the City's reserviors typically exceeds outflow and, consequently, storage increases. The long-term average inflow to Pepacton, Cannonsville, and Neversink Reserviors for this 6-month period, computed on the basis of the 68-year period from December 1940 to May 2008, was 304.0 Bgal. During the corresponding 6 months of the report year, inflow to the three reservoirs totaled 286.1 Bgal. Evaporation loss is not included in the computations.

Combined storage increased steadily from December 2008, when the reservoirs filled. Combined storage decreased modestly in the winter, but remained above normal. The combined storage of the reservoirs was about 101 percent of usable capacity on May 31, 2009.

Combined storage in the three New York City reservoirs was 223.733 Bgal on November 30, 2008, and 273.211 Bgal on May 31, 2009, a net increase of 49.478 Bgal or 18.3 percent of total capacity. The maximum combined storage during the December to May period was 273.211 Bgal on May 31, 2009. Maximum storage in Pepacton Reservoir during the December to May period was 141.116 Bgal on December 31, 2008; maximum storage in Cannonsville Reservoir was 98.072 Bgal on March 12, 2009; and maximum storage in Neversink Reservoir was 35.155 Bgal on May 18, 2009. Pepacton Reservoir spilled from December 29, 2008, to January 3, 2009, and May 18–31, 2009. Cannonsville Reservoir spilled from March 10–20, March 25–28, April 1–7, April 11–14, and May 19–31, 2009. Neversink Reservoir spilled on December 29, 2008, and May 17 and 18, 2009. The combined spill volume from the three reservoirs during this period was 11.797 Bgal.

During the December to May period, diversions to Rondout Reservoir by New York City totaled 91.195 Bgal (501 Mgal/d). The forecasted discharge at Montague, exclusive of water released from the City reservoirs, was greater than the flow objective on all days in the period, and no releases were directed. The observed daily mean discharge at Montague was greater than the applicable flow objective on all days. Applicable design rates for the USGS gaging station Delaware River at Montague, New Jersey, are presented in table 6.

June to November

Monthly precipitation for the June to November period was above the long-term average in June, July, August, and October, and below the long-term average in September and November. Total precipitation during the period was 29.27 in. or 5.72 in. more than the 68-year average (table 1).

Combined storage in the three New York City reservoirs was 273.409 Bgal on June 1, 2009, and 239.847 Bgal on November 30, 2009, a net decrease of 33.562 Bgal or about 12.4 percent of total capacity. During the June to November 2009 period, maximum storage in Pepacton Reservoir was 142.304 Bgal on June 22; 98.217 Bgal in Cannonsville Reservoir on June 23; and 35.409 Bgal in Neversink Reservoir on June 19. Maximum combined storage in the three reservoirs was 275.711 Bgal on June 22, 2009. Pepacton Reservoir spilled from June 1–6, June 16–30, and August 4 and 5. Cannonsville Reservoir spilled from June 1–30, July 30 to August 7, and August 10–4, 2009. Neversink Reservoir spilled from June 17–26, and July 31 to August 4, 2009. The combined spill volume from the three reservoirs during this period was 29.360 Bgal.

Releases were directed to meet the Montague flow objective on 25 days between June 1, 2009, and November 30, 2009, when the forecasted discharge at Montague, exclusive of water released from the New York City reservoirs, was less than the flow objective. Releases at rates designed to protect the tailwaters fishery and aquatic habitat were made at other times during the period.

From June 1, 2009 to June 14, 2009, the Montague flow objective was 1,750 ft^3/s. The forecasted flow, exclusive of releases from Pepacton, Cannonsville, and Neversink Reservoirs, did not decline below the flow objective and no releases were directed. The observed flow was greater than the Montague flow objective on all days in this period.

The New York City Department of Environmental Protection, Bureau of Water Supply, provided the River Master with the following data for the 2009 calendar year, as stipulated by the FFMP. The FFMP can be accessed at *http://water.usgs.gov/osw/odrm/*.

1. The estimated continuous safe yield from all the City's sources, obtainable without pumping, is 1,290 Mgal/d, or a total during calendar year 2009 of 1.290 Bgal/d x 365 days = 470.850 Bgal.
2. The estimated consumption that the City must provide for, from all its sources of supply during calendar year 2009, is 458.805 Bgal.

On the basis of the FFMP and the above-noted values, the aggregate quantity of the Interim Excess Release Quantity (IERQ) was 83 percent of (470.850 - 458.805), or 9.997 Bgal.

Data on water consumption by the City of New York for each calendar year since 1950, from all sources of supply, are presented in table 7.

Effective June 1, 2009, the Decree Parties agreed to ramp discharge-mitigation release rates over a period of 3 days at Cannonsville and Pepacton Reservoirs and 2 days at Neversink Reservoir. Section 17 of the FFMP states that modifications to releases not to exceed 7 consecutive days for purposes of maintenance or repair of immediate necessity, or modifications to avoid unreasonable sub-daily fluctuations in releases, shall not require Decree Party approval, but shall be done in cooperation with NYSDEC, provided, however, that releases shall be sufficient to meet the Montague flow objective in effect at the time.

On June 15, 2009, the beginning of the seasonal IERQ period, the Montague flow objective remained at 1,750 ft^3/s. Storage in the New York City reservoirs remained high in early summer, and declined seasonally until mid-October.

In order to more effectively use the IREQ in 2009, the Decree Parties agreed to a temporary program to increase the summertime releases from Cannonsville Reservoir. This agreement is presented in Appendix A. In addition, in Appendix B the Decree Paries agreed to revised the language in the FFMP to address storage zone bouncing.

Effective September 1, 2009, the Decree Parties approved a temporary supplemental releases program for the Rondout West Branch Tunnel Shutdown. This agreement is presented in Appendix C.

From June 15 to November 30, 2009, the forecasted flow at Montague, exclusive of releases from the New York City reservoirs, was less than the flow objective on 25 days and releases were directed by the River Master. On 6 days during the June 15, 2009, to November 30, 2009 period, the observed flow was less than the flow objective. However, all the observed flows were within 10 percent of the flow objective.

The total discharge observed at Montague, the portion derived from uncontrolled runoff from the drainage area below the reservoirs, the portion contributed by power reservoirs, and the portion contributed by Pepacton, Cannonsville, and Neversink Reservoirs during September and October 2009 are shown in figure 3. In developing the water budget for Montague, uncontrolled runoff was computed as the residual of observed flow minus releases and spills from all reservoirs, and, consequently, was subject to errors in observations, transit times, and routing of the various components of flow. The conservation release from Rio Reservoir is included in the uncontrolled runoff component. The net effect of these uncertainties is incorporated in the computation of uncontrolled runoff. From June 1 to November 30, 2009, diversions from the three New York City Delaware Basin reservoirs to Rondout Reservoir totaled 88.662 Bgal.

Summary of Operations

From December 1, 2008, to November 30, 2009, diversions from the three New York City reservoirs in the upper Delaware River Basin to Rondout Reservoir totaled 179.858 Bgal, and all releases from the three reservoirs to the Delaware River totaled 262.10 Bgal. The River Master directed releases to the Delaware River from these reservoirs that totaled 9.062 Bgal.

During the year, maximum storage in Pepacton Reservoir was 142.304 Bgal (101.5 percent of capacity) on June 22, 2009; 98.217 Bgal (102.6 percent of capacity) in Cannonsville Reservoir on June 23, 2009; and 35.409 Bgal (101.3 percent of capacity) in Neversink Reservoir on June 19, 2009. Maximum combined storage in the three reservoirs was 275.711 Bgal (101.8 percent of combined capacity) on June 22, 2009. The combined spill volume from the three reservoirs for the report year was 41.157 Bgal.

During the report year, minimum storage in Pepacton Reservoir was 114.346 Bgal (81.6 percent of capacity) on October 24, 2009; 71.345 Bgal (74.5 percent of capacity) in Cannonsville Reservoir on December 1, 2008; and 25.458 Bgal (72.9 percent of capacity) in Neversink Reservoir on February 25,

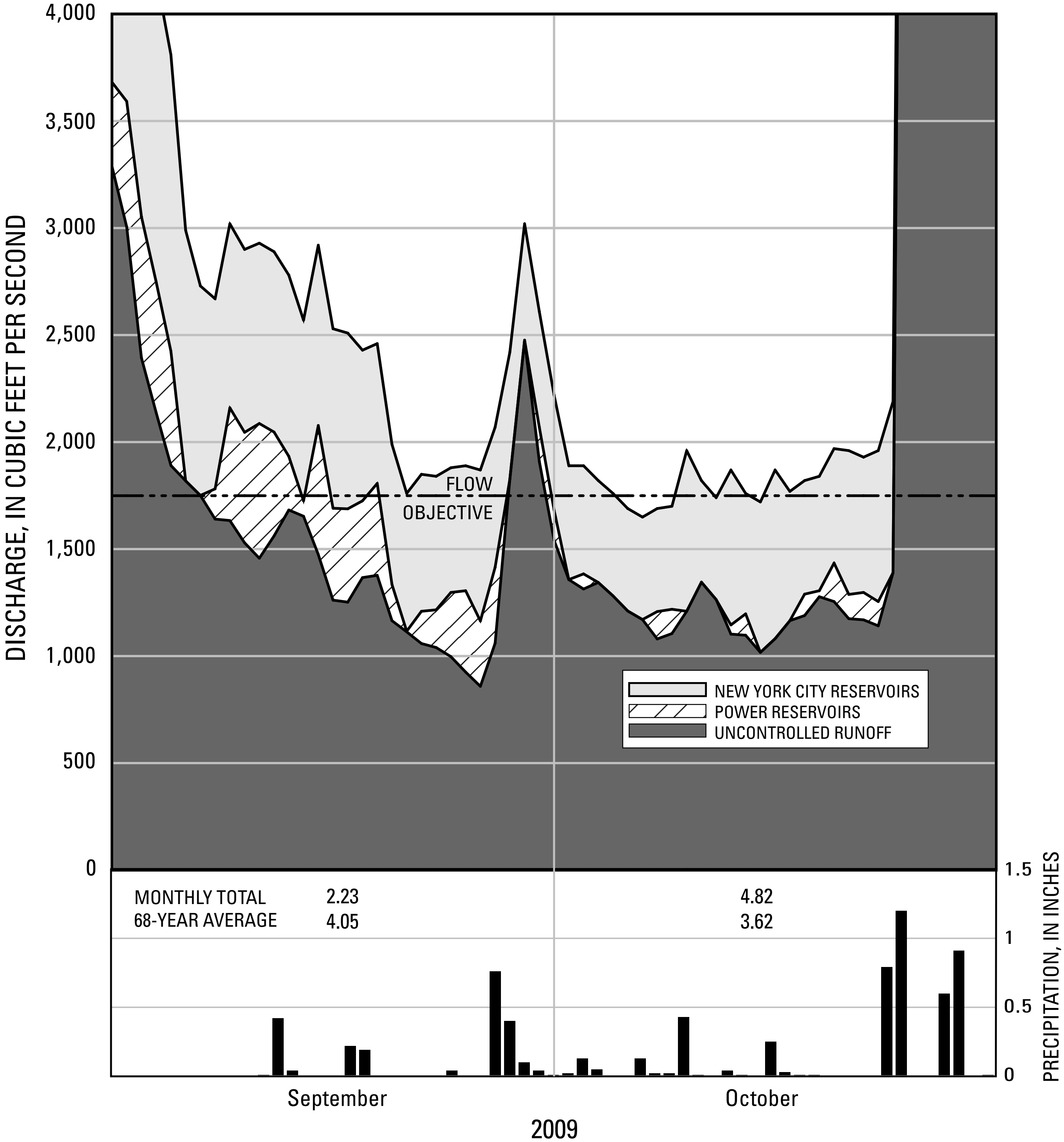


Figure 3. Components of flow, Delaware River at Montague, New Jersey, September and October 2009.

2009. Minimum combined storage in the three reservoirs was 219.506 Bgal (81.0 percent of combined capacity) on February 11, 2009.

On November 30, 2009, the end of the report year, combined storage in the three reservoirs was 239.847 Bgal or 88.6 percent of combined capacity. From December 1, 2008, to November 30, 2009, the net change in combined storage was +16.114 Bgal, or an increase equivalent to 5.9 percent of combined capacity.

Combined storage for the three reservoirs on the first day of the month was above the median in every month from December to April and from June to November, and was below the median in May (fig. 4).

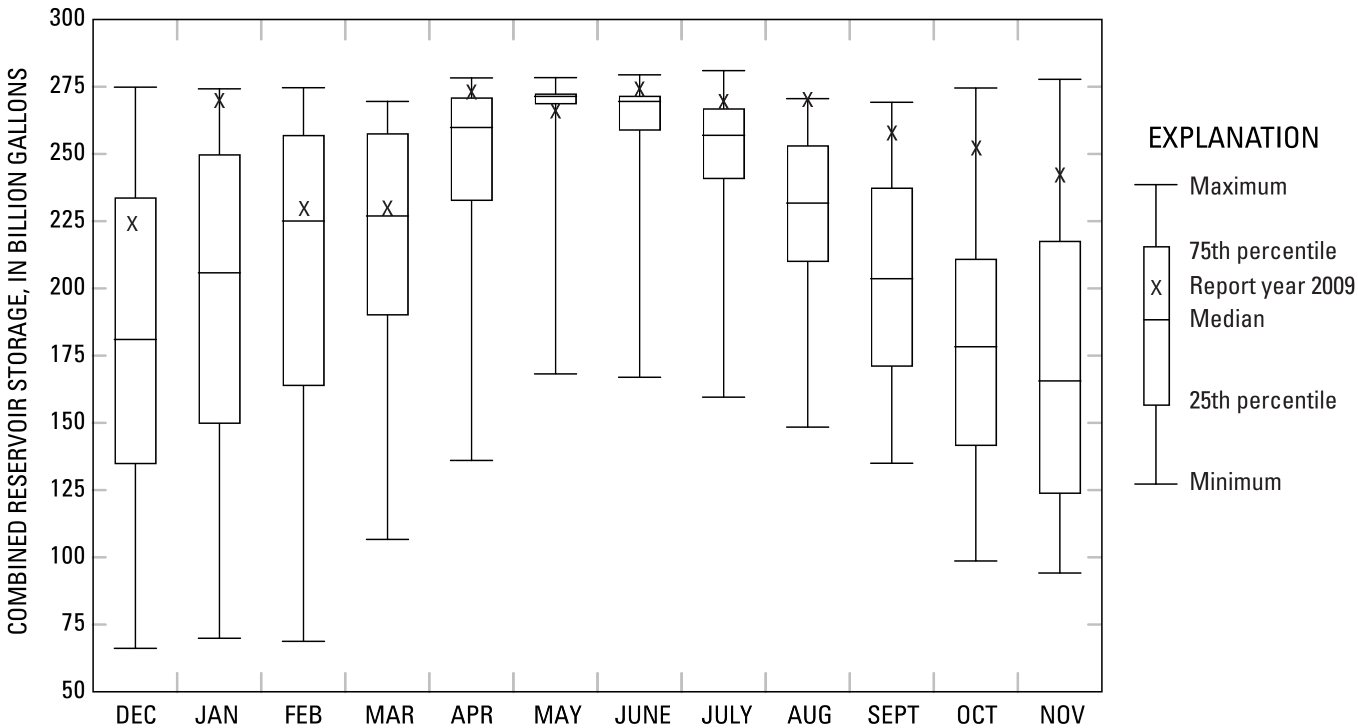


Figure 4. Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs on the first day of the month, December 2008 to November 2009 (this report year), and summary statistics for the reference period, June 1967 to November 2008.

Streamflow

Components of Flow, Delaware River at Montague, New Jersey

The data and computations of the various components of flow form the basic operational records used by the River Master to carry out specific responsibilities related to the Montague formula. The operational record has two parts: forecasted flow at Montague, exclusive of controlled releases from New York City's reservoirs (table 8), and segregation of components of daily mean flow at Montague (table 9).

The following components may be present in the flow of the Delaware River at Montague:

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

The releases from New York City's reservoirs necessary to meet the Montague flow objective were computed on the basis of the forecasted flow at Montague, exclusive of controlled releases from these reservoirs.

Time of Travel

Following are average times for the effective travel of water from the various sources of controlled supply to Montague, New Jersey. These times were used for flow routing during the 2009 report year.

Source	Travel time, in hours
Pepacton Reservoir	60
Cannonsville Reservoir	48
Neversink Reservoir	33
Lake Wallenpaupack	16
Rio Reservoir	8

Travel times were computed from reservoir and powerplant operations data and historical streamflow records. The travel times generally are suitable for use in the operations of the River Master. Occasionally, however, significant exceptions are observed. For example, when a large release from Cannonsville Reservoir follows a small release, a substantial portion of the water fills the channel en route, and the remainder may arrive at Montague as much as 66 hours after the time of release. During winter, the formation of ice, together with lower streamflow, gradually increases the resistance to water flow, resulting in increased travel times. Because ice-affected travel times increase gradually over several days, and releases were not directed to meet the Montague flow objective during periods of ice, no adjustments were made to compensate for increased travel times during these periods of the report year.

Segregation of Flow at Montague

The River Master daily operations record of reservoir releases and segregation of the various components contributing to the flow of the Delaware River at Montague, New Jersey, are presented in table 9. The data are arranged to conform to the downstream movement of water from the various sources to Montague. Summation of data across individual rows in the table is equivalent to routing the various flow contributions to Montague, using the above-noted average travel times. Uncontrolled runoff was computed as a residual by subtracting the flow contributions of all other sources from the observed discharge at Montague.

Computation of Directed Releases

During the report year, the River Master used the following information for daily operations: (1) discharges computed from recorded or reported stream gage heights, for various 24-hour periods, absent real-time information on any changes in stage-discharge relations; (2) daily discharge from New York City's three Delaware Basin reservoirs, measured with venturi meters; (3) precipitation reports for the previous 24 hours; (4) actual powerplant releases converted to daily discharges; (5) advance estimates of power demand converted to daily discharges; (6) advance estimates of uncontrolled runoff at Montague; and (7) average travel times for routing water from various sources. Although uncertainty is inherent in the advance estimates, this information is used by necessity in the daily design and direction of reservoir releases.

The 60-hour travel time of water from Pepacton Reservoir to Montague is greater than the travel time of water from any other reservoir in the upper Delaware River Basin. Releases from Cannonsville and Neversink Reservoirs were timed to arrive at Montague concurrently with releases from Pepacton Reservoir. To allow for differences in travel times, daily directed releases were scheduled to begin from Pepacton Reservoir at 1200 hours, from Cannonsville Reservoir at 2400 hours, and from Neversink Reservoir at 1500 hours the following day.

Releases from the City's reservoirs required to meet the Montague flow objective were computed from forecasts of releases from Lake Wallenpaupack and Rio Reservoir, and estimates of uncontrolled runoff at Montague. To account for the travel times from these sources to Montague, the computation requires estimates of the following components of flow two or more days in advance: (1) releases from Lake Wallenpaupack; (2) releases from Rio Reservoir; and (3) uncontrolled runoff from the drainage area upstream of Montague. The River Master operations record for computing daily directed release requirements during periods of low flow is given in table 8.

The electric utilities furnished forecasts of power generation and releases. Because the hydroelectric plants were used chiefly for area regulation or meeting peak power demands, the forecasts were subject to various modifying factors including the vagaries of weather on electricity demand. In addition, because the power companies are members of regional transmission organizations, demand for power outside of the local service area may unexpectedly affect generation schedules. Consequently, at times, the actual use of water for power generation differs considerably from the forecasts used in the design of reservoir releases.

For computational purposes during periods of low flow, estimates of uncontrolled runoff at Montague were treated as two components: (1) current runoff and (2) forecasted increase in runoff from precipitation. Estimates of these components are given in table 8.

During ice-free conditions, an estimation of uncontrolled runoff was computed using a routing and recession procedure based on discharges at 0800 hours at the following USGS gaging stations:

Station Name	Drainage Area (mi^2)
Beaver Kill at Cooks Falls, New York	241
Oquaga Creek at Deposit, New York	67.6
Equinunk Creek at Equinunk, Pennsylvania	56.3
Callicoon Creek at Callicoon, New York	110
Tenmile River at Tusten, New York	45.6
Lackawaxen River at Hawley, Pennsylvania	290
Shohola Creek near Shohola, Pennsylvania	83.6
Neversink River at Port Jervis, New York	336

During winter, the advance estimate of uncontrolled runoff (current conditions) was made on the basis of observed flows at a reduced network of gaging stations and the recession curve for computed uncontrolled flow at Montague.

The forecasted runoff from precipitation is shown in table 8 under the heading “Weather Adjustment.” Throughout the year, the NWS office in Binghamton, New York, furnished quantitative forecasts of average precipitation and air temperatures for the 3,480 mi^2 drainage basin upstream of Montague, New Jersey. During winter, runoff was estimated on the basis of the current status of snow and ice, along with forecasted precipitation and temperature. During other periods, forecasted precipitation was used to estimate runoff.

The forecasted flow at Montague, exclusive of releases from New York City’s Delaware Basin reservoirs (table 8), is computed as the sum of forecasted releases from power reservoirs, estimated uncontrolled runoff including conservation releases from Rio Reservoir, and weather adjustments. If the computed total flow is less than the flow objective at Montague, then the deficiency is made up by releases from the City’s reservoirs, as directed by the River Master.

When forecasts of precipitation or powerplant releases were revised appreciably after a release was directed, the release required from the City’s reservoirs was recomputed. Commonly, this procedure resulted in a reduced release requirement for New York City reservoirs for that day. Only final values for releases from New York City reservoirs are given in table 8.

Analysis of Forecasts

Forecasts of streamflow at Montague, developed on the basis of anticipated contributions from the components described previously but excluding releases from New York City’s reservoirs, differed on most days from observed flow. Occasionally, variations in the components were partially compensating and observed flows compared favorably with forecasted flows.

The forecasted flow of the Delaware River at Montague, exclusive of releases from the New York City Delaware Basin reservoirs, was less than the flow objective on most days from late September to October 2009. The following tabulation compares forecasted and actual hydroelectric power releases for the period from September 20 to October 24, 2009.

Releases and Runoff	Forecasted flow [(ft^3/s)-d]	Actual flow [(ft^3/s)-d]
Power releases		
Lake Wallenpaupack	1,019	1,247
Rio Reservoir	1,215	2,007
Runoff from uncontrolled area	47,715	43,719

For the September 20 to October 24, 2009, period shown in the tabulation above, actual releases from Lake Wallenpaupack and Rio Reservoir averaged 22.4 and 65.2 percent greater than forecasted releases, respectively. Observed runoff from the uncontrolled area was about 8.4 percent less than forecasted runoff.

On any given day, forecasted releases and actual releases can differ considerably. The ranges of actual daily releases from September 20 to October 24, 2009, are as follows: daily releases at Lake Wallenpaupack differed from forecasted releases by 56 ft^3/s less to 151 ft^3/s greater, and daily releases at Rio Reservoir differed from forecasted releases by 113 ft^3/s less to 160 ft^3/s greater. On the basis of observed flows at Montague, total directed releases from New York City's Delaware Basin reservoirs during the report year were about 10 percent less than required for exact forecasting.

