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Report of the River Master of the Delaware River for the Period December 1, 2017–November 30, 2018

Open-File Report 2025–1051

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

Calendar for Report Year 2018

December 2017

S	M	T	W	T	F	S
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31						

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June 2018

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October 2018

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November 2018

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By Kendra L. Russell, William J. Andrews, and Amy R. McHugh

Open-File Report 2025–1051

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

U.S. Geological Survey, Reston, Virginia: 2025

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River Master Letter of Transmittal and Special Report

Office of the Delaware River Master
U.S. Geological Survey
415 National Center
Reston, VA 20192

August 6, 2025

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

The Honorable
Matt Meyer
Governor of Delaware

The Honorable
Phil Murphy
Governor of New Jersey

The Honorable
Kathy Hochul
Governor of New York

The Honorable
Josh Shapiro
Governor of Pennsylvania

The Honorable
Eric Adams
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.

To the Chief Justice of the United States:

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 hereby transmit the 65th Annual Report of the River Master of the Delaware River for December 1, 2017, to November 30, 2018. In this report, this period is referred to as the River Master "report year."

During the 2018 River Master report year, monthly precipitation in the upper Delaware River Basin ranged from 46 percent of the long-term average in December 2018 to 231 percent of the long-term average in August 2018. Precipitation from December to May, when reservoirs typically refill, was 20.51 inches. Precipitation was below normal in December, March, April, May, and June and above normal in the other 7 months.

When the report year began on December 1, 2017, combined useable storage in the New York City reservoirs in the upper Delaware River Basin was 193.230 billion gallons or 71.3 percent of combined storage capacity. Combined storage in Pepacton, Cannonsville, and Neversink Reservoirs decreased in January 2018 and rose to more than 80 percent of combined usable storage in February, remaining above that level through November 2018. The combined usable storage was 264.292 billion gallons at the end of the report year on November 30, 2018.

Throughout the report year, River Master operations were conducted as stipulated by the Decree and the 2017 Flexible Flow Management Program (FFMP2017) through the U.S. Geological Survey (USGS) Office of the Delaware River Master (ODRM) located at Milford, Pennsylvania (Pa.). Kendra Russell, Deputy Delaware River Master, was in charge of the office, assisted by Vincent DiFrenna, hydrologist.

Shortly after the Decree was issued, the River Master established the River Master Advisory Committee (Advisory Committee), which consisted of principal representatives of the Decree Parties to provide advice and counsel regarding River Master operations. During the report year, the following individuals served as members of the Advisory Committee:

Decree Party affiliation	Committee member
Delaware	David Wunsch
New Jersey	Michele Putnam
New York	Mark Klotz
New York City	Paul Rush
Pennsylvania	Tim Schaeffer

During the year, the Deputy River Master participated in two rounds of meetings with individual Advisory Committee members and staff of the Delaware River Basin Commission (DRBC) to introduce new staff and discuss a proposed ODRM 5-year plan of operations. On July 16, 2018, the full Advisory Committee met at New York City construction facilities in Marlborough, New York (N.Y.), with the River Master, Deputy River Master, and staff of the DRBC to discuss the newly drafted 5-year plan and to formulate plans for conducting studies identified in the FFMP2017. The Deputy Delaware River Master also met periodically with representatives of the Decree Parties as a member of the Decree Parties' Work Group and the DRBC's Regulated Flow Advisory Committee.

During the year, the ODRM 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, streamgage, and diversions by New Jersey. The reports were distributed to members of the Advisory Committee and other parties interested in ODRM operations. A monthly summary of hydrologic conditions was also

provided to Advisory Committee members. The weekly hydrologic reports are available through the ODRM website (https://webapps.usgs.gov/odrm/data/data.html).

The first section of this report documents ODRM operations during the report year. During the year, New York City diverted 166.862 billion gallons from the Delaware River Basin and released 306.379 billion gallons from Pepacton, Cannonsville, and Neversink Reservoirs to the Delaware River. A total of 80.566 billion gallons was spilled from the Pepacton, Cannonsville, and Neversink Reservoirs. The ODRM directed releases from these reservoirs to the Delaware River that totaled 8.024 billion gallons.

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

The ODRM's daily operation records were prepared from hydrologic data collected daily. Data for these records were collected and computed by the ODRM or were furnished by the following agencies and utilities: (1) data for streamflow of the Delaware River at Montague, New Jersey, by the USGS New Jersey Water Science Center (WSC) and for other locations and tributaries by the USGS New York and Pennsylvania WSCs; (2) data for Pepacton, Cannonsville, and Neversink Reservoirs by the New York City Department of Environmental Protection (NYCDEP), Bureau of Water Supply; (3) data for Lake Wallenpaupack by Brookfield Renewable U.S.; and (4) data for Rio Reservoir by Eagle Creek Renewable Energy, LLC, including plans for power generation and furnishing data on reservoir releases and elevations. The National Weather Service offices in Binghamton, N.Y., and State College, Pa., provided quantitative precipitation forecasts and some precipitation data. The River Master and staff are grateful for the continued cooperation and support of the Decree Parties and these agencies and utilities.