Comparison of hydrographs of forecasted daily runoff and observed daily runoff from the uncontrolled area (fig. 5) indicates that the forecasts generally were suitable for use in designing releases from New York City's Delaware Basin reservoirs. Numerical adjustments to the designs were made when needed to compensate for errors in the forecasts, but, because of travel times, the effects of the adjustments on flows at Montague were not evident until several days after the design date.

Analysis of the precipitation forecasts shows that the total precipitation amount forecasted for the 3-day design periods is reasonably accurate, but often the actual timing of precipitation events may be earlier or later than forecasted. The accuracy of the runoff forecasts is affected greatly by the timing of precipitation events. In addition, if the actual storm track differs from the forecasted track, the amount and timing of runoff can be substantially different than forecasted.

Diversions to New York City Water Supply

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

Daily diversions during the report year from Pepacton, Cannonsville, and Neversink Reservoirs to the New York City water-supply system (Rondout Reservoir) are given in table 10. A running account of the average rates of combined diversions from the three reservoirs, computed as stipulated by the Decree, also is shown in table 10. The following tabulation shows allowable maximum diversion rates and average actual diversions for various periods during the report year.

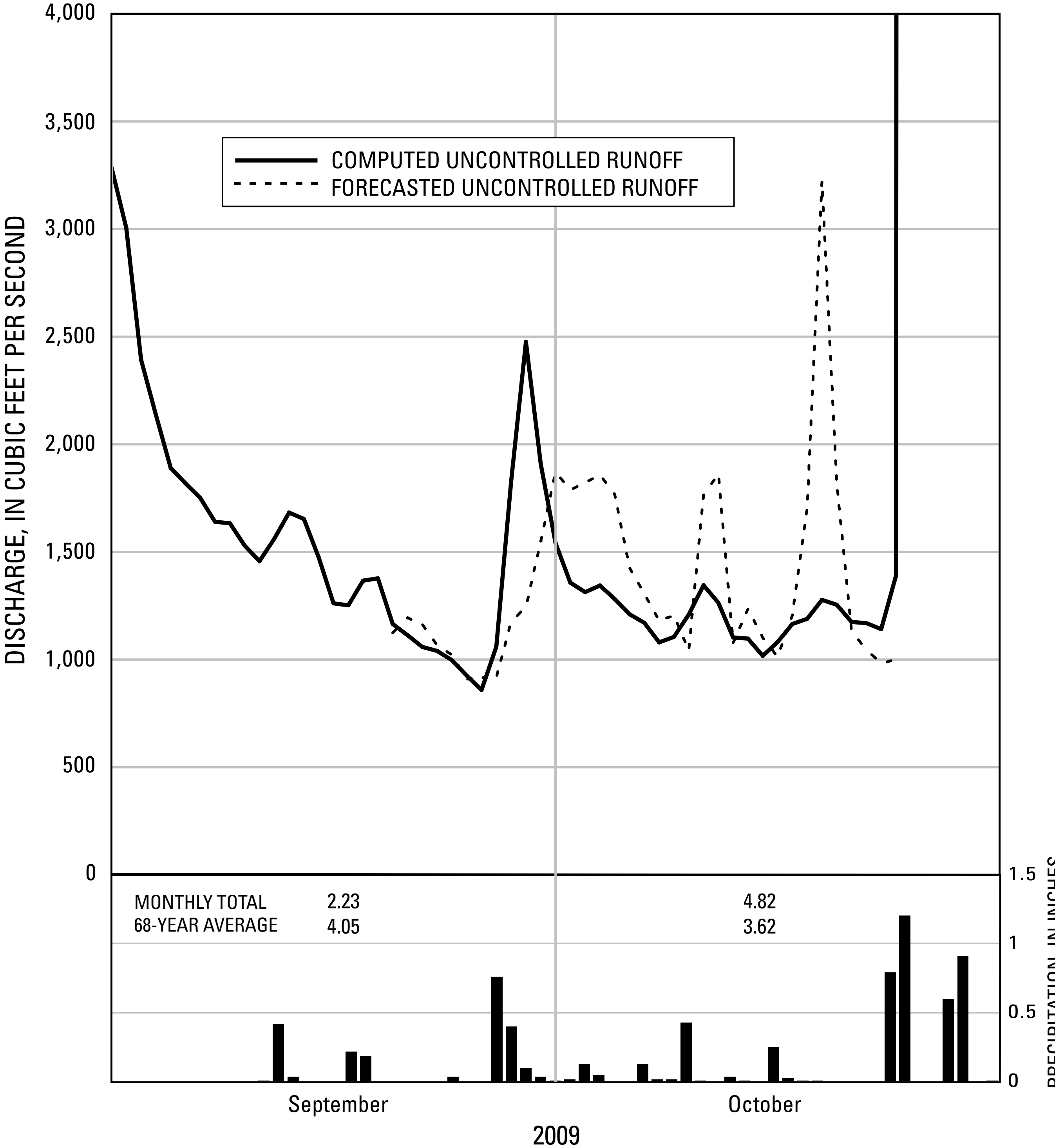


Figure 5. Uncontrolled runoff component, Delaware River at Montague, New Jersey, September 1 to October 31, 2009.

Effective dates	Allowable diversion (Mgal/d)	Average actual diversion (Mgal/d)
June 1, 2008, to May 31, 2009	800	498
June 1 to November 30, 2009	800	485

In accordance with the FFMP, New York City reduced its diversion by 35 Mgal/d and made this quantity of water available to supplement reservoir releases as established in the Tailwaters Habitat Protection and Discharge Mitigation Program (THPDMP). Despite this reduction, New York City did not exceed its allowable diversion.

During the report year, a total of 179.858 Bgal of water was diverted to the New York City water-supply system. The allowable diversion was 347.999 Bgal.

Storage in New York City Reservoirs

The following tabulation summarizes the "point of maximum depletion" and other pertinent levels and contents of Pepacton, Cannonsville, and Neversink Reservoirs. This information was provided by the New York City Board of Water Supply.

Level	Pepacton Reservoir		Cannonsville Reservoir		Neversink Reservoir	
	Elevation (ft)	Contents (Bgal)	Elevation (ft)	Contents (Bgal)	Elevation (ft)	Contents (Bgal)
Full pool or spillway crest	1,280.00	*140.190	1,150.00	*95.706	1,440.00	*34.941
Point of maximum depletion	1,152.00	*3.511	1,040.00	*1.020	1,319.00	*0.525
Sill of diversion tunnel	1,143.00	*4.200	+1,035.00	*1.564	1,314.00	
Sill of river outlet tunnel	1,126.50		1,020.50		1,314.00	
Dead storage		1.800		0.328		1.680

*Contents shown are quantities stored between listed elevations.

+Elevation of mouth of inlet channel of diversion works.

Daily storage in Pepacton, Cannonsville, and Neversink Reservoirs, above the "point of maximum depletion" or minimum full-operating level, is given in tables 3, 4, and 5, respectively. On December 1, 2008, combined storage in the three reservoirs was 224.309 Bgal, or 82.8 percent of combined capacity. Combined storage remained high throughout the year, and did not decline below 80 percent of combined capacity at any time. The three reservoirs spilled a total of 41.157 Bgal during the year. Combined storage reached a maximum for the report year on June 22, 2009, at 275.711 Bgal. Combined storage was 239.847 Bgal, or 88.6 percent of combined capacity, on November 30, 2009.

Comparison of River Master Operations Data With Other Streamflow Records

River Master operations are conducted on a day-to-day basis and, by necessity, use preliminary data on streamflow. In this section, records used in River Master operations are compared to final data published for selected USGS gaging stations. Data on releases were reported in million gallons per day and converted to cubic feet per second for use in the comparisons.

Releases from New York City Reservoirs

River Master operations data on controlled releases from Pepacton, Cannonsville, and Neversink Reservoirs to the Delaware River were furnished by the New York City Department of Environmental Protection. These data were obtained from calibrated instruments connected to venturi meters installed in the outlet conduits of the reservoirs.

The USGS gaging station on East Branch Delaware River at Downsville, New York, is 0.5 mile downstream from Downsville Dam (fig. 1). Discharge measured at this station includes releases from Pepacton Reservoir and a small amount of seepage and any runoff that enters the channel between the dam and the gaging station. The drainage area is 371 mi^2 at the dam and 372 mi^2 at the gaging station. The gaging stations are rated good, which means that about 95 percent of the daily mean discharges are within 10 percent of the true discharge. During the report year, the streamflow record at this gaging station was rated good to fair, which means that about 95 percent of the daily mean discharges are within 10-15 percent of the true discharge, respectively.

The following tabulation compares releases from Pepacton Reservoir (table 9), reported by New York City, to the final records for the USGS gaging station on East Branch Delaware River at Downsville, New York (table 11), for the flow objectives shown.

Flow objective (ft^3/s)	85	100	150	185	250	700
Number of USGS daily mean discharge values used in comparison	61	26	22	30	13	56
New York City-measured mean flow (ft^3/s)	85.1	100	150	186	251	701
USGS-computed mean flow (ft^3/s)	89.4	108	148	181	241	698
Percent difference	-4.8	-7.4	+1.4	+2.8	+4.1	+0.4

The differences at the 100-ft^3/s flow objective is less than 8 percent. The differences at the other flow objectives shown are less than 5 percent. The instruments connected to the venturi meters were recalibrated periodically by New York City to improve the accuracy of the recorded flow data.

The USGS gaging station on West Branch Delaware River at Stilesville, New York, is 1.4 mi downstream from Cannonsville Dam (fig. 1). Discharge measured at this station includes releases from Cannonsville Reservoir and runoff from 2 mi^2 of drainage area between the dam and the gaging station. The drainage area is 454 mi^2 at the dam and 456 mi^2 at the gaging station. The gaging-station records are rated fair at flows greater than 100 ft^3/s and poor at flows less than 100 ft^3/s. A rating of fair means that about 95 percent of the daily mean discharges are within 15 percent of true discharge, whereas a rating of poor means that daily mean discharges have less than fair accuracy. The records include runoff from the area between the dam and the gaging station, and seepage near the base of the dam.

The following tabulation compares releases from Cannonsville Reservoir (table 9), reported by New York City, to the final records for the USGS gaging station on West Branch Delaware River at Stilesville, New York (table 12), for the flow objectives shown. The differences at the three flow objectives shown are less than 8 percent.

Flow objective (ft^3/s)	110	190	250	350	470	1,500
Number of USGS daily mean discharge values used in comparison	17	17	25	19	16	59
New York City-measured mean flow (ft^3/s)	111	192	253	352	471	1,501
USGS-computed mean flow (ft^3/s)	117	190	273	341	471	1,480
Percent difference	-5.1	+1.1	-7.3	+3.2	0	+1.4

The USGS gaging station on Neversink River at Neversink, New York, is 1,650 ft downstream from Neversink Dam (fig. 1). Discharge measured at this station includes releases from Neversink Reservoir and, during storms, a small amount of runoff that originates between the dam and the gaging station. The drainage area is 92.5 mi^2 at the dam and 92.6 mi^2 at the gaging station. The gaging-stations records are rated good, which means that about 95 percent of the daily mean discharges are within 10 percent of the true discharge.

The following tabulation compares releases from Neversink Reservoir (table 9), reported by New York City, to the final records for the USGS gaging station on Neversink River at Neversink, New York (table 13), for the flow objectives shown.

Flow objective (ft^3/s)	60	65	75	110	125	190
Number of USGS daily mean discharge values used in comparison	46	84	28	37	37	43
New York City-measured mean flow (ft^3/s)	60.6	64.9	75.8	110	125	190
USGS-computed mean flow (ft^3/s)	63.2	64.5	80.9	111	119	191
Percent difference	-4.1	+0.6	-6.3	-0.9	+5.0	-0.5

The differences at the six flow objectives shown are less than 7 percent.

Delaware River at Montague, New Jersey

The River Master's operations record for the Delaware River at Montague, New Jersey (table 9), showed about 0.2 percent less discharge for the report year than the published USGS record for the gaging station (table 14). Daily values for the two records agreed closely, except during ice-affected periods.

Diversion Tunnels

Records of diversions through the East Delaware, West Delaware, and Neversink Tunnels (fig. 1) were furnished by the New York City Department of Environmental Protection. These records were obtained from the City's calibrated instruments connected to venturi meters installed in the tunnel conduits. The measured flows were transmitted electronically on a 15-second interval to a City computer and, on 5-minute intervals, release and diversion quantities for the preceding 5-minute period were computed using the instantaneous rate-of-flow data from each instrument. These 5-minute quantities were then summed to compute daily total flows, which were reported to the River Master's office on a daily basis. On a weekly basis, the diversion values were checked against the flow meter totalizer readings and corrected when necessary.

The East Delaware Tunnel is used to divert water from Pepacton Reservoir to Rondout Reservoir. Conditions in the outlet channel of the East Delaware Tunnel were unfavorable for discharge measurements during the report year because of high water levels in Rondout Reservoir.

The hydroelectric powerplant at the downstream end of the East Delaware Tunnel operated most days of the report year. When the powerplant was not in operation, some water leaked through the wicket gates and was not recorded on the totalizer. A current-meter measurement made in 1989 shows that the (assumed constant) rate of leakage is about 8.0 Mgal/d. Because the powerplant was not in operation for the equivalent of 83 days during the 2009 report year, the estimated quantity of unmeasured leakage was about 0.7 Bgal.

The West Delaware Tunnel is used to divert water from Cannonsville Reservoir to Rondout Reservoir. Inspections of the channel below the outlet, when valves were closed, revealed only negligible leakage. A hydroelectric powerplant uses water diverted through the West Delaware Tunnel, but the plant operates only when diversions are less than 300 Mgal/d. When the powerplant is not operating, the valves on the pipelines to the plant are closed, and there is no leakage through the system.

The Neversink Tunnel is used to divert water from Neversink Reservoir to Rondout Reservoir. A hydroelectric powerplant uses water diverted through the Neversink Tunnel. When the powerplant is not operating and the main valve on the diversion tunnel is open, leakage develops that is not recorded on the venturi instruments. One current-meter measurement made in 1999 showed a leakage rate of 16.2 ft^3/s (10.5 Mgal/d). When the powerplant is operating, the leakage is included in the recorded flow. No leakage occurs when the main valve on the tunnel is closed. During the 2009 report year, the powerplant operated part of the day on most days and was not operated the equivalent of 229 days. Using the leakage rate noted above and records of powerplant operation, about 2.4 Bgal of water was diverted but not recorded.

Diversions by New Jersey

The Amended Decree authorizes New Jersey to divert water from the Delaware River and its tributaries in New Jersey, to areas outside of the Delaware River Basin, without compensating releases. These diversions shall not exceed 100 Mgal/d as a monthly average, and the daily mean diversion shall not exceed 120 Mgal/d. The USGS gaging station on Delaware and Raritan Canal at Port Mercer, New Jersey (fig. 1), is used as the official control point for measuring these diversions by New Jersey (table 15).

The following tabulation shows the allowable diversion by New Jersey, the period it was in effect, and the maximum monthly diversion during the report year.

Effective dates	Allowable monthly average diversion (Mgal/d)	Maximum monthly average diversion (Mgal/d)	Month of maximum average diversion
December 1, 2008, to November 30, 2009	100	90.6	February

The maximum daily mean diversion was 103 Mgal on September 24, 2009. Diversions by New Jersey did not exceed the limits stipulated by the Decree.

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

From December 1, 2008, to November 30, 2009, operations of the Delaware River Master were conducted as stipulated by the Decree and the FFMP.

Diversions from the Delaware River Basin to the New York City water-supply system did not exceed those authorized by the Decree and FFMP. Under compensating releases of the Montague Formula, New York City released water from its reservoirs at rates designed by the River Master to meet the applicable flow objectives at Montague, New Jersey. During the report year, New York City complied fully with all directives and requests of the River Master.

Diversions from the Delaware River Basin by New Jersey were within limits stipulated by the Decree. New Jersey complied fully with all directives and requests of the River Master.

Table 1. Precipitation in the Delaware River Basin above Montague, New Jersey.
(Source: National Weather Service, New York City Department of Environmental Protection, and Office of the Delaware River Master)

[All values, except percentages, in inches]

Month	December 1940 to November 2008 Monthly Average	December 2008 to November 2009			
		Amount	Percent of average	Excess (+) or Deficit (-)	
				Month	Cumulative
December	3.41	6.17	181	+2.76	+2.76
January	3.05	2.91	95	-0.14	+2.62
February	2.65	1.51	57	-1.14	+1.48
March	3.38	2.53	75	-0.85	+0.63
April	3.78	2.36	62	-1.42	-0.79
May	4.13	6.14	149	+2.01	+1.22
June	4.09	7.08	173	+2.99	+4.21
July	4.10	6.49	158	+2.39	+6.60
August	3.89	7.03	181	+3.14	+9.74
September	4.05	2.23	55	-1.82	+7.92
October	3.62	4.82	133	+1.20	+9.12
November	3.80	1.62	43	-2.18	+6.94
12 months	43.95	50.89	116		

Table 2. Conservation release rates for New York City reservoirs in the Delaware River Basin.
(Source: Flexible Flow Management Program-Table 3 with 35 Mgal available; table in effect December 9, 2008, to November 20, 2009)

[All values in cubic feet per second]

Storage Zone	Winter		Spring	Summer			Fall	
	Dec 9– Mar 31	Apr 1– Apr 30	May 1– May31	Jun 1– Jun15	Jun 16– Jun 30	Jul 1– Aug 31	Sept 1– Sept 30	Oct 1– Nov 30
Cannonsville								
L1-a	1,500	1,500	*	*	1,500	1,500	1,500	1,500
L1-b	250	*	*	*	*	350	275	250
L1-c	110	110	225	275	275	275	140	110
L2	80	80	215	260	260	260	115	80
L3	70	70	100	175	175	175	95	70
L4	55	55	75	130	130	130	55	60
L5	50	50	50	120	120	120	50	50
Pepacton								
L1-a	700	700	*	*	700	700	700	700
L1-b	185	*	*	*	*	250	200	185
L1-c	85	85	120	150	150	150	100	85
L2	65	65	110	140	140	140	85	60
L3	55	55	80	100	100	100	55	55
L4	45	45	50	85	85	85	40	40
L5	40	40	40	80	80	80	30	30
Neversink								
L1-a	190	190	*	*	190	190	190	190
L1-b	100	*	*	*	*	125	85	95
L1-c	65	65	90	110	110	110	75	60
L2	45	45	85	100	100	100	70	45
L3	40	40	50	75	75	75	40	40
L4	35	35	40	60	60	60	30	30
L5	30	30	30	55	55	55	25	25

*Storage zone does not apply during this period. Releases made in accordance with zone L1-c rates.

Table 3. Storage in Pepacton Reservoir, New York, for year ending November 30, 2009.
(River Master daily operations record; gage reading at 0800 hours; data provided by New York City)

[Storage in millions of gallons above elevation 1,152.00 ft. Add 7,711 million gallons for total contents above sill of outlet tunnel, elevation 1,126.50 ft. Storage at spillway level is 140,190 million gallons; Mgal/d, million gallons per day; ft³/s, cubic feet per second]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	123,032	140,838	123,807	119,002	134,931	137,492	141,042	140,171	136,690	133,401	122,825	118,242
2	123,118	140,579	123,118	119,240	134,895	137,437	141,005	139,877	137,930	133,024	122,481	118,445
3	123,050	140,375	122,429	119,393	134,841	137,383	140,838	139,583	139,050	132,665	122,121	118,562
4	122,981	140,190	121,728	119,461	135,167	137,218	140,801	139,363	139,859	132,379	121,848	118,596
5	122,964	139,859	120,992	119,495	135,421	137,090	140,468	139,068	140,246	132,111	121,505	118,596
6	122,912	139,509	120,344	119,444	135,892	136,981	140,394	138,645	140,190	131,826	121,112	118,833
7	122,722	139,087	119,851	119,546	136,508	136,890	140,209	138,296	139,877	131,576	120,735	119,189
8	122,550	138,885	119,410	120,140	136,799	136,836	139,914	138,094	139,400	131,291	120,429	119,478
9	122,344	138,498	119,121	121,899	137,310	136,763	139,730	137,912	138,829	130,989	120,089	119,682
10	122,207	138,003	118,765	125,574	137,748	136,981	139,748	137,657	139,234	130,688	119,767	119,936
11	123,101	137,547	118,495	127,934	138,094	137,181	139,619	137,310	139,271	130,280	119,444	120,038
12	126,010	137,072	118,478	129,748	138,388	137,163	139,583	137,200	138,958	129,925	119,121	120,208
13	129,518	136,526	119,138	130,954	138,535	137,145	139,564	137,108	138,572	129,536	118,731	120,293
14	131,185	135,982	119,410	132,004	138,553	137,145	139,804	136,818	138,113	129,112	118,259	120,395
15	132,093	135,330	119,571	132,791	138,425	137,364	139,969	136,526	137,565	128,708	117,804	120,531
16	133,024	134,678	119,605	133,473	138,443	137,547	140,560	136,181	137,000	128,251	117,417	120,701
17	133,815	133,995	119,546	134,048	138,535	138,516	140,690	136,036	136,326	127,829	117,031	120,821
18	134,408	133,365	119,342	134,246	138,443	139,546	140,765	136,073	135,747	127,390	116,628	120,941
19	134,895	132,755	119,291	134,498	138,369	140,301	140,950	136,109	135,221	127,006	116,211	121,095
20	135,221	132,147	119,172	134,787	138,149	140,616	140,894	135,928	134,841	126,499	115,792	121,368
21	135,294	131,416	118,985	134,968	138,168	140,708	141,949	135,693	134,426	126,097	115,393	121,916
22	135,330	130,741	118,747	135,185	138,076	140,542	142,304	135,439	134,678	125,679	115,011	122,224
23	135,258	129,996	118,545	135,348	138,003	140,412	141,949	135,203	134,895	125,349	114,611	122,464
24	135,094	129,324	118,344	135,439	137,985	140,375	141,598	134,895	134,805	125,036	114,346	122,705
25	135,982	128,620	118,107	135,239	137,930	140,301	141,283	134,642	134,480	124,638	115,144	122,877
26	136,726	127,899	117,905	135,130	137,912	140,190	141,061	134,354	134,210	124,205	115,542	123,015
27	137,218	127,163	117,719	135,058	137,839	140,320	140,857	134,084	134,012	123,859	115,726	123,273
28	138,351	126,447	118,478	134,895	137,784	140,431	140,801	133,761	133,779	123,825	115,709	123,514
29	139,895	125,888		134,768	137,675	140,727	140,653	133,329	133,599	123,583	116,863	123,739
30	140,857	125,227		134,841	137,601	141,005	140,301	133,707	133,779	123,187	117,534	123,979
31	141,116	124,551		134,895		140,950		134,444	133,653		117,821	
Change	+18,308	-16,565	-6,073	+16,417	+2,706	+3,349	-649	-5,857	-791	-10,466	-5,366	+6,158
Equiv. Mgal/d	+590.6	-534.4	-216.9	+529.6	+90.2	+108.0	-21.6	-188.9	-25.5	-348.9	-173.1	+205.3
Equiv. ft³/s	+914	-827	-336	+819	+140	+167	-33.5	-292	-39.5	-540	-268	+318

Net change for year +1,171 Mgal — Net equivalent for year +3.2 Mgal/d — Net equivalent for year +5.0 ft³/s

Table 4. Storage in Cannonsville Reservoir, New York, for year ending November 30, 2009.
(River Master daily operations record; gage reading at 0800 hours; data provided by New York City)

[Storage in millions of gallons above elevation 1,040.00 ft. Add 2,584 million gallons for total contents above sill outlet tunnel, elevation 1,020.50 ft. Storage at spillway level is 95,706 million gallons; mgal/d, million gallons per day; ft³/s, cubic feet per second]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	71,345	95,250	77,973	84,386	95,523	94,854	97,766	95,676	97,750	91,538	84,270	92,953
2	72,073	95,204	77,269	85,167	95,931	94,763	97,589	95,371	98,023	91,051	84,270	93,136
3	72,510	95,143	76,495	85,586	96,140	94,641	97,347	95,037	97,782	90,610	84,256	93,044
4	72,841	95,022	75,707	85,904	96,301	94,459	97,202	94,885	97,669	90,153	84,256	92,816
5	73,463	94,763	74,892	86,250	96,285	94,291	97,025	94,748	96,752	89,712	84,256	92,512
6	74,008	94,459	74,464	86,814	96,124	94,139	96,864	94,474	96,285	89,317	84,241	92,147
7	74,436	94,139	74,423	87,392	95,883	94,018	96,736	94,535	95,819	88,906	84,227	91,766
8	74,837	93,926	74,492	88,450	95,645	93,896	96,607	94,839	95,326	88,465	84,140	91,294
9	75,210	93,653	74,699	90,868	95,463	93,744	96,591	95,158	94,778	87,999	84,010	90,792
10	75,707	93,181	74,920	95,660	95,219	93,622	96,607	95,280	95,554	87,594	84,010	90,229
11	77,158	92,770	74,947	97,315	95,478	93,501	96,591	95,204	96,382	87,219	83,966	89,773
12	79,535	92,253	75,583	98,072	96,028	93,577	96,559	95,250	96,414	86,886	83,807	89,469
13	82,912	91,644	77,614	97,959	96,301	93,653	96,559	95,387	96,269	86,539	83,692	89,165
14	84,892	91,112	78,885	97,573	96,237	93,744	96,736	95,371	95,980	86,193	83,518	89,089
15	86,207	90,488	79,921	97,218	95,819	93,942	96,913	95,082	95,584	85,817	83,345	89,073
16	87,406	89,408	80,695	96,864	95,234	93,911	96,929	94,961	95,128	85,427	83,302	89,043
17	88,632	88,556	81,163	96,494	94,641	94,291	96,687	94,900	94,596	85,340	83,273	88,784
18	89,743	87,883	81,438	96,317	94,094	94,991	96,398	95,006	94,002	85,253	83,215	88,389
19	90,290	87,219	81,741	96,060	94,079	95,523	96,269	95,250	93,546	85,152	83,143	87,999
20	90,473	86,583	81,987	95,883	94,322	95,980	95,963	95,250	93,242	85,022	82,984	87,797
21	90,397	85,860	82,059	95,645	94,352	96,301	97,058	95,189	92,710	84,892	82,839	87,826
22	90,123	85,181	82,203	95,447	94,626	96,494	98,168	95,082	92,375	84,733	82,622	87,652
23	89,667	84,501	82,276	95,326	94,869	96,527	98,217	94,976	91,964	84,559	82,435	87,450
24	89,286	83,750	82,290	95,098	95,082	96,607	97,798	94,824	91,690	84,429	82,463	87,204
25	89,636	83,013	82,203	95,569	95,158	96,607	97,299	94,672	91,462	84,241	84,328	86,929
26	90,640	82,232	82,232	95,851	95,234	96,527	97,009	94,565	91,279	84,024	85,586	86,756
27	91,020	81,423	82,232	95,963	95,265	96,639	96,848	94,398	91,127	83,981	86,424	86,496
28	91,933	80,778	83,157	95,819	95,234	96,881	96,559	94,200	90,975	84,010	87,060	86,221
29	93,333	80,101		95,478	95,067	97,074	96,253	93,957	90,929	84,270	89,697	86,091
30	94,368	79,341		95,295	94,976	97,637	95,899	94,687	91,309	84,270	91,370	85,831
31	95,022	78,678		95,387		97,798		95,851	91,629		92,375	
Change	+23,929	-16,344	+4,479	+12,230	-411	+2,822	-1,899	-48	-4,222	-7,359	+8,105	-6,544
Equiv. Mgal/d	+771.9	-527.2	+160.0	+394.5	-13.7	+91.0	-63.3	-1.5	-136.2	-245.3	+261.5	-218.1
Equiv. ft³/s	+1,194	-816	+247	+610	-21.2	+141	-97.9	-2.4	-211	-379	+404	-337

Net change for year +14,738 Mgal | Net equivalent for year +40.4 Mgal/d | Net equivalent for year +62.5 ft³/s

Table 5. Storage in Neversink Reservoir, New York, for year ending November 30, 2009.
(River Master daily operations record; gage reading at 0800 hours; data provided by New York City)

[Storage in millions of gallons above elevation 1,319.00 ft. Add 525 million gallons for total contents above sill of outlet tunnel, elevation 1,314.00 ft. Storage at spillway level is 34,941 million gallons; mgal/d, million gallons per day; ft³/s, cubic feet per second]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	29,932	34,749	27,705	25,837	33,120	33,669	34,601	33,746	35,384	32,981	29,665	30,630
2	30,123	34,635	27,240	25,934	33,297	33,732	34,577	33,543	35,185	32,829	29,509	30,854
3	30,200	34,325	26,919	25,699	33,456	33,765	34,483	33,341	35,185	32,733	29,387	31,058
4	30,046	34,379	26,634	25,737	34,155	33,809	34,384	33,129	35,100	32,615	29,432	31,229
5	29,851	34,448	26,541	25,766	34,596	33,853	34,253	32,885	34,917	32,396	29,455	31,327
6	29,634	34,077	26,536	25,834	34,670	33,876	34,116	32,723	34,695	32,377	29,279	31,429
7	29,419	33,925	26,541	25,892	34,528	33,983	33,969	32,538	34,443	32,354	29,146	31,565
8	29,190	33,761	26,541	26,064	34,483	34,121	33,809	32,505	34,296	32,330	29,044	31,648
9	28,955	33,770	26,566	26,697	34,399	34,281	33,485	32,524	34,145	32,108	28,920	31,691
10	28,747	33,365	26,329	27,762	34,272	34,487	33,591	32,538	34,199	31,915	28,826	31,738
11	29,360	33,374	26,064	28,285	34,135	34,640	33,649	32,543	34,199	31,691	28,848	31,780
12	30,975	33,360	26,039	28,800	34,008	34,523	33,761	32,628	34,086	31,537	28,861	31,822
13	32,297	33,072	26,186	29,114	33,838	34,389	33,872	32,723	34,121	31,546	28,716	31,864
14	32,691	32,781	26,257	29,338	33,674	34,248	34,121	32,767	34,062	31,537	28,592	31,915
15	32,924	32,486	26,313	29,536	33,664	34,238	34,394	32,771	34,013	31,332	28,451	32,009
16	33,264	32,150	26,351	29,737	33,659	34,272	34,744	32,738	33,872	31,169	28,324	32,075
17	33,558	31,832	26,367	29,964	33,630	34,887	34,912	32,786	33,727	31,035	28,263	31,882
18	33,756	31,799	26,055	30,213	33,509	35,155	35,100	32,890	33,553	30,905	28,276	31,555
19	33,886	31,771	25,792	30,542	33,587	34,868	35,409	32,991	33,465	30,767	28,276	31,150
20	33,843	31,443	25,729	30,896	33,659	34,616	35,214	33,019	33,379	30,753	28,276	30,961
21	33,934	31,104	25,741	31,150	33,563	34,301	35,334	33,043	33,288	30,730	28,049	31,003
22	34,028	30,762	25,766	31,354	33,625	34,165	35,239	33,053	33,341	30,566	27,813	30,802
23	33,824	30,429	25,800	31,537	33,611	34,072	35,170	33,014	33,480	30,542	27,572	30,538
24	33,751	30,095	25,475	31,672	33,611	33,993	35,110	33,014	33,659	30,369	27,335	30,255
25	33,983	30,037	25,458	31,803	33,504	33,944	35,065	32,977	33,490	30,164	28,381	29,964
26	34,281	29,964	25,475	31,920	33,587	33,843	35,045	32,972	33,441	29,959	28,614	29,878
27	34,233	29,602	25,487	32,019	33,664	33,775	34,833	32,981	33,365	29,968	28,743	29,792
28	34,433	29,279	25,662	32,080	33,543	33,751	34,577	32,972	33,259	30,064	28,937	29,869
29	34,887	28,964		32,269	33,630	33,794	34,301	32,962	33,177	29,968	29,715	29,950
30	34,951	28,650		32,676	33,698	34,199	33,983	33,881	33,216	29,838	30,095	30,037
31	34,868	28,158		32,953		34,463		34,523	33,325		30,359	
Change	+5,036	-6,710	-2,496	+7,291	+745	+765	-480	+540	-1,288	-3,397	+521	-322
Equiv. Mgal/d	+162.5	-216.5	-89.1	+235.2	+24.8	+24.7	-16.0	+17.4	-41.5	-113.2	+16.8	-10.7
Equiv. ft³/s	+251	-335	-138	+364	+38.4	+38.2	-24.8	+26.9	-64.3	-175	+26.0	-16.6

Net change for year +205 Mgal   Net equivalent for year +0.6 Mgal/d   Net equivalent for year +0.9 ft³/s

Table 6. Design rate for Delaware River at Montague, New Jersey, gaging station, December 1, 2008, to November 30, 2009.

[Rate in cubic feet per second]

Effective dates	Montague Design Rate
December 1, 2008, to November 30, 2009	1,750

Table 7. Consumption of water by New York City, 1950 to 2009.
(Data furnished by New York City, Department of Environmental Protection, Bureau of Water Supply)

[Mgal/d, million gallons per day; Bgal, billion gallons]

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

Table 7. Consumption of water by New York City, 1950 to 2009.—Continued
(Data furnished by New York City, Department of Environmental Protection, Bureau of Water Supply)

[Mgal/d, million gallons per day; Bgal, billion gallons]

Year	Average daily consumption			Annual Consumption (Bgal)
	City Proper (Mgal/d)	Outside Communities (Mgal/d)	Total (Mgal/d)	
1995	1,326.1	123.1	1,449.2	528.958
96	1,283.5	120.2	1,403.7	512.351
97	1,201.3	123.5	1,324.8	483.552
98	1,220.0	124.7	1,344.7	490.816
99	1,237.2	128.6	1,365.8	498.517
2000	1,240.4	124.9	1,365.3	499.700
01	1,184.0	128.4	1,312.4	479.026
02	1,135.6	121.1	1,256.7	458.696
03	1,093.7	115.9	1,209.6	441.516
04	1,099.6	117.5	1,217.1	445.461
2005	1,107.6	123.8	1,231.4	449.462
06	1,069.2	116.8	1,186.0	432.890
07	1,114.1	122.9	1,237.0	451.505
08	1,082.9	114.8	1,197.7	438.358
09	1,007.2	109.4	1,116.6	407.559

Table 8. New York City reservoir release design data.
(River Master daily operation record)

[ft³/s, cubic feet per second; (ft³/s)-d, cubic feet per second days; Col., Column]

Advance estimate of discharge of Delaware River at Montague, New Jersey, exclusive of New York City reservoir releases										Computation of balancing adjustment					
Date of advance estimate	Powerplant release forecasts		Uncontrolled runoff		Montague date	Discharge (ft³/s)	Indicated deficiency	Balancing adjustment (ft³/s)	Directed release (ft³/s)	Adjusted directed release		Actual deficiency		Cumulative difference (ft³/s)-d	Balancing adjustment (ft³/s)
	Lake Wallenpaupack (ft³/s)	Rio Reservoir (ft³/s)	Current condition (ft³/s)	Weather adjustment (ft³/s)						Daily (ft³/s)	Cumulative (ft³/s)-d	Daily (ft³/s)	Cumulative (ft³/s)-d		
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14
MONTAGUE DESIGN RATE = 1,750 (ft³/s) DECEMBER 1, 2008, to NOVEMBER 30, 2009 The estimated Montague discharge was greater than the Montague design rate from December 1, 2008, to September 19, 2009.															
Sept. 17	0	177	1,108	16	Sept. 20	1,301	449	+8	457	457	457	415	585	-128	+13
18	0	0	1,195	0	21	1,195	555	+15	570	570	1,027	634	1,219	-192	+19
19	163	0	1,156	7	22	1,326	424	+17	441	441	1,468	540	1,759	-291	+29
20	163	0	1,051	16	23	1,230	520	+17	537	537	2,005	534	2,293	-288	+29
21	163	0	1,000	21	24	1,184	566	+13	579	583	2,588	453	2,746	-158	+16
22	163	113	888	21	25	1,185	565	+19	584	585	3,173	445	3,191	-18	+2
23	163	0	889	27	26	1,079	671	+29	700	706	3,879	586	3,777	+102	-10
24	204	0	884	33	27	1,121	629	+29	658	655	4,534	335	4,112	+422	-42
25	0	0	859	317	28	1,176	574	+16	590	593	5,127	0	4,112	+1,015	-50
26	0	0	859	385	29	1,244	506	+2	508	508	5,635	0	4,112	+1,523	-50
27	0	160	1,080	471	30	1,711	39	-10	29	29	5,664	0	4,112	+1,552	-50

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on quantitative precipitation forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.

Col. 6 = Design rate - Col. 5, when positive; otherwise Col. 6 = 0.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = Design rate - Col. 5 + Col. 7, when positive; otherwise Col. 8 = 0.
Col. 9 = Col. 7 from Table 9.
Col. 10 = Summation of Col. 9.

Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 9), when positive; otherwise Col. 11 = 0.
Col. 12 = Summation of Col. 11.
Col. 13 = Col. 10 - Col. 12.
Col. 14 = Col. 13 divided by -10, limited to ±50.

Table 8. New York City reservoir release design data.—Continued
(River Master daily operation record)

[ft³/s, cubic feet per second; (ft³/s)-d, cubic feet per second days; Col., Column]

Advance estimate of discharge of Delaware River at Montague, New Jersey, exclusive of New York City reservoir releases										Computation of balancing adjustment					
Date of advance estimate	Powerplant release forecasts		Uncontrolled runoff		Montague date	Discharge (ft³/s)	Indicated deficiency	Balancing adjustment (ft³/s)	Directed release (ft³/s)	Adjusted directed release		Actual deficiency		Cumulative difference (ft³/s)-d	Balancing adjustment (ft³/s)
	Lake Wallenpaupack (ft³/s)	Rio Reservoir (ft³/s)	Current condition (ft³/s)	Weather adjustment (ft³/s)						Daily (ft³/s)	Cumulative (ft³/s)-d	Daily (ft³/s)	Cumulative (ft³/s)-d		
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14
Sept. 28	0	0	1,759	112	Oct. 1	1,871	0	-42	0	0	5,664	67	4,179	+1,485	-50
29	0	0	1,768	20	2	1,788	0	-50	0	0	5,664	392	4,571	+1,093	-50
30	0	71	1,664	157	3	1,892	0	-50	0	0	5,664	366	4,937	+727	-50
Oct. 1	0	0	1,387	472	4	1,859	0	-50	0	0	5,664	406	5,343	+321	-32
2	0	0	1,344	423	5	1,767	0	-50	0	0	5,664	469	5,812	-148	+15
3	0	0	1,402	25	6	1,427	323	-50	273	273	5,937	539	6,351	-414	+41
4	0	0	1,293	13	7	1,306	444	-50	394	394	6,331	579	6,930	-599	+50
5	0	241	1,128	52	8	1,421	329	-32	297	297	6,628	542	7,472	-844	+50
6	0	113	1,097	108	9	1,318	432	+15	447	447	7,075	531	8,003	-928	+50
7	0	0	947	96	10	1,043	707	+41	748	751	7,826	541	8,544	-718	+50
8	0	0	1,033	731	11	1,764	0	+50	0	0	7,826	405	8,949	-1,123	+50
9	0	0	953	910	12	1,863	0	+50	0	0	7,826	486	9,435	-1,609	+50
10	0	0	1,073	5	13	1,078	672	+50	722	725	8,551	605	10,040	-1,489	+50
11	0	0	1,211	24	14	1,235	515	+50	565	563	9,114	553	10,593	-1,479	+50
12	0	0	1,066	35	15	1,101	649	+50	699	703	9,817	733	11,326	-1,509	+50
13	0	0	1,000	14	16	1,014	736	+50	786	788	10,605	668	11,994	-1,389	+50
14	0	0	984	221	17	1,205	545	+50	595	604	11,209	584	12,578	-1,369	+50
15	0	99	943	762	18	1,804	0	+50	0	0	11,209	461	13,039	-1,830	+50
16	0	0	1,080	2,141	19	3,221	0	+50	0	0	11,209	473	13,512	-2,303	+50
17	0	0	1,127	692	20	1,819	0	+50	0	0	11,209	315	13,827	-2,618	+50
18	0	0	1,087	43	21	1,130	620	+50	670	672	11,881	462	14,289	-2,408	+50
19	0	128	1,047	0	22	1,175	575	+50	625	632	12,513	452	14,741	-2,228	+50
20	0	113	982	0	23	1,095	655	+50	705	705	13,218	495	15,236	-2,018	+50
21	0	0	965	36	24	1,001	749	+50	799	801	14,019	361	15,597	-1,578	+50

The estimated discharge at Montague was greater than the Montague design rate from October 25, 2009, to November 30, 2009.

Col. 1 - Furnished by power company.
Col. 2 - Furnished by power company.
Col. 3 - Computed from index stations.
Col. 4 - Computed increase in runoff based on quantitative precipitation forecasts.
Col. 5 = Col. 1 + Col. 2 + Col. 3 + Col. 4.
Col. 6 = Design rate - Col. 5, when positive; otherwise Col. 6 = 0.
Col. 7 = Col. 14 (4 days earlier).
Col. 8 = Design rate - Col. 5 + Col. 7, when positive; otherwise Col. 8 = 0.
Col. 9 = Col. 7 from Table 9.
Col. 10 = Summation of Col. 9.
Col. 11 = Design rate - (Col. 9 + Col. 10 from Table 9), when positive; otherwise Col. 11 = 0.
Col. 12 = Summation of Col. 11.
Col. 13 = Col. 10 - Col. 12.
Col. 14 = Col. 13 divided by -10, limited to ±50.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey. (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases			Computed uncontrolled	Total
									New York City Reservoirs		Power-plants		
Date	Amount								Directed	Other			
2008	Col. 1	Col. 2	Col. 3	Col. 4	2008	Col. 5	Col. 6	2008	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Nov. 28	0	285	108	60	Nov. 30	0	248	Dec. 1	0	453	248	3,299	4,000
29	0	285	110	60	Dec. 1	360	496	2	0	455	856	5,319	6,630
30	0	283	110	62	2	295	532	3	0	455	827	5,318	6,600
Dec. 1	0	234	110	65	3	415	532	4	0	409	947	4,464	5,820
2	0	186	110	65	4	251	496	5	0	361	747	4,262	5,370
3	0	186	110	65	5	304	195	6	0	361	499	4,080	4,940
4	0	186	110	65	6	0	0	7	0	361	0	3,719	4,080
5	0	186	110	65	7	0	301	8	0	361	301	3,208	3,870
6	0	186	110	65	8	357	567	9	0	361	924	2,845	4,130
7	0	186	111	65	9	398	496	10	0	362	894	3,424	4,680
8	0	186	110	65	10	404	532	11	0	361	936	10,403	11,700
9	0	186	110	65	11	849	603	12	0	361	1,452	38,387	40,200
10	0	186	111	70	12	1,579	851	13	0	367	2,430	35,003	37,800
11	0	184	111	110	13	1,612	851	14	0	405	2,463	18,132	21,000
12	0	59	113	190	14	1,605	851	15	0	362	2,456	12,882	15,700
13	0	370	190	190	15	1,484	851	16	0	750	2,335	11,415	14,500
14	0	684	255	190	16	1,318	851	17	0	1,129	2,169	10,702	14,000
15	0	701	255	190	17	935	851	18	0	1,146	1,786	9,268	12,200
16	0	701	430	190	18	976	851	19	0	1,321	1,827	8,252	11,400
17	0	701	834	190	19	893	851	20	0	1,725	1,744	7,531	11,000
18	0	701	1,238	190	20	1,206	851	21	0	2,129	2,057	6,714	10,900
19	0	701	1,497	190	21	1,000	851	22	0	2,388	1,851	6,061	10,300
20	0	701	1,496	190	22	1,300	851	23	0	2,387	2,151	5,562	10,100
21	0	701	1,504	189	23	1,359	851	24	0	2,394	2,210	5,056	9,660
22	0	702	1,507	192	24	1,472	851	25	0	2,401	2,323	11,076	15,800
23	0	701	1,505	190	25	1,536	851	26	0	2,396	2,387	12,517	17,300
24	0	701	1,508	190	26	1,372	851	27	0	2,399	2,223	9,078	13,700
25	0	701	1,507	189	27	890	851	28	0	2,397	1,741	9,162	13,300
26	0	701	1,508	189	28	477	851	29	0	2,398	1,328	14,074	17,800
27	0	701	1,511	186	29	288	851	30	0	2,398	1,139	12,563	16,100
28	0	701	1,504	187	30	461	851	31	0	2,392	1,312	10,196	13,900
Total	0	13,873	19,903	4,169		25,396	21,167		0	37,945	46,563	303,972	388,480

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases			Computed uncontrolled	Total
									New York City Reservoirs		Power-plants		
Date	Amount								Directed	Other			
2008/2009	Col. 1	Col. 2	Col. 3	Col. 4	2008/2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Dec. 29	0	702	1,499	190	Dec. 31	559	851	Jan. 1	0	2,391	1,410	8,299	12,100
30	0	701	1,499	190	Jan. 1	0	851	2	0	2,390	851	7,559	10,800
31	0	701	1,502	190	2	476	337	3	0	2,393	813	6,324	9,530
Jan. 1	0	699	1,501	190	3	0	230	4	0	2,390	230	6,080	8,700
2	0	699	1,497	190	4	66	426	5	0	2,386	492	4,802	7,680
3	0	701	1,490	190	5	771	426	6	0	2,381	1,197	4,322	7,900
4	0	699	1,491	189	6	880	426	7	0	2,379	1,306	4,355	8,040
5	0	699	1,502	190	7	1,215	426	8	0	2,391	1,641	4,348	8,380
6	0	701	1,508	190	8	882	426	9	0	2,399	1,308	4,073	7,780
7	0	701	1,505	190	9	648	408	10	0	2,396	1,056	3,588	7,040
8	0	701	1,507	190	10	612	408	11	0	2,398	1,020	3,062	6,480
9	0	701	1,507	190	11	680	426	12	0	2,398	1,106	3,466	6,970
10	0	701	1,504	190	12	637	426	13	0	2,395	1,063	3,272	6,730
11	0	701	1,502	190	13	811	426	14	0	2,393	1,237	3,550	7,180
12	0	701	1,501	190	14	1,029	426	15	0	2,392	1,455	2,613	6,460
13	0	701	1,508	203	15	1,037	426	16	0	2,412	1,463	2,325	6,200
14	0	705	1,904	184	16	626	426	17	0	2,793	1,052	1,955	5,800
15	0	701	1,894	190	17	510	408	18	0	2,785	918	1,597	5,300
16	0	701	1,504	190	18	654	0	19	0	2,395	654	2,151	5,200
17	0	701	1,504	190	19	583	0	20	0	2,395	583	2,822	5,800
18	0	701	1,501	190	20	662	18	21	0	2,392	680	2,628	5,700
19	0	701	1,499	190	21	486	142	22	0	2,390	628	2,382	5,400
20	0	701	1,496	190	22	608	142	23	0	2,387	750	2,463	5,600
21	0	701	1,497	189	23	606	124	24	0	2,387	730	2,183	5,300
22	0	701	1,494	189	24	0	0	25	0	2,384	0	2,216	4,600
23	0	701	1,491	190	25	220	18	26	0	2,382	238	1,980	4,600
24	0	701	1,490	190	26	537	142	27	0	2,381	679	2,040	5,100
25	0	701	1,496	189	27	518	18	28	0	2,386	536	2,078	5,000
26	0	701	1,504	190	28	600	160	29	0	2,395	760	1,945	5,100
27	0	701	1,505	189	29	817	71	30	0	2,395	888	2,517	5,800
28	0	701	1,505	190	30	494	0	31	0	2,396	494	2,510	5,400
Total	0	21,728	47,307	5,892		18,224	9,014		0	74,927	27,238	105,505	207,670