Sincerely yours,

/Signed/

Joseph P. Nielsen

Acting Delaware River Master

Acknowledgments

The Office of the Delaware River Master's (ODRM) daily operation records were prepared from hydrologic data collected daily. Data for these records were collected and computed by the ODRM or provided by the following agencies and utilities. Data for streamflow of the Delaware River at Montague, New Jersey, and other locations and tributaries were provided by the U.S. Geological Survey (USGS). The New York City Department of Environmental Protection provided data for the Pepacton, Cannonsville, and Neversink Reservoirs. Brookfield Renewable U.S. provided data for Lake Wallenpaupack. Eagle Creek Renewable Energy, LLC, provided data for Rio Reservoir. The National Weather Service offices in Binghamton, New York, and State College, Pennsylvania, provided quantitative precipitation forecasts and some precipitation data. Darwin Ockerman of the USGS assisted and contributed to this report by collecting and organizing data.

Contents

Figures

Tables

Conversion Factors

U.S. customary units to International System of Units

Multiply	By	To obtain
	Length	
inch (in.)	2.54	centimeter (cm)
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)
billion gallons	3.785	cubic hectometer (hm^3)
cubic foot per second accumulated daily ([ft^3/s]-d)	2,447	cubic meter per second accumulated daily ([m^3/s]-d)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
	Flow rate	
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)

Datums

Vertical coordinate information is referenced to the Bureau of Water Supply (BWS) datum, which was established by the New York City Department of Environmental Protection, Bureau of Water Supply.

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83).

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

Abbreviations

BWS	Bureau of Water Supply
DRBC	Delaware River Basin Commission
FFMP	Flexible Flow Management Program
FFMP2017	2017 Flexible Flow Management Program
ft	foot
ft^3/s	cubic foot per second
(ft^3/s)-d	cubic foot per second accumulated daily
HPP	Habitat Protection Program
IERQ	Interim Excess Release Quantity
in.	inch
Mgal	million gallons
Mgal/d	million gallons per day
mi	mile
mi^2	square mile
NAD 83	North American Datum of 1983
N.J.	New Jersey
N.Y.	New York
NYCDEP	New York City Department of Environmental Protection
ODRM	Office of the Delaware River Master
OST	Operational Support Tool
Pa.	Pennsylvania
USGS	U.S. Geological Survey
WSC	Water Science Center

Report of the River Master of the Delaware River for the Period December 1, 2017–November 30, 2018

By Kendra L. Russell, William J. Andrews, and Amy R. McHugh

Executive Summary

A Decree of the Supreme Court of the United States entered June 7, 1954 (*New Jersey* v. *New York*, 347 U.S. 995), established the position of Delaware River Master within the U.S. Geological Survey. In addition, the Decree authorizes the diversion of water from the Delaware River Basin and requires that compensating releases from certain reservoirs owned by New York City be made under the supervision and direction of the River Master. The Decree stipulates that the River Master provide reports to the Court, not less frequently than annually. This report is the 65th annual report of the River Master of the Delaware River. The report covers the 2018 River Master report year, from December 1, 2017, to November 30, 2018.

During the report year, precipitation in the upper Delaware River Basin was 60.39 inches or 136 percent of the long-term average. On December 1, 2017, combined useable storage in the New York City reservoirs in the upper Delaware River Basin was 193.230 billion gallons or 71.3 percent of the combined useable storage capacity of 270.837 billion gallons. The reservoirs had a usable capacity of 99.5 percent on May 31, 2018. Combined storage remained high (above 80 percent combined capacity) and did not decline below 80 percent of combined capacity through November 30, 2018. River Master operations during the year were conducted as stipulated by the Decree and the Flexible Flow Management Program.

Diversions from the Delaware River Basin by New York City and New Jersey fully complied 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 42 days during the report year. Interim Excess Release Quantity banks and conservation releases, designed to relieve thermal stress and protect the fishery and aquatic habitat in the tailwaters of the reservoirs, were also made during the report year.

Introduction

An Amended Decree of the Supreme Court of the United States entered June 7, 1954 (*New Jersey* v. *New York*, 347 U.S. 995; available at https://webapps.usgs.gov/odrm/about/decree), authorizes diversion of water from the Delaware River Basin and provides 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 be made under the supervision and direction of the Office of the Delaware River Master (ODRM). The Decree also stipulates that reports on Delaware River operations be made to the Court not less frequently than annually. The reports can be accessed at https://webapps.usgs.gov/odrm/publications/publications.

This report documents operations of the ODRM from December 1, 2017, to November 30, 2018, or the 2018 River Master report year, hereafter referred to as the "report year." The ODRM operations were guided by a **Flexible Flow Management Program** (FFMP) signed by all of the Decree Parties by October 23, 2017 (Russell and others, 2024). That FFMP was set to expire on May 31, 2023, or, pending successful execution of some of its various provisions, May 31, 2028. A modification and reissuance of "Appendix A (Operations Plan)" of the FFMP on July 16, 2018 (appendix 1 of this report) added clarification to the text, tables, and graphics, with operations fundamentally unchanged. Changes in the "Agreement and Operation Plans (Appendix A)" of both of those FFMP versions are referred to as the 2017 Flexible Flow Management Program (FFMP2017) in this report (app. 1).