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases: New York City Reservoirs		Controlled Releases: Power-plants	Computed uncontrolled	Total
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Jan. 29	0	701	1,502	170	Jan. 31	528	0	Feb. 1	0	2,373	528	2,199	5,100
30	0	701	1,499	101	Feb. 1	492	0	2	0	2,301	492	2,307	5,100
31	0	701	1,497	101	2	555	0	3	0	2,299	555	2,146	5,000
Feb. 1	0	701	1,499	101	3	598	53	4	0	2,301	651	2,348	5,300
2	0	701	1,502	91	4	621	177	5	0	2,294	798	1,808	4,900
3	0	701	1,502	65	5	509	124	6	0	2,268	633	1,599	4,500
4	0	688	1,238	65	6	353	0	7	0	1,991	353	1,356	3,700
5	0	498	469	65	7	0	0	8	0	1,032	0	1,868	2,900
6	0	303	252	65	8	70	0	9	0	620	70	2,510	3,200
7	0	193	252	65	9	365	0	10	0	510	365	2,625	3,500
8	0	186	252	65	10	413	0	11	0	503	413	2,584	3,500
9	0	186	252	65	11	365	0	12	0	503	365	4,932	5,800
10	0	186	252	65	12	403	18	13	0	503	421	12,376	13,300
11	0	186	252	65	13	294	89	14	0	503	383	9,614	10,500
12	0	186	254	65	14	0	0	15	0	505	0	7,195	7,700
13	0	186	255	65	15	61	0	16	0	506	61	5,933	6,500
14	0	186	255	65	16	388	0	17	0	506	388	4,906	5,800
15	0	186	255	65	17	305	0	18	0	506	305	4,389	5,200
16	0	186	255	65	18	422	0	19	0	506	422	4,072	5,000
17	0	186	257	65	19	505	124	20	0	508	629	3,963	5,100
18	0	186	257	65	20	326	89	21	0	508	415	3,477	4,400
19	0	187	254	65	21	0	0	22	0	506	0	3,494	4,000
20	0	186	251	65	22	0	160	23	0	502	160	3,338	4,000
21	0	184	251	65	23	363	266	24	0	500	629	2,871	4,000
22	0	155	251	65	24	396	319	25	0	471	715	2,614	3,800
23	0	121	251	65	25	426	426	26	0	437	852	2,711	4,000
24	0	90	251	65	26	268	426	27	0	406	694	3,000	4,100
25	0	85	251	65	27	340	160	28	0	401	500	4,499	5,400
Total	0	8,942	15,768	2,059		9,366	2,431		0	26,769	11,797	106,734	145,300

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases			Computed uncontrolled	Total
									New York City Reservoirs		Power-plants		
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Feb. 26	0	85	232	65	Feb. 28	0	0	Mar. 1	0	382	0	6,618	7,000
27	0	85	187	65	Mar. 1	0	53	2	0	337	53	5,710	6,100
28	0	85	155	65	2	370	213	3	0	305	583	4,312	5,200
Mar. 1	0	85	203	65	3	414	142	4	0	353	556	3,491	4,400
2	0	85	248	65	4	255	18	5	0	398	273	3,829	4,500
3	0	85	252	65	5	290	301	6	0	402	591	3,907	4,900
4	0	85	252	65	6	231	266	7	0	402	497	3,891	4,790
5	0	85	254	65	7	0	248	8	0	404	248	5,848	6,500
6	0	85	254	62	8	0	390	9	0	401	390	20,409	21,200
7	0	82	243	65	9	223	426	10	0	390	649	30,561	31,600
8	0	85	342	65	10	325	426	11	0	492	751	21,157	22,400
9	0	88	1,015	65	11	289	426	12	0	1,168	715	19,217	21,100
10	0	186	1,502	74	12	252	426	13	0	1,762	678	14,160	16,600
11	0	186	1,504	101	13	392	426	14	0	1,791	818	10,691	13,300
12	0	186	1,502	101	14	0	426	15	0	1,789	426	9,085	11,300
13	0	186	1,505	101	15	29	426	16	0	1,792	455	8,053	10,300
14	0	186	1,504	94	16	325	426	17	0	1,784	751	7,185	9,720
15	0	186	1,501	65	17	432	426	18	0	1,752	858	6,610	9,220
16	0	186	1,499	65	18	334	426	19	0	1,750	760	6,600	9,100
17	0	186	1,501	65	19	382	426	20	0	1,752	808	7,420	9,980
18	0	181	1,499	65	20	397	426	21	0	1,745	823	6,202	8,770
19	0	145	1,497	65	21	0	426	22	0	1,707	426	5,267	7,400
20	0	113	1,391	65	22	24	426	23	0	1,569	450	4,631	6,650
21	0	85	1,050	65	23	609	426	24	0	1,200	1,035	4,065	6,300
22	0	85	890	65	24	353	426	25	0	1,040	779	3,371	5,190
23	0	85	317	65	25	482	390	26	0	467	872	3,511	4,850
24	0	85	252	65	26	377	426	27	0	402	803	3,655	4,860
25	0	85	362	65	27	384	426	28	0	512	810	3,808	5,130
26	0	85	758	65	28	0	426	29	0	908	426	3,876	5,210
27	0	85	1,109	65	29	35	426	30	0	1,259	461	5,150	6,870
28	0	85	1,159	65	30	144	426	31	0	1,309	570	5,731	7,610
Total	0	3,627	25,939	2,158		7,348	10,967		0	31,724	18,315	248,021	298,060

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases: New York City Reservoirs		Controlled Releases: Power-plants	Computed uncontrolled	Total
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Mar. 29	0	84	1,047	65	Mar. 31	140	426	Apr. 1	0	1,196	566	4,658	6,420
30	0	85	657	65	Apr. 1	141	248	2	0	807	389	4,544	5,740
31	0	85	297	65	2	179	284	3	0	447	463	4,940	5,850
Apr. 1	0	85	367	65	3	156	248	4	0	517	404	8,789	9,710
2	0	85	749	65	4	0	266	5	0	899	266	9,735	10,900
3	0	85	1,153	65	5	0	284	6	0	1,303	284	7,893	9,480
4	0	85	1,471	65	6	20	35	7	0	1,621	55	7,484	9,160
5	0	85	1,499	65	7	495	160	8	0	1,649	655	6,606	8,910
6	0	85	1,499	65	8	404	266	9	0	1,649	670	5,621	7,940
7	0	85	1,497	65	9	382	106	10	0	1,647	488	4,875	7,010
8	0	85	1,377	65	10	431	0	11	0	1,527	431	4,192	6,150
9	0	85	820	65	11	0	0	12	0	970	0	4,270	5,240
10	0	85	192	65	12	0	0	13	0	342	0	4,118	4,460
11	0	85	237	65	13	0	0	14	0	387	0	3,953	4,340
12	0	85	628	65	14	0	0	15	0	778	0	3,792	4,570
13	0	85	1,032	65	15	27	71	16	0	1,182	98	3,500	4,780
14	0	85	1,442	65	16	0	0	17	0	1,592	0	3,018	4,610
15	0	87	1,497	65	17	0	71	18	0	1,649	71	2,700	4,420
16	0	87	1,343	65	18	0	0	19	0	1,495	0	2,325	3,820
17	0	85	774	65	19	0	177	20	0	924	177	2,319	3,420
18	0	87	175	65	20	0	426	21	0	327	426	2,917	3,670
19	0	85	119	65	21	0	426	22	0	269	426	4,085	4,780
20	0	85	114	65	22	27	301	23	0	264	328	4,028	4,620
21	0	84	113	65	23	0	284	24	0	262	284	3,534	4,080
22	0	84	111	65	24	0	106	25	0	260	106	3,174	3,540
23	0	85	111	65	25	0	0	26	0	261	0	2,949	3,210
24	0	85	111	65	26	0	0	27	0	261	0	2,769	3,030
25	0	85	111	65	27	338	0	28	0	261	338	2,601	3,200
26	0	85	111	60	28	0	0	29	0	256	0	2,394	2,650
27	0	84	93	45	29	0	0	30	0	222	0	2,268	2,490
Total	0	2,552	20,747	1,925		2,740	4,185		0	25,224	6,925	130,051	162,200

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases			Computed uncontrolled	Total
									New York City Reservoirs		Power-plants		
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Apr. 28	0	63	85	45	Apr. 30	0	18	May 1	0	193	18	2,179	2,390
29	0	65	88	53	May 1	0	89	2	0	206	89	2,165	2,460
30	0	70	150	76	2	0	71	3	0	296	71	2,193	2,560
May 1	0	101	193	76	3	0	18	4	0	370	18	2,162	2,550
2	0	101	192	76	4	0	89	5	0	369	89	2,032	2,490
3	0	101	192	76	5	0	0	6	0	369	0	2,061	2,430
4	0	101	192	76	6	9	0	7	0	369	9	2,842	3,220
5	0	99	192	76	7	0	0	8	0	367	0	3,313	3,680
6	0	101	192	76	8	0	0	9	0	369	0	3,241	3,610
7	0	101	190	76	9	0	0	10	0	367	0	3,833	4,200
8	0	101	192	76	10	0	124	11	0	369	124	3,577	4,070
9	0	101	192	76	11	0	177	12	0	369	177	2,934	3,480
10	0	101	192	76	12	322	213	13	0	369	535	2,576	3,480
11	0	101	193	76	13	404	124	14	0	370	528	2,432	3,330
12	0	101	190	76	14	457	248	15	0	367	705	3,848	4,920
13	0	101	192	76	15	524	426	16	0	369	950	4,341	5,660
14	0	101	192	76	16	0	124	17	0	369	124	10,107	10,600
15	0	101	193	76	17	1,031	426	18	0	370	1,457	16,373	18,200
16	0	101	193	76	18	716	426	19	0	370	1,142	10,088	11,600
17	0	101	193	76	19	814	426	20	0	370	1,240	7,380	8,990
18	0	101	192	76	20	648	461	21	0	369	1,109	6,052	7,530
19	0	101	192	82	21	541	532	22	0	375	1,073	5,422	6,870
20	0	183	246	101	22	225	390	23	0	530	615	4,675	5,820
21	0	286	275	101	23	0	461	24	0	662	461	3,857	4,980
22	0	138	252	101	24	0	266	25	0	491	266	4,293	5,050
23	0	130	252	101	25	52	124	26	0	483	176	3,831	4,490
24	0	130	254	97	26	456	426	27	0	481	882	3,317	4,680
25	0	130	246	93	27	564	426	28	0	469	990	4,591	6,050
26	0	127	249	101	28	131	426	29	0	477	557	5,566	6,600
27	0	130	255	101	29	0	71	30	0	486	71	12,343	12,900
28	0	130	254	102	30	0	71	31	0	486	71	10,443	11,000
Total	0	3,499	6,255	2,522		6,894	6,653		0	12,276	13,547	154,067	179,890

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases: New York City Reservoirs		Controlled Releases: Powerplants	Computed uncontrolled	Total
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
May 29	0	130	254	102	May 31	20	177	June 1	0	486	197	7,947	8,630
30	0	130	252	104	June 1	408	160	2	0	486	568	6,396	7,450
31	0	133	299	110	2	260	71	3	0	542	331	5,627	6,500
June 1	0	150	325	110	3	565	85	4	0	585	650	4,995	6,230
2	0	150	325	110	4	883	106	5	0	585	989	4,426	6,000
3	0	150	325	110	5	323	128	6	0	585	451	3,634	4,670
4	0	150	325	110	6	0	128	7	0	585	128	3,227	3,940
5	0	150	325	110	7	42	128	8	0	585	170	2,905	3,660
6	0	150	325	107	8	486	128	9	0	582	614	4,554	5,750
7	0	149	325	101	9	1,601	113	10	0	575	1,714	5,671	7,960
8	0	139	323	101	10	1,296	113	11	0	563	1,409	4,468	6,440
9	0	139	323	101	11	1,306	213	12	0	563	1,519	5,338	7,420
10	0	139	323	101	12	546	184	13	0	563	730	5,207	6,500
11	0	139	325	101	13	0	184	14	0	565	184	5,811	6,560
12	0	139	326	101	14	812	184	15	0	566	996	6,028	7,590
13	0	141	326	102	15	987	184	16	0	569	1,171	5,990	7,730
14	0	141	326	110	16	987	142	17	0	577	1,129	5,574	7,280
15	0	162	438	110	17	1,229	287	18	0	710	1,516	8,274	10,500
16	0	325	818	128	18	1,312	390	19	0	1,271	1,702	17,327	20,300
17	0	526	1,230	190	19	909	603	20	0	1,946	1,512	13,042	16,500
18	0	682	1,488	190	20	964	851	21	0	2,360	1,815	18,125	22,300
19	0	701	1,501	190	21	770	851	22	0	2,392	1,621	19,487	23,500
20	0	408	1,504	190	22	855	780	23	0	2,102	1,635	15,363	19,100
21	0	141	1,505	190	23	530	656	24	0	1,836	1,186	12,078	15,100
22	0	142	1,505	190	24	506	213	25	0	1,837	719	9,544	12,100
23	0	213	1,504	190	25	692	230	26	0	1,907	922	8,371	11,200
24	0	605	1,504	190	26	530	762	27	0	2,299	1,292	8,609	12,200
25	0	692	1,504	175	27	517	851	28	0	2,371	1,368	7,261	11,000
26	0	699	1,501	110	28	767	603	29	0	2,310	1,370	5,570	9,250
27	0	699	1,502	110	29	653	603	30	0	2,311	1,256	4,693	8,260
Total	0	8,414	22,856	3,944		20,756	10,108		0	35,214	30,864	235,542	301,620

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases			Computed uncontrolled	Total
									New York City Reservoirs		Power-plants		
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
June 28	0	699	1,502	110	June 30	372	266	July 1	0	2,311	638	4,841	7,790
29	0	699	1,499	110	July 1	416	213	2	0	2,308	629	4,943	7,880
30	0	699	1,499	110	2	508	461	3	0	2,308	969	4,813	8,090
July 1	0	699	1,497	110	3	660	461	4	0	2,306	1,121	4,203	7,630
2	0	688	1,355	110	4	548	461	5	0	2,153	1,009	3,258	6,420
3	0	538	996	110	5	561	461	6	0	1,644	1,022	3,084	5,750
4	0	500	995	110	6	677	496	7	0	1,605	1,173	2,762	5,540
5	0	481	730	110	7	664	230	8	0	1,321	894	2,505	4,720
6	0	300	320	110	8	683	124	9	0	730	807	3,233	4,770
7	0	193	336	110	9	845	89	10	0	639	934	2,697	4,270
8	0	150	345	110	10	672	0	11	0	605	672	2,503	3,780
9	0	150	353	110	11	459	106	12	0	613	565	2,362	3,540
10	0	150	351	110	12	39	567	13	0	611	606	2,363	3,580
11	0	150	348	110	13	479	461	14	0	608	940	2,542	4,090
12	0	150	350	110	14	520	0	15	0	610	520	2,430	3,560
13	0	150	350	110	15	495	0	16	0	610	495	1,895	3,000
14	0	150	350	110	16	459	0	17	0	610	459	1,961	3,030
15	0	150	348	110	17	524	0	18	0	608	524	2,628	3,760
16	0	150	354	110	18	0	0	19	0	614	0	2,906	3,520
17	0	150	353	110	19	0	0	20	0	613	0	2,467	3,080
18	0	150	353	110	20	249	0	21	0	613	249	2,038	2,900
19	0	150	354	110	21	283	0	22	0	614	283	1,963	2,860
20	0	150	354	110	22	285	0	23	0	614	285	1,801	2,700
21	0	150	354	110	23	231	0	24	0	614	231	1,685	2,530
22	0	150	353	110	24	432	0	25	0	613	432	1,755	2,800
23	0	150	353	110	25	0	71	26	0	613	71	1,836	2,520
24	0	149	353	110	26	1	53	27	0	612	54	1,714	2,380
25	0	150	353	110	27	343	142	28	0	613	485	1,562	2,660
26	0	150	353	110	28	383	248	29	0	613	631	1,526	2,770
27	0	150	353	110	29	370	213	30	0	613	583	9,404	10,600
28	0	150	353	111	30	864	816	31	0	614	1,680	13,406	15,700
Total	0	8,645	18,117	3,411		13,022	5,939		0	30,173	18,961	99,086	148,220

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases			Computed uncontrolled	Total
									New York City Reservoirs		Power-plants		
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
July 29	0	150	353	125	July 31	676	851	Aug. 1	0	628	1,527	20,045	22,200
30	0	238	724	142	Aug. 1	321	851	2	0	1,104	1,172	14,924	17,200
31	0	251	1,496	190	2	370	851	3	0	1,937	1,221	14,842	18,000
Aug. 1	0	251	1,499	190	3	578	390	4	0	1,940	968	9,892	12,800
2	0	251	1,499	190	4	800	798	5	0	1,940	1,598	6,962	10,500
3	0	255	1,497	190	5	548	638	6	0	1,942	1,168	5,302	8,430
4	0	412	1,496	190	6	558	603	7	0	2,098	1,161	4,281	7,540
5	0	613	1,494	170	7	640	213	8	0	2,277	853	3,080	6,210
6	0	701	1,494	125	8	0	0	9	0	2,320	0	2,820	5,140
7	0	704	1,493	125	9	32	270	10	0	2,322	302	8,476	11,100
8	0	704	1,491	125	10	602	809	11	0	2,320	1,411	20,269	24,000
9	0	701	1,497	125	11	541	809	12	0	2,323	1,350	12,627	16,300
10	0	699	1,499	125	12	597	809	13	0	2,323	1,406	8,671	12,400
11	0	699	1,499	125	13	567	809	14	0	2,323	1,376	7,301	11,000
12	0	701	1,501	125	14	598	809	15	0	2,327	1,407	5,346	9,080
13	0	701	1,499	125	15	19	809	16	0	2,325	828	4,387	7,540
14	0	701	1,496	125	16	22	667	17	0	2,322	689	3,729	6,740
15	0	701	1,502	125	17	612	152	18	0	2,328	764	3,008	6,100
16	0	693	1,504	125	18	611	0	19	0	2,322	611	2,687	5,620
17	0	562	1,502	125	19	618	0	20	0	2,189	618	2,563	5,370
18	0	436	1,499	125	20	673	220	21	0	2,060	893	2,597	5,550
19	0	300	1,499	125	21	517	539	22	0	1,924	1,056	6,510	9,490
20	0	249	1,496	125	22	0	504	23	0	1,870	504	10,726	13,100
21	0	249	1,494	125	23	432	809	24	0	1,868	1,241	7,191	10,300
22	0	521	1,364	125	24	606	809	25	0	1,740	1,415	4,675	7,830
23	0	249	831	125	25	634	617	26	0	1,205	1,251	3,734	6,190
24	0	251	602	125	26	576	585	27	0	978	1,161	3,221	5,360
25	0	251	487	125	27	612	585	28	0	863	1,197	2,880	4,940
26	0	251	413	125	28	454	433	29	0	789	887	2,984	4,660
27	0	251	353	125	29	0	0	30	0	729	0	4,271	5,000
28	0	251	353	125	30	0	0	31	0	729	0	4,161	4,890
Total	0	13,677	38,426	4,262		13,814	16,239		0	56,365	30,053	214,162	300,580

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases			Computed unconrolled	Total
									New York City Reservoirs		Power-plants		
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Aug. 29	0	251	353	125	Aug. 31	393	0	Sept. 1	0	729	393	3,288	4,410
30	0	255	498	125	Sept. 1	587	0	2	0	878	587	3,005	4,470
31	0	444	818	125	2	660	0	3	0	1,387	660	2,393	4,440
Sept. 1	0	452	855	125	3	611	0	4	0	1,432	611	2,137	4,180
2	0	452	809	125	4	462	71	5	0	1,386	533	1,891	3,810
3	0	347	699	125	5	0	0	6	0	1,171	0	1,819	2,990
4	0	244	610	125	6	0	0	7	0	979	0	1,751	2,730
5	0	220	543	125	7	0	142	8	0	888	142	1,640	2,670
6	0	220	515	125	8	456	71	9	0	860	527	1,633	3,020
7	0	220	509	125	9	356	160	10	0	854	516	1,530	2,900
8	0	220	498	125	10	416	213	11	0	843	629	1,458	2,930
9	0	220	498	125	11	415	71	12	0	843	486	1,561	2,890
10	0	220	501	125	12	251	0	13	0	846	251	1,683	2,780
11	0	220	500	125	13	0	71	14	0	845	71	1,654	2,570
12	0	220	497	125	14	461	142	15	0	842	603	1,475	2,920
13	0	220	497	122	15	430	0	16	0	839	430	1,261	2,530
14	0	220	500	102	16	436	0	17	0	822	436	1,252	2,510
15	0	220	408	76	17	259	0	18	0	704	359	1,367	2,430
16	0	220	357	76	18	429	0	19	0	653	429	1,378	2,460
17	457	220	359	76	19	0	170	20	457	198	170	1,165	1,990
18	570	206	362	76	20	2	0	21	570	74	2	1,114	1,760
19	441	200	364	76	21	151	0	22	441	194	151	1,059	1,850
20	537	189	359	76	22	176	0	23	537	87	176	1,040	1,840
21	579	102	405	76	23	171	128	24	583	0	299	998	1,880
22	584	101	408	76	24	107	273	25	585	0	380	925	1,890
23	700	101	529	76	25	163	142	26	706	0	305	859	1,870
24	658	101	478	76	26	355	0	27	655	0	355	1,060	2,070
25	590	101	416	76	27	0	0	28	593	0	0	1,827	2,420
26	508	101	367	76	28	0	0	29	508	36	0	2,476	3,020
27	29	101	364	76	29	0	160	30	29	512	160	1,909	2,610
Total	5,653	6,608	14,876	3,087		7,847	1,814		5,664	18,907	9,661	48,608	82,840

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases			Computed unconrolled	Total
									New York City Reservoirs		Power-plants		
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Sept. 28	0	101	360	76	Sept. 30	0	142	Oct. 1	0	537	142	1,541	2,220
29	0	101	360	71	Oct. 1	0	0	2	0	532	0	1,358	1,890
30	0	99	347	60	2	0	71	3	0	506	71	1,313	1,890
Oct. 1	0	85	331	60	3	0	0	4	0	476	0	1,344	1,820
2	0	85	334	60	4	0	0	5	0	479	0	1,281	1,760
3	273	85	334	60	5	0	0	6	273	206	0	1,211	1,690
4	394	85	334	60	6	0	0	7	394	85	0	1,171	1,650
5	297	85	337	60	7	0	128	8	297	185	128	1,080	1,690
6	447	85	336	60	8	0	113	9	447	34	113	1,106	1,700
7	748	85	606	60	9	0	0	10	751	0	0	1,209	1,960
8	0	85	330	60	10	0	0	11	0	475	0	1,345	1,820
9	0	85	331	60	11	0	0	12	0	476	0	1,264	1,740
10	722	85	580	60	12	42	0	13	725	0	42	1,103	1,870
11	565	85	418	60	13	0	99	14	563	0	99	1,098	1,760
12	699	85	558	60	14	0	0	15	703	0	0	1,017	1,720
13	786	139	589	60	15	0	0	16	788	0	0	1,082	1,870
14	595	145	399	60	16	0	0	17	604	0	0	1,166	1,770
15	0	145	326	60	17	0	99	18	0	531	99	1,190	1,820
16	0	145	330	60	18	28	0	19	0	535	28	1,277	1,840
17	0	145	330	60	19	52	128	20	0	535	180	1,255	1,970
18	670	145	467	60	20	0	113	21	672	0	113	1,175	1,960
19	625	145	427	60	21	0	128	22	632	0	128	1,170	1,930
20	705	145	500	60	22	0	113	23	705	0	113	1,142	1,960
21	799	145	596	60	23	0	0	24	801	0	0	1,389	2,190
22	0	145	331	60	24	0	0	25	0	536	0	10,164	10,700
23	0	145	333	60	25	24	0	26	0	538	24	9,038	9,600
24	0	145	334	60	26	45	0	27	0	539	45	5,896	6,480
25	0	145	334	60	27	34	128	28	0	539	162	6,049	6,750
26	0	145	357	60	28	34	422	29	0	562	456	17,382	18,400
27	0	145	412	60	29	598	426	30	0	617	1,024	12,659	14,300
28	0	145	463	60	30	811	426	31	0	668	1,237	8,995	10,900
Total	8,325	3,635	12,424	1,887		1,668	2,536		8,355	9,591	4,204	99,470	121,620

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 9. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey.—Continued (River Master daily operation record)

[Mean discharge in cubic feet per second for 24 hours; Col., Column]

Controlled Releases from New York City Reservoirs					Controlled Releases from Power Reservoirs			Segregation of Flow, Delaware River at Montague, New Jersey					
Directed		Pepacton	Cannons-ville	Never-sink	Date	Lake Wallenpaupack	Rio Reservoir	Date	Controlled Releases			Computed uncontrolled	Total
									New York City Reservoirs		Power-plants		
Date	Amount								Directed	Other			
2009	Col. 1	Col. 2	Col. 3	Col. 4	2009	Col. 5	Col. 6	2009	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11
Oct. 29	0	145	588	60	Oct. 31	545	160	Nov. 1	0	793	705	7,492	8,990
30	0	145	970	63	Nov. 1	0	241	2	0	1,178	241	6,841	8,260
31	0	152	1,347	62	2	448	809	3	0	1,561	1,257	5,252	8,070
Nov. 1	0	145	1,491	62	3	419	585	4	0	1,698	1,004	4,358	7,060
2	0	145	1,502	62	4	303	376	5	0	1,709	679	3,982	6,370
3	0	145	1,504	60	5	385	312	6	0	1,709	697	3,664	6,070
4	0	145	1,501	62	6	481	326	7	0	1,708	807	3,345	5,860
5	0	145	1,501	67	7	0	326	8	0	1,713	326	3,121	5,160
6	0	145	1,499	94	8	0	294	9	0	1,738	294	3,038	5,070
7	0	147	1,496	94	9	379	326	10	0	1,737	705	2,708	5,150
8	0	147	1,493	94	10	462	475	11	0	1,734	937	2,469	5,140
9	0	145	1,385	94	11	428	475	12	0	1,624	903	2,153	4,680
10	0	145	1,115	94	12	279	475	13	0	1,354	754	2,172	4,280
11	0	145	937	94	13	358	489	14	0	1,176	847	2,007	4,030
12	0	145	688	94	14	0	89	15	0	927	89	2,214	3,230
13	0	145	481	94	15	34	319	16	0	720	353	2,347	3,420
14	0	145	472	94	16	213	624	17	0	711	837	2,112	3,660
15	0	145	472	94	17	214	475	18	0	711	689	1,970	3,370
16	0	145	473	94	18	254	67	19	0	712	321	1,947	2,980
17	0	108	470	85	19	217	0	20	0	663	217	3,250	4,130
18	0	105	472	60	20	207	0	21	0	637	207	5,776	6,620
19	0	105	472	60	21	0	0	22	0	637	0	4,853	5,490
20	0	105	472	60	22	17	121	23	0	637	138	4,095	4,870
21	0	105	472	60	23	344	358	24	0	637	702	3,601	4,940
22	0	105	472	60	24	460	411	25	0	637	871	3,302	4,810
23	0	105	469	60	25	354	291	26	0	634	645	3,131	4,410
24	0	105	472	60	26	0	206	27	0	637	206	3,137	3,980
25	0	105	469	60	27	0	67	28	0	634	67	2,949	3,650
26	0	105	470	60	28	0	0	29	0	635	0	2,825	3,460
27	0	105	470	60	29	9	135	30	0	635	144	2,781	3,560
Total	0	3,924	26,095	2,217		6,810	8,832		0	32,236	15,642	102,892	150,770

Col. 2 - 24 hours beginning 1200 of date shown.
Col. 3 - 24 hours ending 2400 one day later.
Col. 4 - 24 hours beginning 1500 one day later.
Col. 5 - 24 hours beginning 0800 of date shown.
Col. 6 - 24 hours beginning 1600 of date shown.
Col. 7 = Col. 2 + Col. 3 + Col. 4 in response to direction (Col. 1).
Col. 8 = Col. 2 + Col. 3 + Col. 4 - Col. 7.
Col. 9 = Col. 5 + Col. 6.
Col. 10 = Col. 11 - Col. 7 - Col. 8 - Col. 9.
Col. 11 = 24 hours of calendar day shown.

Table 10. Diversions to New York City water-supply system.
(River Master daily operation record)

[Million gallons per day for 24-hour period beginning 0800 local time]

Date 2008	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2008 to date	Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2008 to date
Dec. 1	415	0	1	494	Jan. 1	453	0	191	483
2	420	280	0	495	2	452	0	372	485
3	447	100	268	496	3	453	0	0	485
4	451	0	305	498	4	452	0	3	485
5	452	0	303	499	5	453	0	419	486
6	452	0	306	501	6	452	0	210	487
7	453	0	306	502	7	450	0	212	488
8	452	0	305	503	8	451	0	0	488
9	450	0	311	505	9	450	0	414	489
10	451	0	305	506	10	452		0	489
11	259	0	176	506	11	452	0	2	489
12	1	0	0	503	12	424	0	287	490
13	0	0	0	500	13	453	0	288	491
14	0	0	0	498	14	451	0	286	492
15	0	0	0	495	15	451	0	286	493
16	0	0	0	493	16	452	0	288	494
17	0	0	0	490	17	452	0	0	494
18	0	0	0	488	18	450	0	2	494
19	175	0	205	487	19	450	0	300	495
20	201	0	0	486	20	450	0	315	496
21	201	0	0	485	21	451	0	311	497
22	203	0	241	484	22	448	0	308	498
23	300	0	103	484	23	447	0	305	500
24	306	0	185	484	24	449	0	0	499
25	303	0	1	483	25	452	0	0	499
26	303	0	207	483	26	452	0	307	500
27	303	0	0	482	27	451	0	301	501
28	303	0	2	482	28	450	0	305	502
29	300	0	197	482	29	452	0	283	503
30	298	0	230	482	30	451	0	440	505
31	411	0	198	482	31	451	0	464	507
Total	8,310	380	4,155			13,957	0	6,899	

Table 10. Diversions to New York City water-supply system.—Continued
(River Master daily operation record)

[Million gallons per day for 24-hour period beginning 0800 local time]

Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2008 to date	Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2008 to date
Feb. 1	453	0	470	508	Mar. 1	449	9	2	520
2	453	0	345	509	2	449	118	312	521
3	451	0	297	510	3	449	99	0	521
4	451	0	99	511	4	450	100	0	521
5	451	0	0	510	5	449	0	0	521
6	450	0	0	510	6	449	0	0	521
7	450	0	0	510	7	434	0	0	520
8	449	0	0	510	8	450	0	4	520
9	437	0	272	510	9	17	0	13	518
10	446	0	294	511	10	0	0	0	516
11	448	0	98	511	11	0	0	0	515
12	448	0	0	511	12	0	0	0	513
13	453	0	0	511	13	0	0	0	511
14	453	0	0	511	14	0	0	0	509
15	453	0	0	510	15	0	0	0	507
16	453	0	3	510	16	2	0	0	506
17	453	158	313	512	17	300	0	0	505
18	449	200	314	514	18	300	0	0	504
19	449	202	103	514	19	301	0	0	504
20	449	199	0	515	20	302	0	0	503
21	450	199	0	515	21	302	0	0	502
22	449	200	0	516	22	302	0	0	502
23	449	200	362	518	23	299	59	0	501
24	448	200	0	518	24	401	0	0	501
25	449	200	0	519	25	400	0	0	500
26	449	200	2	519	26	442	0	54	500
27	449	200	0.	520	27	448	0	103	501
28	449	75	0	520	28	448	0	0	500
					29	451	0	0	500
					30	451	0	102	500
					31	447	0	54	500
Total	12,591	2,233	2,972			9,192	385	644	

Table 10. Diversions to New York City water-supply system.—Continued
(River Master daily operation record)

[Million gallons per day for 24-hour period beginning 0800 local time]

Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2008 to date	Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2008 to date
Apr. 1	451	0	53	500	May 1	300	299	0	503
2	451	0	52	500	2	300	299	0	503
3	400	0	0	500	3	301	299	0	504
4	400	0	0	500	4	302	300	0	504
5	180	0	244	500	5	301	299	0	504
6	0	0	453	499	6	300	299	0	505
7	189	0	309	499	7	218	299	0	505
8	6	0	303	499	8	251	299	0	505
9	0	0	310	498	9	0	299	0	504
10	209	0	311	498	10	2	299	0	504
11	247	0	309	498	11	148	30	174	503
12	246	0	311	499	12	146	0	214	503
13	418	0	311	499	13	149	0	211	502
14	451	0	114	500	14	154	0	213	502
15	245	50	108	499	15	35	199	206	502
16	201	50	107	499	16	0	199	0	501
17	399	126	209	500	17	0	16	0	499
18	399	0	0	499	18	0	0	511	500
19	398	0	0	499	19	0	0	515	500
20	323	203	215	500	20	0	0	515	500
21	401	137	101	500	21	239	0	278	500
22	397	124	100	500	22	299	0	206	500
23	323	100	104	501	23	299	0	182	500
24	300	201	210	501	24	299	0	179	500
25	301	187	0	501	25	299	0	177	499
26	300	200	2	501	26	300	0	209	500
27	301	286	208	502	27	300	0	212	500
28	300	299	0	502	28	300	0	225	500
29	300	299	0	503	29	300	0	75	499
30	301	299	0	503	30	301	0	0	499
					31	55	0	0	498
Total	8,837	2,561	4,444			5,898	3,435	4,302	

Table 10. Diversions to New York City water-supply system.—Continued
(River Master daily operation record)

[Million gallons per day for 24-hour period beginning 0800 local time]

Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2009 to date	Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2009 to date
June 1	0	0	156	156	July 1	303	0	312	303
2	0	0	216	186	2	297	0	305	313
3	0	0	214	195	3	299	0	303	321
4	399	0	211	299	4	297	0	304	330
5	149	0	212	311	5	434	0	223	339
6	377	0	218	359	6	449	0	211	348
7	444	0	215	402	7	450	0	103	353
8	450	0	426	461	8	448	0	0	356
9	451	0	1	460	9	449	0	0	358
10	450	0	0	459	10	449	199	0	366
11	450	0	0	458	11	450	201	0	372
12	450	0	0	457	12	443	201	0	379
13	449	0	0	457	13	433	201	0	385
14	449	0	0	456	14	433	201	0	391
15	0	0	0	426	15	420	201	0	396
16	0	0	0	399	16	435	201	0	401
17	0	0	0	376	17	452	201	0	406
18	0	0	0	355	18	450	201	0	411
19	0	0	0	336	19	450	201	0	416
20	0	0	0	319	20	449	201	0	421
21	0	0	0	304	21	449	201	0	425
22	0	0	0	290	22	450	201	43	431
23	0	0	0	278	23	448	201	0	435
24	0	0	0	266	24	449	201	0	439
25	0	0	0	255	25	448	201	0	443
26	0	0	279	256	26	448	201	0	446
27	0	0	389	261	27	451	201	0	450
28	0	0	381	266	28	450	201	0	453
29	242	0	402	279	29	390	159	0	455
30	301	0	405	293	30	0	0	0	447
					31	0	0	0	440
Total	5,061	0	3,725			12,273	3,976	1,804	

Table 10. Diversions to New York City water-supply system.—Continued
(River Master daily operation record)

[Million gallons per day for 24-hour period beginning 0800 local time]

Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2009 to date	Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2009 to date
Aug. 1	0	0	0	433	Sept. 1	294	280	103	470
2	0	0	0	426	2	303	299	104	473
3	0	0	0	419	3	299	298	107	475
4	0	0	242	417	4	297	298	213	479
5	264	0	310	419	5	295	298	0	480
6	300	0	308	422	6	296	298	0	481
7	450	0	212	425	7	296	298	0	482
8	450	0	214	429	8	294	299	208	485
9	450	0	215	432	9	298	298	170	488
10	449	0	211	435	10	391	211	172	491
11	451	0	210	439	11	401	201	167	494
12	451	0	211	442	12	400	201	0	495
13	450	0	211	445	13	399	201	0	496
14	448	0	213	447	14	399	200	174	498
15	448	0	211	450	15	398	200	139	501
16	447	0	213	453	16	402	0	139	501
17	450	0	218	456	17	399	0	140	501
18	450	0	103	457	18	399	0	139	502
19	449	0	105	458	19	400	0	0	501
20	449	0	103	459	20	401	0	2	500
21	169	0	175	458	21	400	0	157	500
22	0	0	0	452	22	371	0	3	499
23	414	0	0	452	23	400	0	185	500
24	443	198	235	457	24	433	0	191	501
25	312	200	102	459	25	451	0	192	502
26	307	199	102	460	26	452	0	0	502
27	300	200	104	462	27	454	0	0	501
28	298	200	171	464	28	450	0	149	502
29	297	200	0	465	29	450	0	148	503
30	302	200	0	465	30	449	0	152	504
31	302	200	233	468					
Total	10,000	1,597	4,632			11,371	3,880	3,154	

Table 10. Diversions to New York City water-supply system.—Continued
(River Master daily operation record)

[Million gallons per day for 24-hour period beginning 0800 local time]

Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2009 to date	Date 2009	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average June 1, 2009 to date
Oct. 1	451	0	149	505	Nov. 1	430	0	0	512
2	452	0	149	505	2	431	0	0	512
3	453	0	0	505	3	431	0	0	511
4	451	0	0	505	4	431	0	0	511
5	449	0	188	506	5	74	0	0	508
6	453	0	149	506	6	98	0	15	505
7	453	0	149	507	7	2	0	0	502
8	451	0	148	508	8	2	0	0	499
9	450	0	144	508	9	0	0	0	496
10	452	0	0	508	10	0	0	0	493
11	452	0	0	508	11	0	0	0	490
12	454	0	171	509	12	0	0	0	487
13	454	0	153	509	13	0	0	0	484
14	450	0	152	510	14	0	0	0	481
15	449	0	154	511	15	0	0	0	478
16	427	0	76	511	16	0	208	254	478
17	426	0	0	510	17	0	298	371	479
18	426	0	0	509	18	1	295	401	481
19	426	0	0	509	19	4	298	410	482
20	426	0	254	510	20	2	298	418	483
21	425	0	264	511	21	0	298	424	485
22	425	0	257	512	22	0	298	424	486
23	425	0	256	514	23	0	298	422	487
24	425	0	256	515	24	0	298	423	489
25	425	0	257	516	25	0	298	205	489
26	424	0	14	515	26	0	298	206	489
27	424	0	0	515	27	0	298	0	488
28	424	0	0	514	28	0	298	0	487
29	430	0	0	514	29	0	298	0	486
30	431	0	0	512	30	0	298	0	485
31	431	0	0	512					
Total	13,594	0	3,340			1,906	4,377	3,973	

Table 11. Daily mean discharge, East Branch Delaware River at Downsville, New York (station number 01417000), for report year ending November 30, 2009. (U.S. Geological Survey published record)

[All values except total are in cubic feet per second, ft^3/s; total in cubic feet per second days, (ft^3/s)-d]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	250	1,200	683	87	87	95	977	721	243	440	98	132
2	200	925	692	87	87	107	924	717	243	441	93	133
3	177	773	694	86	88	106	833	629	243	389	94	133
4	177	717	704	84	88	106	654	500	307	277	95	133
5	177	717	599	83	89	107	339	499	577	221	95	133
6	178	711	397	83	90	109	307	374	693	213	95	133
7	177	704	239	85	90	109	174	263	692	214	94	134
8	178	704	182	85	90	109	149	150	693	215	94	134
9	178	704	183	85	90	109	147	150	694	214	95	133
10	178	704	184	139	90	109	146	150	690	214	95	133
11	179	699	184	180	90	109	144	151	680	214	95	134
12	106	692	184	181	90	109	144	151	681	215	95	134
13	206	692	185	180	90	109	143	151	685	215	116	133
14	537	692	185	180	90	110	143	150	689	215	134	134
15	717	696	185	181	90	109	183	147	691	216	132	134
16	717	689	185	181	92	111	594	147	692	215	132	135
17	717	691	185	181	91	112	893	148	627	216	131	118
18	717	692	184	181	92	112	1,250	147	475	211	131	96
19	717	692	186	159	91	215	1,460	147	346	196	130	97
20	717	692	184	125	91	525	1,580	148	253	196	130	97
21	716	689	185	94	91	763	2,780	148	240	138	131	97
22	717	680	172	85	91	450	3,120	148	241	104	131	98
23	717	680	138	85	92	277	2,510	148	242	105	132	98
24	717	680	105	86	92	266	2,180	148	238	106	132	98
25	717	690	87	87	92	204	1,870	148	237	106	132	98
26	717	690	87	87	92	169	1,510	147	238	106	132	98
27	717	680	87	87	91	283	1,330	148	239	109	132	98
28	717	680	87	87	77	365	1,210	144	239	109	132	97
29	784	675		87	72	752	1,010	144	241	109	132	98
30	1,360	668		87	73	979	785	184	241	109	132	98
31	1,540	680		88		918		243	344		132	
Total	16,619	22,278	7,352	3,593	2,659	8,113	29,489	7,390	13,634	6,048	3,624	3,521
Mean	536	719	263	116	88.6	262	983	238	440	202	117	117

Year total 124,320 (ft^3/s)-d

Mean 341 ft^3/s

Table 12. Daily mean discharge, West Branch Delaware River at Stilesville, New York (station number 01425000), for report year ending November 30, 2009. (U.S. Geological Survey published record)

[All values except total are in cubic feet per second, ft^3/s; total in cubic feet per second days, (ft^3/s)-d]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	124	1,460	1,460	202	291	138	1,260	1,480	2,930	792	344	1,350
2	123	1,460	1,460	234	348	190	1,160	1,480	3,050	847	333	1,520
3	122	1,460	1,460	270	743	190	1,030	1,330	2,740	785	336	1,540
4	122	1,460	1,460	276	1,200	190	916	963	2,290	667	336	1,540
5	122	1,460	1,240	276	1,520	190	800	962	1,880	556	336	1,540
6	122	1,460	500	276	1,460	191	700	697	1,640	490	336	1,540
7	122	1,480	273	280	1,450	190	622	313	1,490	474	338	1,540
8	122	1,460	269	281	1,440	189	546	322	1,460	470	592	1,550
9	122	1,460	269	372	1,320	189	535	331	1,480	463	338	1,540
10	126	1,460	269	1,080	756	188	555	331	1,570	463	336	1,420
11	128	1,460	269	2,570	188	186	537	336	1,750	465	548	1,140
12	141	1,460	275	3,140	244	186	537	337	1,730	464	417	963
13	133	1,460	276	2,980	659	186	542	336	1,660	463	524	688
14	188	1,460	276	2,660	1,030	189	667	336	1,560	463	556	484
15	254	1,910	276	2,330	1,380	190	730	336	1,480	463	391	471
16	253	1,970	276	2,010	1,430	193	845	340	1,490	384	332	471
17	376	1,490	276	1,770	1,270	195	1,100	341	1,490	340	331	471
18	753	1,480	276	1,630	702	193	1,390	341	1,490	339	331	471
19	1,150	1,480	275	1,560	173	192	1,610	340	1,480	339	454	471
20	1,430	1,480	273	1,490	111	237	1,590	340	1,480	340	421	473
21	1,450	1,480	270	1,360	111	354	2,450	340	1,480	340	486	471
22	1,460	1,480	271	1,030	107	432	3,300	342	1,480	374	574	471
23	1,460	1,480	272	860	106	435	3,210	343	1,340	380	341	471
24	1,470	1,450	272	330	106	460	2,760	344	799	476	352	471
25	1,470	1,450	272	272	106	456	2,310	344	551	449	345	471
26	1,470	1,450	272	373	105	430	2,120	343	453	389	345	471
27	1,490	1,460	266	764	106	523	1,960	343	389	349	363	471
28	1,490	1,470	234	1,060	98	655	1,770	341	336	343	423	470
29	1,480	1,460		1,110	90	868	1,630	347	338	340	466	471
30	1,460	1,460		999	91	1,220	1,530	346	337	340	588	471
31	1,460	1,460		606		1,280		945	468		985	
Total	22,193	46,370	13,537	34,451	18,741	10,905	40,712	15,970	44,111	13,847	13,198	25,892
Mean	716	1,496	483	1,111	625	352	1,357	515	1,423	462	426	863

Year total 299,927 (ft^3/s)-d

Mean 822 ft^3/s

Table 13. Daily mean discharge, Neversink River at Neversink, New York (station number 01436000), for report year ending November 30, 2009.

[All values except total are in cubic feet per second, ft³/s; total in cubic feet per second days, (ft³/s)-d]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	63	211	101	63	68	69	107	111	1,480	119	70	63
2	65	191	101	62	69	82	109	111	811	120	67	63
3	65	189	101	61	69	82	109	112	699	121	67	63
4	65	190	76	62	70	82	109	110	392	121	67	63
5	65	191	61	63	71	82	109	110	185	122	66	62
6	65	191	63	63	69	82	109	110	175	122	66	61
7	64	192	63	63	69	82	109	110	144	122	65	80
8	64	190	62	64	67	82	104	111	116	122	65	97
9	65	188	62	65	67	84	101	112	116	122	65	98
10	65	191	63	63	67	87	101	112	116	122	65	98
11	66	190	63	63	67	82	101	112	116	122	65	96
12	79	191	62	87	66	82	101	112	116	122	65	96
13	149	191	61	101	67	82	101	112	116	122	63	96
14	192	188	62	101	67	82	101	112	116	122	63	98
15	192	203	62	101	67	82	107	112	116	113	63	98
16	192	186	62	79	67	83	110	112	116	88	63	96
17	192	190	63	64	68	402	120	112	116	79	63	96
18	192	192	63	64	68	453	1,290	112	116	78	63	95
19	192	191	62	63	69	77	1,590	112	117	79	63	74
20	192	190	62	63	68	74	919	112	118	79	63	62
21	192	190	62	63	68	92	1,430	112	119	79	63	61
22	191	189	62	63	69	101	879	112	119	79	63	61
23	192	190	60	62	68	101	582	112	119	79	63	61
24	192	189	61	63	69	101	442	113	119	79	64	61
25	192	189	63	63	69	101	392	113	119	79	63	61
26	192	188	63	63	69	94	310	112	119	79	63	61
27	192	188	63	63	69	97	142	113	119	79	63	60
28	192	189	62	63	54	101	112	114	119	79	64	60
29	201	189		63	46	102	112	114	119	79	63	62
30	278	190		62	46	101	112	123	119	79	63	61
31	232	137		63		102		592	119		63	
Total	4,530	5,864	1,871	2,106	1,987	3,406	10,120	3,959	6,706	3,007	1,992	2,264
Mean	146	189	66.8	67.9	66.2	110	337	128	216	100	64.3	75.5

Year total 47,812 (ft³/s)-d

Mean 131 ft³/s

Table 14. Daily mean discharge, Delaware River at Montague, New Jersey (station number 01438500), for report year ending November 30, 2009. (U.S. Geological Survey published record)

[All values except total are in cubic feet per second, ft^3/s; total in cubic feet per second days, (ft^3/s)-d; e, estimated]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	4,000	12,100	[e]4,960	8,310	6,420	2,390	8,630	7,790	22,200	4,400	2,240	8,990
2	6,630	10,800	[e]5,210	[e]6,540	5,740	2,460	7,450	7,880	17,200	4,460	1,890	8,260
3	6,600	9,530	[e]5,170	[e]5,470	5,850	2,560	6,500	8,090	18,000	4,430	1,890	8,070
4	5,820	8,700	[e]5,060	[e]4,840	9,710	2,550	6,230	7,630	12,800	4,160	1,810	7,060
5	5,370	7,680	[e]4,570	4,720	10,900	2,490	6,000	6,420	10,500	3,770	1,770	6,370
6	4,940	7,900	[e]3,970	4,900	9,480	2,430	4,670	5,750	8,430	2,890	1,700	6,070
7	4,080	8,060	[e]3,950	4,790	9,160	3,220	3,940	5,540	7,540	2,620	1,680	5,860
8	3,870	8,380	[e]3,400	6,500	8,910	3,680	3,660	4,720	6,210	2,560	1,730	5,160
9	4,130	7,780	[e]3,280	21,200	7,940	3,610	5,750	4,770	5,140	2,930	1,750	5,070
10	4,680	7,040	[e]3,700	31,600	7,010	4,200	7,960	4,270	11,100	2,810	2,030	5,150
11	11,700	6,480	[e]3,960	22,400	6,150	4,070	6,440	3,770	24,000	2,840	1,890	5,140
12	40,200	[e]6,310	[e]5,640	21,100	5,240	3,480	7,420	3,510	16,300	2,800	1,820	4,680
13	37,800	[e]6,670	[e]10,300	16,600	4,460	3,480	6,500	3,560	12,400	2,670	1,970	4,280
14	21,000	[e]6,560	[e]12,000	13,300	4,340	3,330	6,560	4,080	11,000	2,450	1,860	4,030
15	15,700	[e]6,020	[e]8,420	11,300	4,570	4,920	7,590	3,530	9,080	2,830	1,820	3,230
16	14,500	[e]5,660	[e]7,090	10,300	4,780	5,660	7,730	2,940	7,540	2,550	1,990	3,420
17	14,000	[e]5,380	[e]6,450	9,720	4,610	10,600	7,280	2,980	6,740	2,540	1,900	3,660
18	12,200	[e]5,180	[e]5,790	9,220	4,420	18,200	10,500	3,730	6,100	2,450	1,960	3,370
19	11,400	[e]5,620	[e]5,560	9,110	3,820	11,600	20,300	3,480	5,620	2,490	1,840	2,980
20	11,000	[e]5,840	[e]5,370	9,980	3,420	8,990	16,500	3,020	5,370	1,990	1,970	4,130
21	10,900	[e]5,620	[e]4,960	8,770	3,670	7,530	22,300	2,820	5,550	1,750	1,960	6,620
22	10,300	[e]5,220	[e]4,530	7,400	4,780	6,870	23,500	2,780	9,490	1,840	1,930	5,490
23	10,100	[e]5,510	[e]4,250	6,650	4,620	5,820	19,100	2,610	13,100	1,830	1,960	4,870
24	9,660	[e]5,790	[e]4,170	6,300	4,080	4,980	15,100	2,430	10,300	1,870	2,190	4,940
25	15,800	[e]4,370	4,470	5,190	3,540	5,050	12,100	2,710	7,830	1,880	10,700	4,810
26	17,300	[e]3,970	4,820	4,850	3,210	4,490	11,200	2,410	6,190	1,870	9,600	4,410
27	13,700	[e]4,600	4,850	4,860	3,030	4,680	12,200	2,260	5,360	2,080	6,480	3,980
28	13,300	[e]4,840	6,190	5,130	3,200	6,050	11,000	2,550	4,940	2,450	6,750	3,650
29	17,800	[e]4,950		5,210	2,650	6,600	9,250	2,660	4,650	3,100	18,400	3,460
30	16,100	[e]5,290		6,870	2,490	12,900	8,260	10,500	5,000	2,660	14,300	3,560
31	13,900	[e]5,330		7,610		11,000		15,700	4,890		10,900	
Total	388,480	203,180	152,090	300,740	162,200	179,890	301,620	146,890	300,570	81,970	122,680	150,770
Mean	12,530	6,554	5,432	9,701	5,407	5,803	10,050	4,738	9,696	2,732	3,957	5,026

Year total 2,491,080 (ft^3/s)-d

Mean 6,825 ft^3/s

Table 15. Diversions by New Jersey; daily mean discharge, Delaware and Raritan Canal at Port Mercer, New Jersey (station number 01460440), for report year ending November 30, 2009.
(U.S. Geological Survey published record)

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

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	79	86	96	91	88	94	95	93	83	92	87	90
2	88	86	95	89	89	93	93	89	59	90	88	75
3	85	86	100	89	90	89	92	89	60	93	93	81
4	87	e87	97	88	81	83	89	88	91	95	93	79
5	88	87	95	87	86	84	88	87	101	92	94	85
6	89	88	94	87	85	84	82	88	97	94	93	80
7	90	63	95	e85	80	49	91	90	92	95	91	73
8	88	64	98	e87	83	66	91	89	97	94	e89	75
9	88	80	95	e85	86	87	90	90	96	94	e89	80
10	89	83	91	e87	90	92	86	89	93	91	93	81
11	81	86	87	e87	85	95	91	88	95	93	92	85
12	-18	85	87	e88	79	91	91	85	97	81	96	82
13	68	85	88	e87	85	94	91	87	101	85	92	76
14	79	87	88	e87	e84	92	66	90	89	87	e89	81
15	80	89	88	e89	e83	92	78	89	90	86	e87	87
16	83	88	88	e90	82	93	87	89	95	87	e85	83
17	73	96	88	91	83	89	82	90	e90	87	e86	77
18	74	95	88	90	86	93	84	90	e90	88	e87	77
19	74	95	87	91	89	89	79	91	e92	86	e87	86
20	65	95	87	91	87	91	86	90	e90	86	e88	82
21	70	96	87	90	72	94	81	93	e92	85	e88	75
22	79	96	88	90	76	95	78	e81	e90	72	e91	80
23	82	96	87	90	84	96	86	e87	24	82	e91	85
24	85	96	88	92	82	95	89	e81	91	103	e84	85
25	76	96	88	92	86	91	86	88	98	93	e68	87
26	80	96	88	93	88	94	87	91	96	89	e69	89
27	83	96	89	92	89	94	83	84	95	83	71	85
28	84	100	90	93	90	96	85	86	70	82	53	82
29	85	90		90	89	96	84	88	76	79	75	80
30	85	93		82	92	92	85	79	74	87	90	81
31	86	95		87		95		94	83		91	
Total	2,425	2,761	2,537	2,757	2,549	2,778	2,576	2,733	2,687	2,651	2,670	2,444
Mean	78.2	89.1	90.6	88.9	85.0	89.6	85.9	88.2	86.7	88.4	86.1	81.5

Year total 31,568 Mgal

Mean 86.5 Mgal/d

QUALITY OF WATER IN THE DELAWARE ESTUARY

Introduction

This section describes the water-quality monitoring program for the Delaware Estuary during the River Master 2009 report year, December 1, 2008, to November 30, 2009. This program is conducted by the USGS, in cooperation with the DRBC. Selected data collected for this program are presented and water-quality conditions are summarized. The DRBC and others use these data to assess water-quality conditions and track the movement of the "salt front" in the Delaware Estuary.

Water-Quality Monitoring Program

As part of a long-term program, the quality of water in the Delaware Estuary between Trenton, New Jersey, and Reedy Island Jetty, Delaware, is monitored at various locations (fig. 6). Data on water temperature, specific conductance, dissolved oxygen, and pH were collected by electronic instruments at four sites—Trenton, Benjamin Franklin Bridge (Philadelphia), Chester, and Reedy Island Jetty. Data on turbidity were collected by electronic instruments at three of these sites—Trenton, Benjamin Franklin Bridge (Philadelphia), and Reedy Island Jetty. Monitors at Trenton and Reedy Island Jetty were operated continuously throughout the report year, with the exception of turbidity at Reedy Island Jetty, which began in mid-April 2009. Water-quality monitors at Benjamin Franklin Bridge and Chester were not operated from mid-December 2008 to early April 2009.

The frequency of water-quality sampling was once monthly in each month from March to October at 22 sites between Biles Channel and South of Brown Shoal (sites A–W on fig. 6). These water samples were collected and analyzed by the State of Delaware for the DRBC. At each site, water samples were collected at a single point near the center of the channel near the water surface and analyzed for selected physical properties and chemical and biological constituents, including routine chemical substances, nutrients, and bacteria. These analyses consisted of field measurements and laboratory determinations.

Data obtained from the electronic water-quality monitors are processed and stored in the USGS Water Data for the Nation (NWISWeb) database (*http://dx.doi.org/10.5066/F7P55KJN*). These data are posted online by the USGS in annual water-year summaries for New Jersey and Pennsylvania. Water-quality data for the other sampling sites are not presented in this report but are available from DRBC (*http://www.nj.gov/drbc/*) and STORET (*http://www3.epa.gov/storet/*), an environmental quality database operated by the U.S. Environmental Protection Agency.

Water Quality During the 2009 Report Year

Streamflow

Streamflow has a major effect on the quality of water in the Delaware Estuary. High freshwater inflows commonly result in improved water quality by limiting the upstream movement of seawater and reducing the concentration of dissolved substances. High inflows also aid in maintaining lower water temperatures during warm weather and in supporting higher concentrations of dissolved oxygen. Under

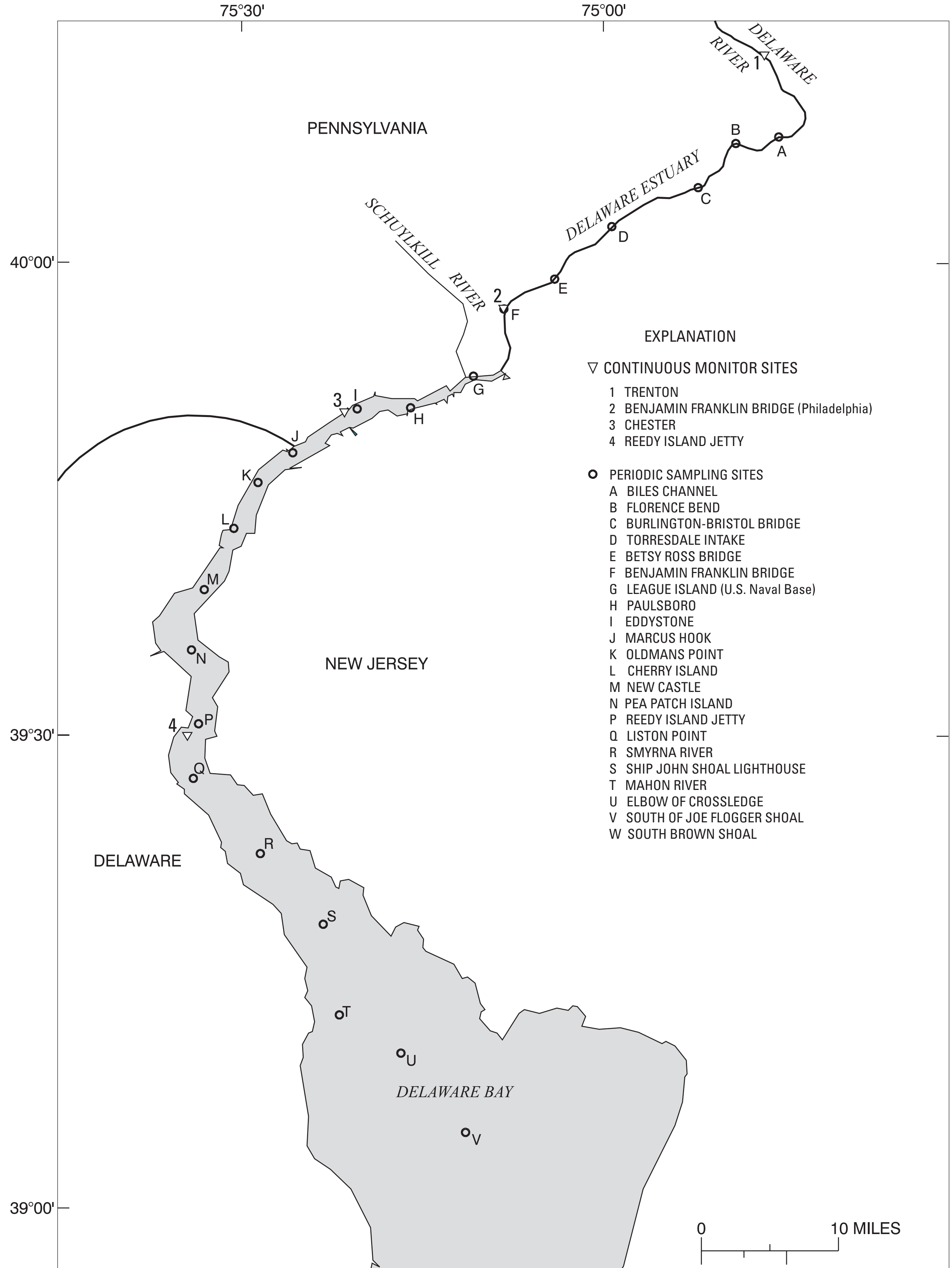


Figure 6. Location of water-quality monitoring sites on the Delaware Estuary.

certain conditions, however, high streamflows can transport large quantities of nutrients to the estuary, which may result in excessive levels of algae.

Streamflow from the Delaware River Basin upstream of Trenton, New Jersey, is the major source of freshwater inflow to the Delaware Estuary. During the report year, monthly mean streamflow measured at the USGS gaging station Delaware River at Trenton, New Jersey, was highest during December 2008 (26,700 ft^3/s) and lowest during September 2009 (6,922 ft^3/s; table 16[2]). Monthly mean streamflows were less than long-term mean monthly flows in all months from February to May 2009. The greatest percentage of flow deficiency was in April 2009, when monthly mean streamflow was 52 percent of the long-term mean monthly flow. Long-term monthly mean streamflow was computed on the basis of data for the period from 1913 to 2008. The highest daily mean streamflow during the report year was 85,200 ft^3/s on December 13, 2008. The lowest daily mean streamflow was 4,150 ft^3/s on October 9, 2009.

Water Temperature

Water temperature has an important influence on water quality, as it affects various physical, chemical, and biological properties of water. Generally, increases in water temperature have detrimental effects on water quality by decreasing the saturation level of dissolved oxygen and increasing the biological activity of aquatic organisms. Although the primary factors that affect water temperature in the Delaware Estuary are climatic, various kinds of water use, especially powerplant cooling, also can have substantial effects.

Water temperature data for the monitor site at the Benjamin Franklin Bridge, Philadelphia, Pennsylvania, were collected continuously from April to November 2009. In May 2009, the monthly mean temperature was greater than the long-term mean monthly temperature. Monthly mean temperatures were less than the respective long-term means in all months from June to October and were equal to the long-term means

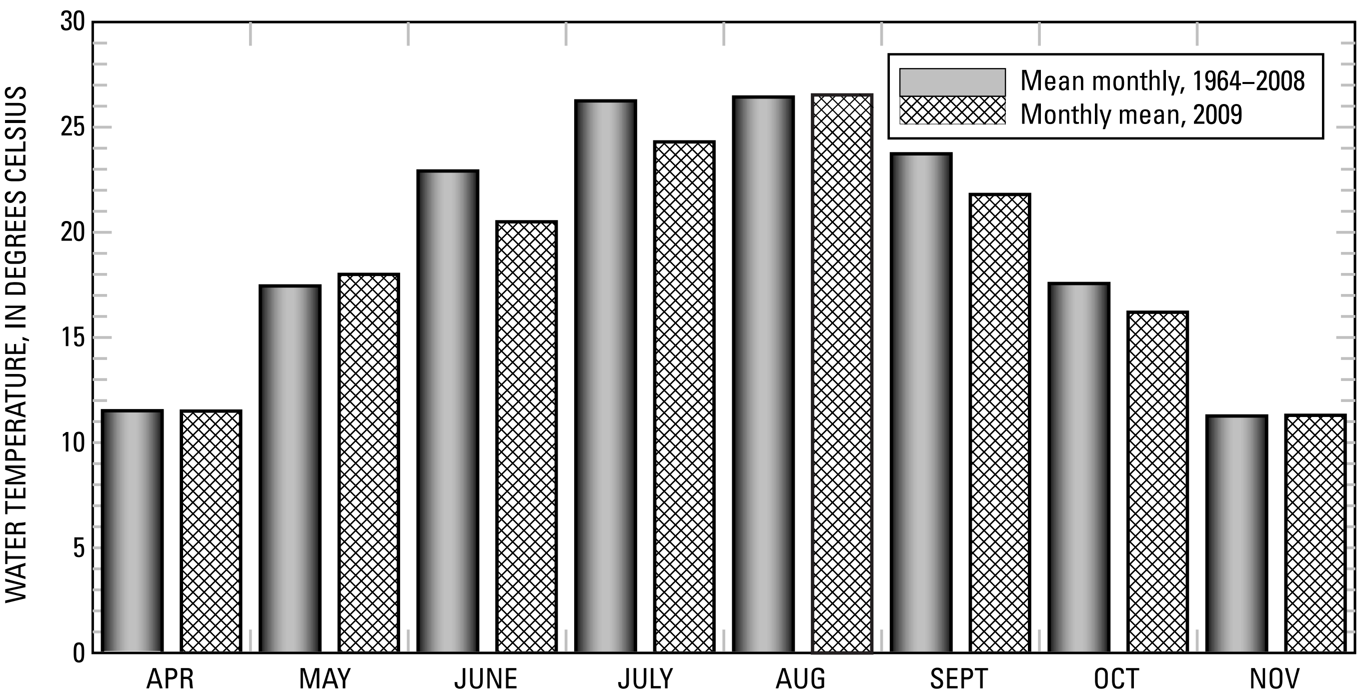


Figure 7. Water temperature in the Delaware Estuary at Benjamin Franklin Bridge at Philadelphia, Pennsylvania, April to November.

[2]All numbered tables in the section "Quality of Water in the Delaware Estuary" are grouped at the end of this section, beginning on page 65.

in April 2009. Long-term mean water temperatures were computed using data for the period from 1964 to 2008 (fig. 7). The maximum daily mean water temperature of 26.7˚C was recorded on August 25, 2009.

Specific Conductance and Chloride

Specific conductance is a measure of the capacity of water to conduct an electrical current and is a function of the types and quantities of dissolved substances in water. As concentrations of dissolved ions increase, specific conductance of the water also increases. Specific conductance measurements are good indicators of dissolved solids content and total ion concentrations. Seawater and some manmade constituents can cause the specific conductance of estuary water to increase substantially. Dilution associated with high freshwater inflows results in decreased levels of dissolved solids and lower specific conductance whereas low inflows have the opposite effect.

The upstream movement of seawater and the accompanying increase in chloride concentrations is an important concern for water supplies obtained from the Delaware Estuary. Water with chloride concentrations greater than 250 milligrams per liter (mg/L) is considered undesirable for domestic use, and water with concentrations exceeding 50 mg/L is unsatisfactory for chemically sensitive consumers and some industrial processes. Chloride concentrations in the estuary increase in a downstream direction, with proximity to the Atlantic Ocean.

Chloride concentration was not measured directly at the monitor site at Reedy Island Jetty, Delaware. Instead, a mathematical relation between specific conductance and chloride concentration, developed on the basis of long-term field measurements of specific conductance and laboratory analyses of chloride, was used to estimate chloride concentrations from specific conductance values. Chloride concentrations estimated from the relation are presented in table 17. The specific conductance-chloride relation is less reliable when chloride concentrations are less than 30 mg/L, because other chemical substances may be present in quantities large enough to affect the relation. Thus, chloride concentrations estimated from specific conductance data are not presented when concentrations of less than 30 mg/L result from the relation. Instead, estimated values less than 30 mg/L are reported as < 30 mg/L. Chloride concentrations at Chester, Pennsylvania (table 18), were measured directly by Kimberly Clark Chester Operations and are not derived from specific conductance data.

At Reedy Island Jetty, the greatest daily maximum chloride concentration was 7,600 mg/L on October 19, 2009 (table 17). Daily maximum chloride concentrations during the report year exceeded 1,000 mg/L on nearly 96 percent of the days. The lowest daily minimum chloride concentration was 52 mg/L on December 31, 2008, and January 1, 2009. Daily minimum chloride concentrations exceeded 1,000 mg/L on nearly 52 percent of the days. From December to May, daily maximum chloride concentrations at Reedy Island Jetty ranged from 290 to 6,300 mg/L. From June to November, daily maximum chloride concentrations ranged from 980 to 7,600 mg/L.

At Chester, the greatest daily maximum chloride concentration was 215 mg/L on December 18, 2008, and January 4, 2009 (table 18). During the report year, daily maximum concentrations exceeded 50 mg/L on 70 percent of the days. The lowest daily minimum chloride concentration was 28 mg/L on December 15-16, 2008; June 28, 30, 2009; and July 4, 16, 2009. Daily minimum concentrations exceeded 50 mg/L on about 29 percent of the days. Chloride concentrations were persistently high from mid-January to mid-March 2009, and during most of October, when daily minimum concentrations exceeded 50 mg/L on most days.

Dissolved Oxygen

Dissolved oxygen in water is necessary for the respiratory processes of aquatic organisms and for chemical reactions in aquatic environments. Fish and many other clean-water species require relatively high dissolved-oxygen concentrations at all times. The major source of dissolved oxygen in the Delaware Estuary is diffusion from the atmosphere, and, to a lesser extent, photosynthetic activity of aquatic plants. The principal factors that affect dissolved-oxygen concentrations in the estuary are water temperature, biochemical oxygen demand, freshwater inflow, phytoplankton, turbidity, salinity, and tidal and wind-driven mixing.

Concentrations of dissolved oxygen at several sites on the Delaware Estuary have been measured since 1961 by the USGS. Two of these sites, Delaware River at Benjamin Franklin Bridge at Philadelphia, Pennsylvania, and Delaware River at Chester, Pennsylvania, have nearly continuous records and are in the reach of the estuary most affected by effluent discharges. For these stations, the mean and minimum daily mean dissolved-oxygen concentrations for the 3-month period of July to September during the 1965–2009 report years are shown in figure 8. Although concentrations have increased considerably over this 45-year period, mean concentrations can vary substantially from year to year.

Concentrations of dissolved oxygen in the Delaware Estuary generally are greatest near Trenton and decrease in a downstream direction. In an area just downstream of the Benjamin Franklin Bridge, concentrations commonly reach minimum levels. During the report year, daily mean concentrations of dissolved oxygen at the Benjamin Franklin Bridge monitor site were lowest in late July, and the lowest recorded daily mean concentration was 4.1 mg/L on July 24 and 26, 2009 (table 19). Daily mean concentrations of dissolved oxygen were consistently 6.0 mg/L or greater on all days from December 1–17, 2008; April 2, 2008, to July 20, 2008; and all days from September 5 to November 30, 2009. At Chester, daily mean dissolved-oxygen concentrations were lowest in late July, and the lowest recorded daily mean concentration was 4.9 mg/L on July 25, 2009 (table 20).

Histograms of half-hourly dissolved-oxygen concentrations at the Benjamin Franklin Bridge and Chester monitor sites during the critical summer period from July to September 2009 are presented in figure 9. Half-hourly concentrations at the Benjamin Franklin Bridge were 4 mg/L or less in about 4 percent of this period. At Chester, half-hourly dissolved-oxygen concentrations were 4 mg/L or less during less than 1 percent of the 2009 critical summer period.

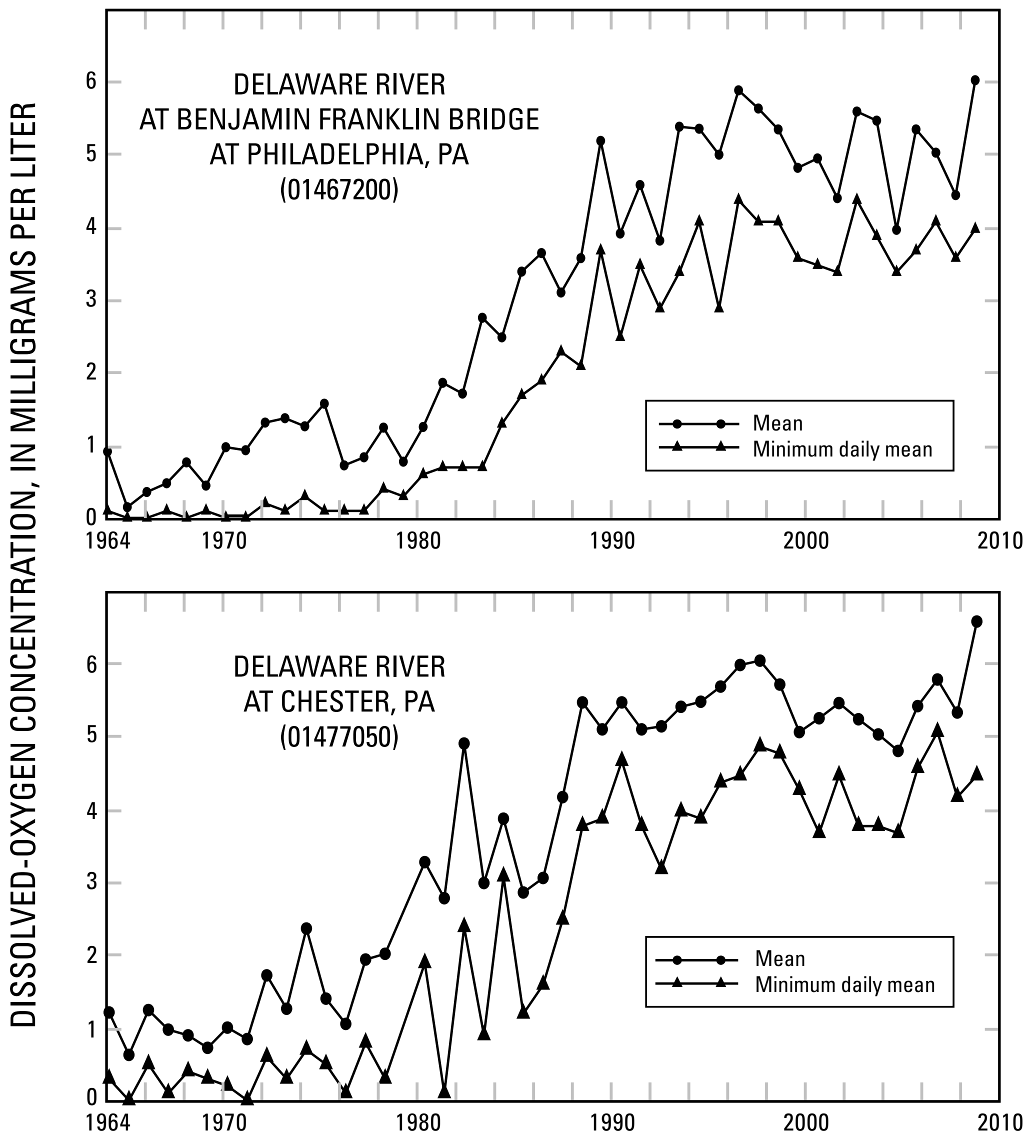


Figure 8. Mean and minimum daily mean dissolved-oxygen concentrations from July to September at two monitor sites on the Delaware Estuary, 1965–2009.

Hydrogen-Ion Activity (pH)

The pH of a solution is a measure of the effective concentration (activity) of dissolved hydrogen ions. Solutions having pH less than 7 are characterized as acidic, whereas solutions with pH greater than 7 are considered basic or alkaline. The pH of uncontaminated surface water generally ranges from 6.5 to 8.5. Major factors affecting the pH of surface water include the geologic composition of the drainage basin and human inputs, including effluent discharges. In addition, photosynthetic activity and dissolved gases, including carbon dioxide, hydrogen sulfide, and ammonia, can have a considerable effect on pH. During the report year, pH was measured seasonally at the Benjamin Franklin Bridge and Chester monitor sites, and continuously at the Reedy Island Jetty site. During these periods, the ranges of daily median pH measured at these stations are as follows: Benjamin Franklin Bridge, 6.9 to 7.5; Chester, 6.9 to 7.6; and Reedy Island Jetty, 7.2 to 8.1. Generally, the pH of water in the Delaware Estuary is lowest near Trenton, New Jersey, and increases (that is, water becomes more alkaline) in a downstream direction. The pH of water in the Delaware Estuary between the Benjamin Franklin Bridge and Reedy Island Jetty is not a limiting factor for aquatic health or other beneficial uses of the water.

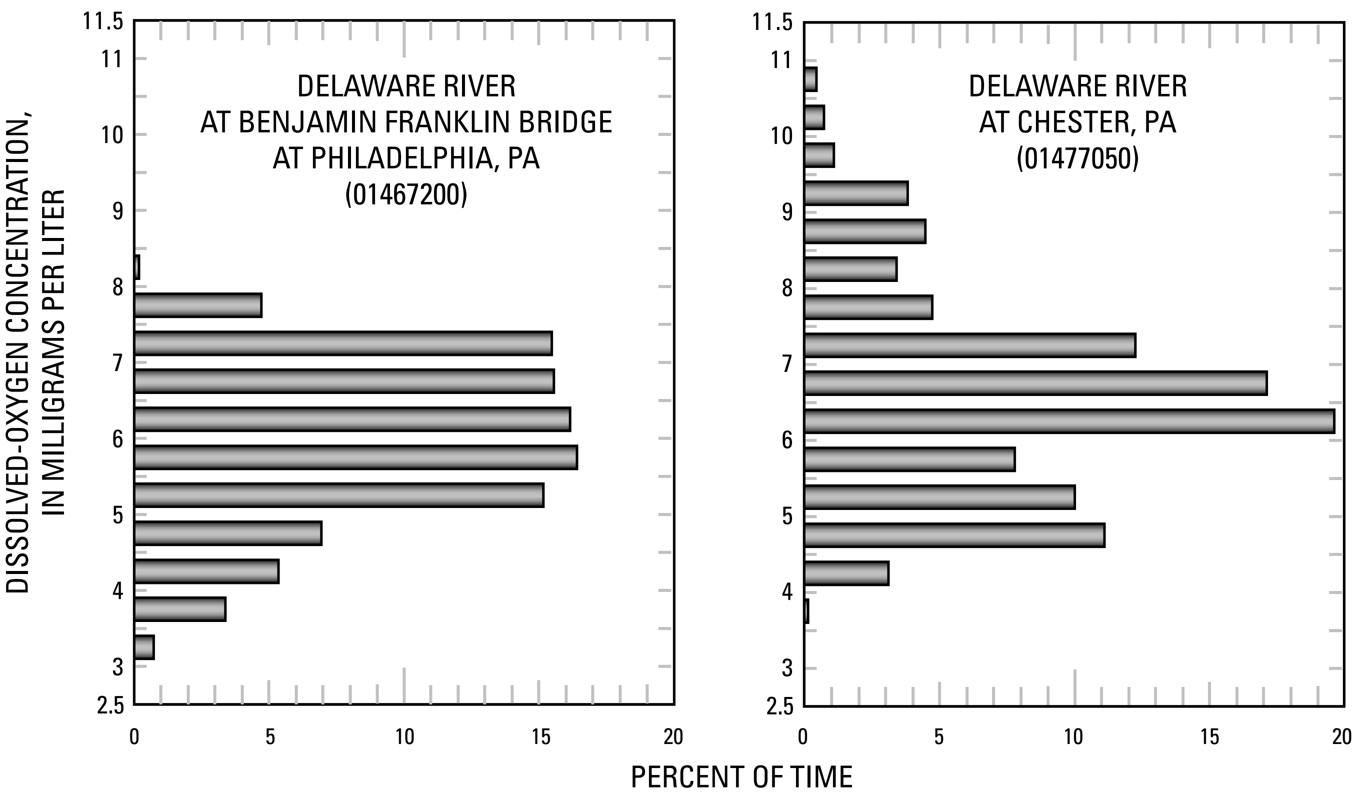


Figure 9. Distribution of half-hourly dissolved-oxygen concentrations at two monitor sites on the Delaware Estuary, July to September 2009.

Table 16. Daily mean discharge, Delaware River at Trenton, New Jersey (station number 01463500), for report year ending November 30, 2009. (U.S. Geological Survey published record)

[All values, except total, are in cubic feet per second, ft^3/s; total in cubic feet per second days, (ft^3/s)-d; e, estimated]

DAY	DEC	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	9,760	26,800	9,800	9,820	12,900	6,480	16,500	16,200	23,400	10,900	6,090	21,900
2	11,500	22,600	9,460	12,200	11,900	6,660	13,800	18,200	39,600	9,790	5,620	18,800
3	13,000	20,200	9,860	11,100	12,400	7,170	12,600	17,100	33,900	9,050	4,990	16,900
4	13,400	18,300	9,630	9,790	16,200	7,600	13,100	15,800	27,900	8,850	4,860	16,200
5	12,300	16,800	8,740	8,800	18,600	9,660	13,200	14,700	20,800	8,310	5,160	14,600
6	11,300	16,200	e8,050	8,830	18,800	9,690	13,500	12,900	17,500	7,790	6,430	13,200
7	10,700	18,800	7,950	9,330	17,500	16,700	11,400	11,500	14,600	7,110	5,510	12,700
8	9,370	21,000	7,820	9,940	16,400	15,100	9,450	11,200	12,900	6,350	4,690	12,000
9	8,450	18,500	9,330	11,300	15,700	13,100	9,060	10,200	11,800	5,860	e4,150	10,700
10	8,770	16,400	8,830	29,500	14,200	11,700	11,600	9,230	11,000	5,880	e4,510	10,300
11	14,100	14,800	9,030	35,400	13,200	10,900	14,800	8,850	16,100	6,700	4,660	10,300
12	62,600	13,800	10,100	28,100	12,400	10,300	14,700	10,600	28,300	9,890	4,780	10,200
13	85,200	13,200	13,200	26,100	10,900	9,600	20,700	10,400	25,800	10,700	4,480	9,650
14	57,500	13,200	19,900	21,400	9,960	9,100	25,100	8,330	26,300	8,270	4,330	9,040
15	40,600	12,800	19,100	18,400	9,880	9,370	21,100	8,400	19,800	6,770	4,510	8,720
16	33,900	e10,800	15,400	16,400	10,600	10,300	20,900	8,010	16,600	6,600	4,750	7,770
17	32,000	e9,160	13,300	15,400	10,300	14,300	20,000	7,020	14,300	6,310	5,390	7,170
18	29,800	e9,580	12,200	14,500	9,710	20,300	19,400	7,300	12,700	6,380	6,180	7,650
19	26,400	e10,100	11,400	13,900	9,210	25,400	32,500	7,430	12,100	6,100	6,150	7,360
20	25,100	e10,000	11,200	13,800	8,700	18,700	36,800	7,320	11,400	6,040	5,540	7,990
21	22,200	e9,820	10,600	14,700	8,810	15,700	34,400	7,010	11,700	5,910	5,040	11,500
22	20,900	e9,990	9,890	13,800	10,300	13,600	38,200	6,540	15,600	5,450	5,000	13,300
23	18,700	e9,760	9,040	12,000	11,100	12,600	36,000	6,940	18,600	4,670	4,800	12,400
24	18,900	e10,500	8,440	10,900	11,000	12,200	30,100	8,310	20,600	5,150	5,960	11,000
25	33,100	e10,100	8,440	10,500	10,000	12,100	24,700	6,880	16,700	4,710	15,600	10,600
26	37,600	8,980	8,120	9,390	9,020	10,800	20,800	6,530	13,800	4,600	19,900	10,200
27	33,700	8,180	8,200	8,970	8,220	9,550	19,800	7,770	11,700	5,250	21,500	9,790
28	30,200	9,380	8,590	8,900	7,770	9,480	20,400	6,750	14,800	6,070	24,600	8,930
29	31,400	9,830		9,270	7,480	11,000	18,400	6,550	15,000	5,980	28,100	8,500
30	34,400	9,930		11,000	6,830	12,700	16,400	7,490	14,700	6,210	34,700	7,980
31	31,000	9,990		12,500		18,100		18,200	12,000		26,900	
Total	827,850	419,500	295,620	445,940	349,990	379,960	609,410	309,660	562,000	207,650	294,880	337,350
Mean	26,700	13,530	10,560	14,390	11,670	12,260	20,310	9,989	18,130	6,922	9,512	11,240

Year total 5,039,810 (ft^3/s)-d

Mean 13,810 ft^3/s

Table 17. Daily maximum and minimum chloride concentrations estimated from values of specific conductance, Delaware River at Reedy Island Jetty, Delaware (station number 01482800), for report year ending November 30, 2009.

[Concentrations in milligrams per liter; Max, maximum value; Min, minimum value]

DAY	DEC		JAN		FEB		MAR		APR		MAY		JUNE		JULY		AUG		SEPT		OCT		NOV	
	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	6,300	3,200	970	52	4,200	1,300	5,200	2,100	5,100	2,200	2,600	1,200	3,200	900	2,300	160	3,400	920	4,700	630	5,200	2,300	3,100	960
2	4,700	2,200	1,800	110	4,000	1,300	5,200	2,400	4,600	1,800	2,600	1,100	2,600	840	2,100	200	2,700	820	4,700	860	5,200	2,500	3,800	840
3	4,900	2,200	890	83	5,000	1,500	5,600	2,200	4,100	2,000	3,100	1,300	3,200	820	2,500	180	2,700	440	4,400	1,300	5,200	2,500	4,300	990
4	4,600	2,100	1,600	57	5,700	1,900	6,000	2,100	3,200	1,700	3,200	1,400	3,400	790	2,800	250	2,200	390	4,800	1,400	4,900	2,500	3,400	820
5	4,600	2,000	2,400	61	4,900	2,000	5,900	2,200	2,800	1,200	3,300	1,300	3,400	840	3,300	330	2,400	330	5,000	1,600	4,900	2,400	3,200	780
6	5,300	2,000	2,800	200	5,800	1,900	5,600	2,300	3,500	1,200	3,200	1,200	3,300	840	3,400	500	2,500	340	4,500	1,700	5,200	2,300	2,800	730
7	5,500	2,100	3,200	460	5,800	1,800	5,300	2,100	3,500	960	3,200	930	3,500	840	3,700	660	2,800	390	5,100	2,000	4,800	2,200	3,900	780
8	5,000	1,800	1,900	280	5,300	2,100	5,300	2,200	2,300	790	2,200	810	3,200	820	3,700	770	2,900	400	5,100	1,900	4,000	2,100	2,400	730
9	5,800	1,900	860	210	4,800	2,000	5,300	2,400	2,400	700	2,100	670	2,900	900	3,700	860	3,000	490	5,000	1,900	5,500	2,100	2,700	670
10	5,500	2,100	2,100	190	4,800	2,000	5,500	2,300	3,100	630	2,200	590	3,200	830	3,800	960	2,700	480	6,400	2,300	4,600	2,100	2,400	660
11	5,100	2,100	2,200	240	5,000	2,000	4,500	2,200	2,400	670	2,000	560	3,400	920	3,500	1,100	2,800	460	6,300	3,100	5,400	2,000	3,900	670
12	4,900	890	2,300	280	4,400	2,000	3,400	1,700	2,700	640	2,300	570	3,000	840	2,900	900	2,900	430	5,600	2,400	5,100	2,300	5,000	1,700
13	2,200	320	2,200	340	2,700	1,500	3,400	1,500	2,800	640	2,700	600	2,600	770	3,100	870	3,100	510	5,900	2,000	4,800	2,300	5,700	2,600
14	1,700	250	1,800	340	3,700	1,600	3,500	1,300	2,600	660	3,100	670	2,700	660	2,800	890	3,000	450	6,100	1,800	6,000	2,400	6,300	2,500
15	750	220	1,400	370	3,200	1,300	3,200	1,200	3,100	740	1,900	570	2,600	590	3,100	840	3,000	390	6,100	2,200	6,600	2,900	5,400	2,400
16	400	200	1,900	330	4,100	1,400	3,000	1,100	4,100	970	2,000	550	2,400	590	2,800	790	3,100	420	6,400	2,400	7,200	3,600	4,800	2,100
17	510	270	2,700	330	4,300	1,300	3,300	1,100	3,600	1,100	2,200	470	2,100	500	3,400	720	3,200	460	6,400	2,600	7,300	3,900	5,000	2,100
18	290	200	3,000	570	4,500	1,600	3,300	960	3,300	1,200	2,900	570	1,800	520	3,800	880	3,200	520	6,100	2,600	7,500	3,700	5,000	2,200
19	460	150	3,300	610	4,500	1,800	3,100	940	3,700	1,500	3,100	600	1,800	370	4,100	930	3,200	540	4,800	2,500	7,600	3,500	4,600	2,100
20	970	130	3,500	790	4,000	1,400	3,700	930	3,400	1,700	3,100	610	1,700	280	4,100	1,000	3,100	580	5,300	2,400	6,800	3,400	4,200	2,000
21	1,300	110	4,200	1,200	3,900	1,200	4,500	1,900	3,500	1,700	3,400	630	1,700	180	4,100	1,100	3,300	650	5,100	2,400	6,600	3,300	4,400	1,700
22	390	110	4,800	1,400	4,500	1,300	4,700	2,200	3,400	1,500	3,200	590	1,700	190	4,000	1,300	2,600	660	4,900	2,400	6,400	3,100	4,700	1,700
23	1,600	230	4,200	1,200	3,600	970	5,000	2,100	3,400	1,500	3,200	570	2,000	140	3,800	1,300	2,300	530	5,000	2,400	6,200	3,100	5,600	2,200
24	2,800	390	4,700	1,500	3,700	750	6,000	2,400	3,000	1,300	3,400	650	1,600	150	4,100	1,400	1,700	510	4,800	2,300	6,800	3,600	6,000	2,700
25	1,800	330	5,000	1,500	5,100	1,000	5,900	2,200	2,700	1,200	3,100	660	1,200	140	3,400	1,300	1,700	420	5,400	2,200	4,900	2,300	5,300	2,100
26	1,600	240	4,700	1,600	4,800	1,500	5,600	2,600	3,100	1,000	2,900	740	1,200	130	3,600	1,400	1,800	410	5,600	2,800	5,400	2,400	6,000	2,600
27	2,200	180	4,500	1,700	4,500	1,900	4,700	2,700	2,700	1,000	3,400	820	990	130	3,000	1,400	2,500	410	5,100	2,900	5,800	2,300	5,700	2,700
28	1,500	170	4,600	2,200	4,000	1,700	4,800	2,500	2,600	1,100	3,300	940	980	140	3,400	1,300	2,300	440	4,200	2,500	5,900	2,600	5,500	2,300
29	930	150	3,700	1,600			5,000	2,400	2,400	1,000	3,400	1,000	1,700	150	3,500	1,300	3,000	470	4,600	2,200	5,300	1,700	5,700	2,400
30	470	97	3,600	1,700			4,700	2,200	2,900	1,200	3,200	1,000	2,000	150	3,200	1,100	2,500	500	5,000	2,100	4,800	1,400	6,200	2,500
31	520	52	3,500	1,600			4,000	2,100			2,900	990			3,000	1,100	3,200	510			3,600	1,100		
Mean	2,700	920	2,900	750	4,500	1,600	4,700	2,000	3,200	1,200	2,900	800	2,400	530	3,400	900	2,700	490	5,300	2,100	5,700	2,600	4,600	1,700
Max	6,300	3,200	5,000	2,200	5,800	2,100	6,000	2,700	5,100	2,200	3,400	1,400	3,500	920	4,100	1,400	3,400	920	6,400	3,100	7,600	3,900	6,300	2,700
Min	290	52	860	52	2,700	750	3,000	930	2,300	630	1,900	470	980	130	2,100	160	1,700	330	4,200	630	3,600	1,100	2,400	660

Table 18. Daily maximum and minimum chloride concentrations, Delaware River at Chester, Pennsylvania (station number 01477050), for report year ending November 30, 2009.
(Record furnished by Kimberly Clark Chester Operations)

[Concentrations in milligrams per liter; ---, missing data; Max, maximum value; Min, minimum value]

DAY	DEC		JAN		FEB		MAR		APR		MAY		JUNE		JULY		AUG		SEPT		OCT		NOV	
	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	65	49	57	49	74	57	65	57	54	39	49	49	57	42	42	35	57	49	46	40	57	49	53	40
2	57	49	57	49	74	65	74	65	142	33	57	49	57	49	42	35	57	57	46	40	57	49	53	46
3	57	57	93	49	199	65	65	57	46	46	57	49	57	42	42	35	57	42	46	40	66	57	46	40
4	65	57	215	49	139	74	65	57	46	33	183	49	57	42	35	28	49	42	53	40	57	49	46	40
5	57	42	57	42	166	83	65	42	46	46	66	49	57	42	35	35	49	35	60	46	57	49	40	40
6	65	42	166	42	83	74	83	57	65	57	114	49	49	42	42	35	42	35	53	40	57	57	46	40
7	65	49	57	42	93	83	65	57	57	57	103	49	49	42	49	35	49	35	53	46	65	57	53	40
8	57	49	57	49	93	88	65	65	152	57	57	49	49	42	49	42	49	42	53	46	57	49	53	40
9	74	49	57	49	103	80	152	65	57	57	57	49	49	42	49	42	42	35	53	36	57	49	46	40
10	65	49	57	49	103	83	90	65	57	57	57	49	49	42	57	42	42	35	46	46	65	57	46	40
11	65	49	57	46	103	83	166	65	152	57	57	49	57	49	49	42	42	42	53	40	57	57	46	40
12	49	35	65	49	198	83	166	65	126	49	57	57	57	42	57	42	42	42	53	46	57	57	38	32
13	49	42	74	57	93	83	57	57	57	49	57	49	57	42	57	42	42	35	53	46	68	57	38	32
14	57	36	74	57	93	74	166	57	57	49	57	49	66	49	35	35	42	35	53	46	60	53	32	32
15	35	28	65	57	93	74	57	57	57	49	126	57	57	42	35	35	42	35	56	49	60	53	38	32
16	35	28	74	57	93	83	57	49	65	57	66	57	49	42	42	28	49	42	56	49	94	60	38	32
17	182	35	83	49	103	93	65	49	152	49	93	57	49	42	49	42	42	35	56	49	85	68	38	32
18	215	35	74	57	93	83	66	49	139	57	65	49	57	49	49	42	57	42	56	49	85	68	46	32
19	35	35	83	49	83	65	57	49	74	57	57	57	103	42	49	42	50	40	56	49	85	60	38	32
20	42	35	83	57	93	83	57	42	93	57	57	49	114	42	42	42	42	35	56	49	68	53	45	32
21	42	42	57	49	198	83	57	---	57	53	57	57	103	42	42	49	42	42	63	49	76	53	45	38
22	57	49	57	49	152	83	---	---	65	49	65	57	49	42	57	42	46	42	56	49	68	60	38	38
23	57	49	83	57	65	57	154	61	57	49	65	57	126	42	49	42	42	42	49	49	60	53	38	38
24	57	49	66	57	66	57	39	33	139	57	114	57	139	42	49	42	42	49	56	49	68	60	38	32
25	65	49	66	57	74	65	46	39	57	49	57	49	57	42	49	49	42	35	56	56	60	53	38	32
26	83	35	152	49	74	65	39	39	139	49	93	49	42	35	49	49	42	35	56	49	53	53	45	38
27	83	35	57	49	166	65	46	39	190	35	66	42	42	35	57	49	40	35	56	49	60	53	38	38
28	66	57	65	57	74	65	154	39	65	57	65	48	42	28	49	42	49	42	57	46	53	46	45	38
29	65	57	83	57			142	39	152	42	57	49	35	35	57	49	53	46	52	49	53	46	45	32
30	57	36	83	57			46	33	152	42	57	42	42	28	57	49	46	46	57	49	53	40	32	32
31	57	49	182	74			78	33			57	42			57	49	46	40			53	46		
Mean	67	44	82	52	109	75	83	51	92	50	72	51	62	41	48	41	46	40	54	46	64	54	43	36
Max	215	57	215	74	199	93	166	65	190	57	183	57	139	49	57	49	57	57	63	56	94	68	53	46
Min	35	28	57	42	65	57	39	33	46	33	49	42	35	28	35	28	40	35	46	36	53	40	32	32

Table 19. Daily mean dissolved oxygen concentration, Delaware River at Benjamin Franklin Bridge at Philadelphia, Pennsylvania (station number 01467200), April 1 to November 30, 2009.
(U.S. Geological Survey published record)

[Concentrations in milligrams per liter; Max, maximum value; Min, minimum value]

DAY	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	---	7.7	7.4	7.0	5.2	5.6	7.0	8.7
2	10.4	7.3	7.2	6.9	5.7	5.7	7.1	8.8
3	10.3	7.1	7.2	7.1	5.4	5.7	6.9	8.7
4	10.1	6.6	6.8	7.2	5.3	5.8	6.8	8.8
5	10.0	6.3	6.2	7.2	5.1	6.1	6.8	8.8
6	9.8	6.1	6.1	7.5	5.0	6.4	6.8	9.0
7	9.5	6.1	6.4	7.4	5.2	6.4	7.1	9.0
8	9.3	6.1	6.5	7.2	5.5	6.3	7.3	9.1
9	9.2	6.1	6.1	7.1	5.6	6.3	7.3	9.1
10	9.2	6.4	6.3	7.4	5.5	6.5	7.2	9.3
11	9.1	6.3	6.0	7.5	5.6	6.7	7.3	9.3
12	9.2	6.2	6.0	7.3	6.1	6.5	7.3	9.5
13	9.4	6.2	6.2	7.0	6.4	6.6	7.3	9.7
14	9.5	6.2	5.9	7.2	6.3	7.0	7.4	9.6
15	9.5	5.9	5.7	7.2	6.5	7.5	7.4	9.7
16	9.3	5.8	5.6	7.5	6.4	7.4	7.5	9.8
17	9.4	5.9	5.6	7.2	6.3	7.2	7.7	9.9
18	9.3	6.1	5.6	6.4	6.2	7.0	7.9	9.7
19	9.5	6.8	5.8	6.3	6.1	7.2	8.1	9.7
20	9.4	7.0	6.0	5.9	6.0	7.5	8.3	9.5
21	9.1	7.2	6.5	5.2	5.8	7.5	8.5	9.4
22	9.0	7.3	7.0	4.9	5.5	7.4	8.5	9.4
23	9.0	7.4	7.3	4.4	5.1	7.2	8.5	9.6
24	9.1	7.7	7.4	4.1	5.2	7.0	8.4	9.5
25	9.0	7.7	7.4	4.2	5.3	7.0	8.6	9.5
26	8.7	7.6	7.1	4.1	5.4	6.7	9.2	9.3
27	8.4	7.4	6.9	4.2	5.6	6.5	9.3	9.3
28	8.3	7.3	6.8	4.3	5.6	6.4	9.0	9.7
29	8.1	7.1	6.8	4.4	5.4	6.3	8.4	9.7
30	7.8	7.1	6.9	4.3	5.4	6.2	8.7	9.6
31		7.3		4.4	5.5		8.8	
Mean	9.2	6.8	6.5	6.1	5.7	6.7	7.8	9.4
Max	10.4	7.7	7.4	7.5	6.5	7.5	9.3	9.9
Min	7.8	5.8	5.6	4.1	5.0	5.6	6.8	8.7

Table 20. Daily mean dissolved oxygen concentration, Delaware River at Chester, Pennsylvania (station number 01477050), April 1 to November 30, 2009.
(U.S. Geological Survey published record)

[Concentrations in milligrams per liter; Max, maximum value; Min, minimum value]

DAY	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV
1	---	8.2	6.4	9.1	---	7.4	6.5	7.7
2	10.2	8.0	6.4	9.3	---	7.8	6.5	7.7
3	9.9	7.7	6.3	9.3	---	8.0	6.5	7.7
4	9.9	7.4	6.1	9.5	5.0	7.8	6.2	7.6
5	10.1	7.2	6.0	9.6	5.3	7.6	6.2	7.6
6	9.9	7.0	6.0	9.8	5.3	7.3	6.3	7.7
7	9.6	7.0	6.0	9.8	5.4	7.1	6.6	7.8
8	9.7	6.9	6.2	9.8	5.4	6.9	6.7	7.8
9	9.6	7.0	6.2	9.5	5.4	6.6	6.8	7.7
10	9.3	7.1	6.1	9.1	5.2	6.6	6.7	7.6
11	9.1	7.1	6.0	8.5	5.2	6.9	6.6	7.7
12	9.0	6.9	5.9	7.9	5.1	6.6	6.7	8.1
13	9.0	7.0	5.8	7.6	5.1	6.2	6.8	8.6
14	8.9	7.2	5.9	7.6	5.4	6.4	6.8	8.6
15	8.9	7.1	6.2	7.7	5.9	6.6	6.9	8.4
16	9.1	6.9	6.7	7.4	6.6	6.5	7.4	8.3
17	9.3	6.9	7.0	7.1	7.2	6.5	7.6	8.3
18	9.1	7.1	7.0	6.6	7.6	6.6	7.8	8.3
19	9.0	7.5	6.8	6.4	7.7	6.4	7.7	8.3
20	9.1	7.6	6.6	6.2	7.5	6.5	7.6	8.2
21	9.1	7.9	6.4	5.9	7.2	6.4	7.5	8.1
22	8.8	8.5	6.7	5.6	6.7	6.4	7.3	8.2
23	8.8	9.0	7.2	5.4	6.3	6.2	7.3	8.4
24	8.8	9.2	7.3	5.1	6.3	6.0	7.6	8.6
25	8.8	9.0	7.5	4.9	6.8	5.9	7.4	8.4
26	8.6	8.6	7.6	5.0	7.0	6.2	7.3	8.2
27	8.5	7.9	7.7	5.1	7.3	6.3	7.3	8.1
28	8.5	7.5	8.0	5.2	7.1	6.4	7.4	8.6
29	8.5	7.2	8.4	5.1	6.7	6.5	7.6	8.7
30	8.3	6.7	9.0	5.3	6.7	6.6	7.9	8.6
31		6.3		5.3	6.9		7.9	
Mean	9.1	7.5	6.7	7.3	6.3	6.7	7.1	8.1
Max	10.2	9.2	9.0	9.8	7.7	8.0	7.9	8.7
Min	8.3	6.3	5.8	4.9	5.0	5.9	6.2	7.6

Appendix A

AGREEMENT

Temporary

IERQ Extraordinary Needs Bank

Releases Program for Summer 2009

In order to more effectively use the 2009 Interim Excess Release Quantity (IERQ) water, the Decree Parties, in accordance with Section 4.d of the Flexible Flow Management Program, hereby agree to the following, for the period beginning June 1, 2009 and ending May 31, 2010:

1. The Montague Flow Objective shall remain at 1,750 cfs, and the 9,300 cfs-days of water otherwise devoted to the 100-cfs summertime increment of the Montague Flow Objective shall be debited from the Interim Excess Release Quantity and designated as an Interim Excess Release Quantity Extraordinary Needs Bank and used in accordance with Paragraphs 2 through 4 hereof.

2. Figure 1 shall be revised as attached, to divide the L2 storage zone into two subzones for a portion of the year. The L2 Storage Zone in Figure 1 shall be divided into two subzones for the period beginning June 1 and ending August 31, by a line 43 billion gallons above the L2 (Drought Watch) line. The subzone above the line shall be denoted L2 High, and the subzone below the line shall be denoted L2 Low.

3. A quantity of 6,045 cfs-days of water shall be debited from the Interim Excess Release Quantity Extraordinary Needs Bank, and Table 3 <u>Schedule of Releases With 35 mdg Available</u> shall be temporarily revised as attached, to provide for 2009 increased summertime releases from Cannonsville Reservoir as follows:

    a. For the period June 1 through June 15:

        i. releases shall be 325 cfs when storage is in Zones L1 and L2 High; and

        ii. releases shall be 300 cfs when storage is in Zone L2 Low.

    b. For the period June 16 through June 30:

        i. releases shall be 325 cfs when storage is in Zones L1-b, L1-c and L2 High; and

        ii. releases shall be 300 cfs when storage is in Zone L2 Low.

    c. For the period July 1 through August 31:

        i. releases shall be 325 cfs when storage is in Zones L1-c and L2 High; and

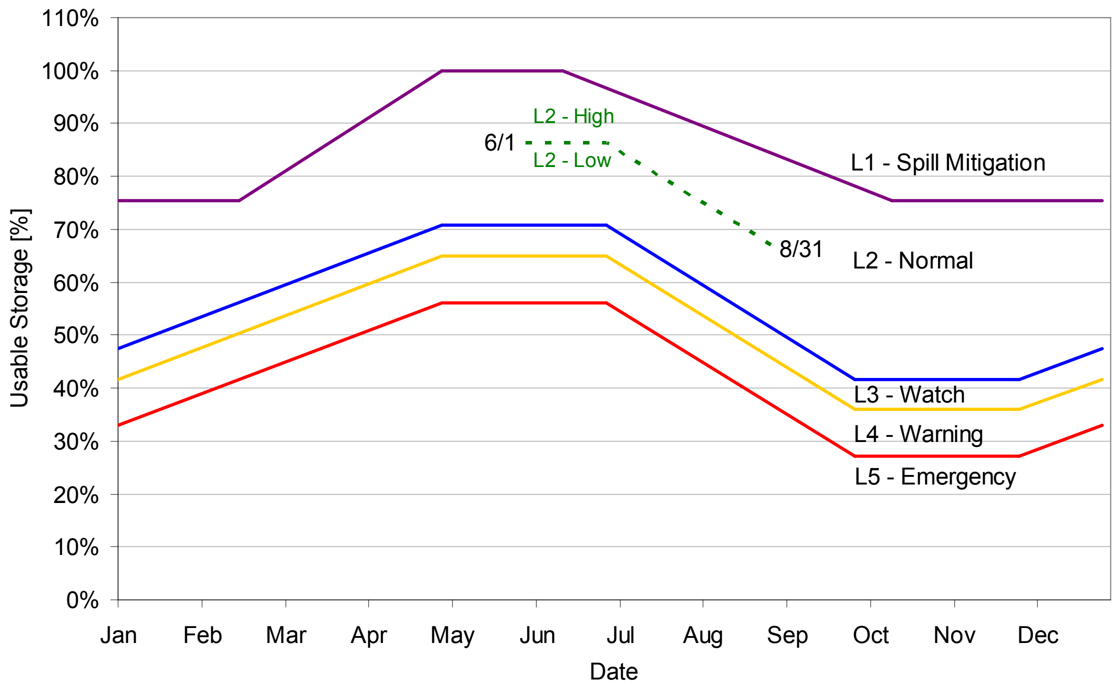
        ii. releases shall be 300 cfs when storage is in Zone L2 Low.

4. A quantity of 3,255 cfs-days of water shall be retained in the Interim Excess Release Quantity Extraordinary Needs Bank for such purposes as may be approved in accordance with Section 4.d of the Flexible Flow Management Program.

<u>APPROVALS</u>:

State of Delaware	Date	State of Delaware	Date
State of New Jersey	Date	State of New York	Date
Commonwealth of Pennsylvania	Date	City of New York	Date

Revised FFMP Figure 1—New York City Delaware System Usable Combined Storage Zones for Temporary IERQ Extraordinary Needs Bank Releases Program for Summer 2009 (Cannonsville, Pepacton, and Neversink Reservoirs).



Revised FFMP Table 3—Schedule of Releases (cfs) with 35 mgd Available for the Temporary IERQ Extraordinary Needs Bank Releases Program for Summer 2009 (Cannonsville, Pepacton, and Neversink Reservoir)

Cannonsville Storage Zone	**Winter**		**Spring**		**Summer**			**Fall**		
	Dec 1 - 31-Mar	Apr 1 - 30-Apr	May 1 - 20-May	May 21 - 31-May	Jun 1 - 15-Jun	Jun 16 - 30-Jun	Jul 1 - 31-Aug	Sep 1 - 15-Sep	Sep 16 - 15-Sep	Oct 1 - 30-Nov
L1-a	1500	1500	*	*	*	1500	1500	1500	1500	1500
L1-b	250	*	*	*	*	*	350	275	275	250
L1-c	110	110	200	250	325/~~275~~	325/~~275~~	325/~~275~~	275	140	110
L2-High	80	80	190	240	325/~~260~~	325/~~260~~	325/~~260~~	260	115	80
L2-Low	80	80	190	240	300/~~260~~	300/~~260~~	300/~~260~~	260	115	80
L3	70	70	100	100	175	175	175	95	95	70
L4	55	55	75	75	130	130	130	55	55	60
L5	50	50	50	50	120	120	120	50	50	50

Pepacton Storage Zone	**Winter**		**Spring**		**Summer**			**Fall**		
	Dec 1 - 31-Mar	Apr 1 - 30-Apr	May 1 - 20-May	May 21 - 31-May	Jun 1 - 15-Jun	Jun 16 - 30-Jun	Jul 1 - 31-Aug	Sep 1 - 15-Sep	Sep 16 - 15-Sep	Oct 1 - 30-Nov
L1-a	700	700	*	*	*	700	700	700	700	700
L1-b	185	*	*	*	*	*	250	200	200	185
L1-c	85	85	110	130	150	150	150	150	100	85
L2-H/L	65	65	100	125	140	140	140	140	85	60
L3	55	55	80	80	100	100	100	55	55	55
L4	45	45	50	50	85	85	85	40	40	40
L5	40	40	40	40	80	80	80	30	30	30

Neversink Storage Zone	**Winter**		**Spring**		**Summer**			**Fall**		
	Dec 1 - 31-Mar	Apr 1 - 30-Apr	May 1 - 20-May	May 21 - 31-May	Jun 1 - 15-Jun	Jun 16 - 30-Jun	Jul 1 - 31-Aug	Sep 1 - 15-Sep	Sep 16 - 15-Sep	Oct 1 - 30-Nov
L1-a	190	190	*	*	*	190	190	190	190	190
L1-b	100	*	*	*	*	*	125	125	85	95
L1-c	65	65	85	100	110	110	110	110	75	60
L2-H/L	45	45	75	90	100	100	100	100	70	45
L3	40	40	50	50	75	75	75	40	40	40
L4	35	35	40	40	60	60	60	30	30	30
L5	30	30	30	30	55	55	55	25	25	25

Appendix B

AGREEMENT
Effective June 1, 2009

Revised FFMP Language to
Address Storage Zone Bouncing

Recent episodes of storage zone “bouncing” — multiple transitions between FFMP reservoir release rates in short periods of time — have resulted in large, frequent variations in streamflow, particularly on the West Branch Delaware River. Improved procedures are needed to avoid automatic adjustment of release rates based only on the storage thresholds incorporated in the rule curves of the FFMP. The Decree Parties Work Group discussed ways to reduce storage zone bouncing and agreed to the following revised language for FFMP Sections 6.a.x. and 17 (third paragraph). These revised procedures are designed to reduce the incidence of storage zone bouncing and to provide for smoother transitions between FFMP release rates.

6. TAILWATERS HABITAT PROTECTION and DISCHARGE MITIGATION PROGRAM (THPDMP)

a. Controlled Releases

x. To more naturally effect downward or upward transitions between discharge mitigation release rates identified in Table 3, discharge mitigation release rates may be ramped, in cooperation with NYSDEC, generally over a period of three days at Cannonsville and Pepacton Reservoirs or two days at Neversink Reservoir.

17. TEMPORARY SUSPENSION MODIFICATION

(Paragraph 3). Modifications to releases not to exceed seven consecutive days for purpose(s) of maintenance or repair of immediate necessity, or to avoid unreasonable fluctuations in releases, shall not require Decree Party approval, but shall be done in cooperation with NYSDEC, provided, however, that releases shall be sufficient to meet the Montague flow objective in effect at the time.

State of Delaware	Date	State of Delaware	Date
State of New Jersey	Date	State of New York	Date
Commonwealth of Pennsylvania	Date	City of New York	Date

Appendix C

Temporary Supplemental Release Program
For Tentative 2009 Rondout West Branch Tunnel Shutdown

In order to perform necessary dive work on a dewatering shaft, the Rondout to West Branch Tunnel (RWBT) is tentatively scheduled to be shut down in the fall of 2009. A final decision has not yet been made on when this work will take place. Once the decision is made to perform the work, the RWBT will be shut down for the minimum period to time required to perform this critical work. In accordance with Section 17 of the Flexible Flow Management Program (FFMP), the New York City Department of Environmental Protection is herein authorized to implement a temporary supplemental releases program for the period ending May 31, 2010.

Shutdown supplemental releases will be made in accordance with Table 1 below and FFMP Table 3 with 35 mgd available and FFMP Figures 1 and 2.

Using a National Weather Service product, the Advanced Hydrologic Predicition Service (AHPS) long-term probabilistic reservoir inflow forecasts, NYCDEP will identify the hydrologic regime expected in the coming months. The conditional (not historical) simulation will be used to better simulate current and expected future hydrometeorological conditions. Based on best professional judgment and to adequately protect water supply, while not being overly cautious, the probability level 0.7 or "70%" forecast will be used. The AHPS forecast will be compared to DEP's historical inflow data and catagorized into very dry (only 10% of historical flows are this low or lower), dry (25%), normal (50%), and wet (75%). NYCDEP will select the category of historical inflow data that conservatively matches the forecast and evaluate operational requirements. Based upon that selection and evaluation, NYCDEP will determine the water supply condition for each reservoir. Acting in cooperation with the NYSDEC, NYCDEP will determine a shutdown supplementary release quantity from Table 1 below for the Cannonsville, Pepacton and Neversink reservoirs. Shutdown supplemental release quantities from each reservoir will be determined individually, based upon each reservoir's water supply condition. This will be the amount of supplemental water that can be released each day, over and above any other programmed releases (e.g. as specified in the FFMP). The shutdown supplementary release quantity will be added to any L1-b, L1-c, or L2 release amounts which may be in effect at the time, in Table 3 of the FFMP. The shutdown supplementary release quantity will not be added to any L1-a, L3, L4 or L5 releases which may be in effect.

Table 1
Shutdown Supplementary Release Quantity (cfs)

Reservoir Water Supply Condition	Cannonsville	Pepacton	Neversink
C1	220	60	20
C2	125	20	10
C3	60	*	*
C4	*	*	*

* No shutdown supplementary release beyond FFMP Table 3.

Under this program, cumulative supplementary water released, beyond that which would have ordinarily been released under the FFMP, will range between 0 and 50 billion gallons, depending upon the water supply condition of the reservoirs over the term of the program. If all reservoirs remain in excellent water supply condition (C1), the total supplementary releases will be approximately 50 billion gallons, substantially exceeding the estimated water not diverted during the shutdown.

Release levels will be reevaluated, generally on a weekly basis, in conjunction with the issuance of updated AHPS probabilistic forecasts.

Authorization under this temporary supplemental releases program shall become effective September 1, 2009 and shall continue until May 31, 2010 unless by unanimous agreement prior to that date the Parties approve a modification, suspension or earlier termination, as conditions may dictate. In the event the RWBT shutdown does not occur, termination of this program by the NYCDEP would not require approval of the other Parties.

City of New York	Date	State of New York	Date
State of Delaware	Date	State of Delaware	Date
Commonwealth of Pennsylvania	Date	State of New Jersey	Date

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