Some hydrologic data presented in this report are records of streamflow for U.S. Geological Survey (USGS) data-collection stations. These records were collected and computed by the offices of the USGS at Troy, New York (N.Y.), and Lawrenceville, New Jersey (N.J.), in cooperation with the States of New York and New Jersey and the City of New York. The locations of major streams, reservoirs, and selected USGS streamgaging stations (streamgages) in the Delaware River Basin are shown in figure 1.

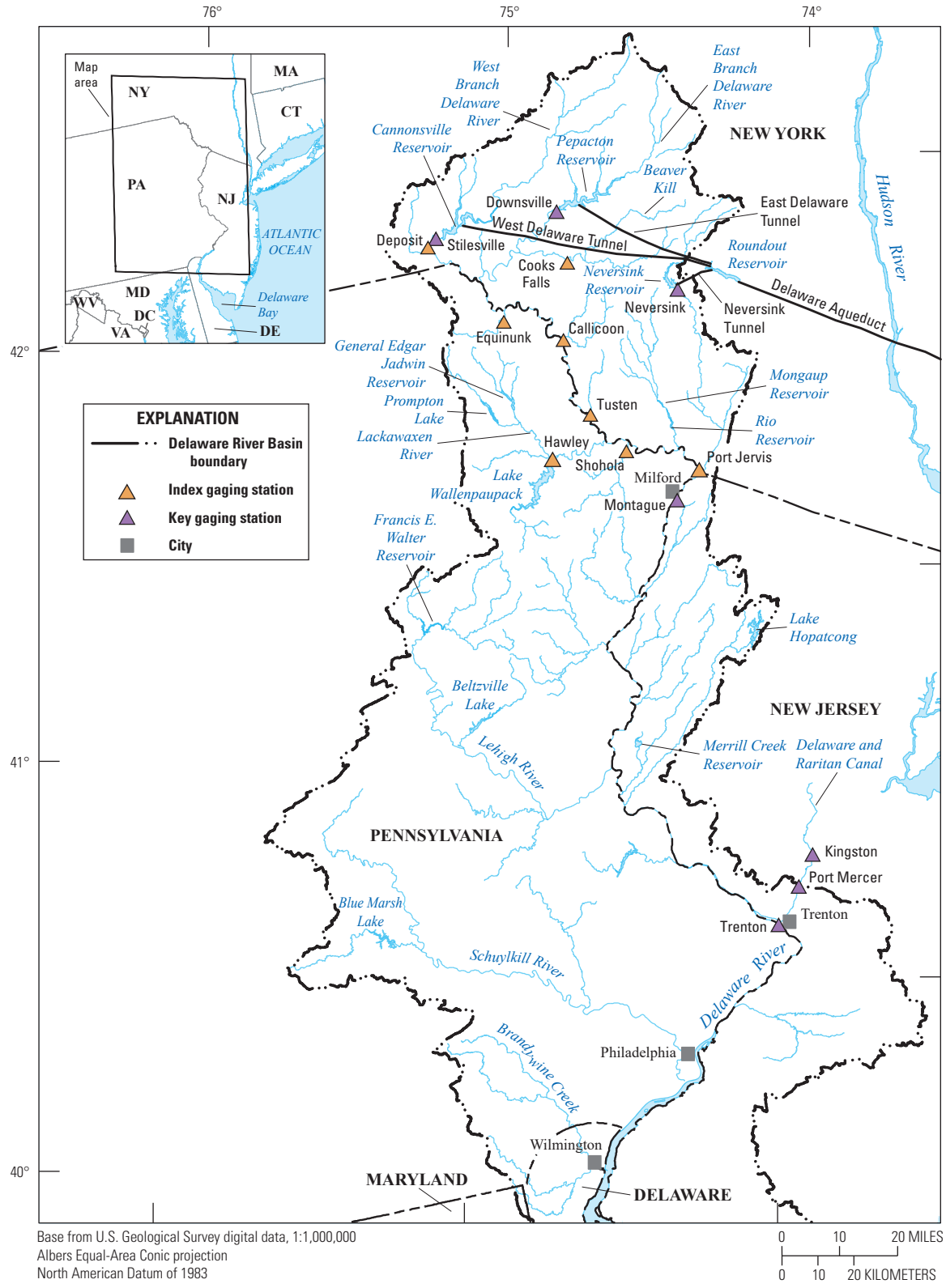

Figure 1. Map showing the Delaware River Basin upstream from Wilmington, Delaware. The Delaware River Basin boundary is shown along with key gaging stations and index gaging stations; refer to the "Glossary" section for definitions.

Method to Determine Directed Releases From New York City Reservoirs

The data and computations of the various streamflow components form the operational record used by the ODRM to carry out responsibilities related to the Montague formula, as specified by the Decree. The operational record has two parts: (1) segregating the streamflow components of the current daily mean discharge at the USGS streamgage at the Delaware River at Montague, N.J. (site number 01438500), referred to as the "Montague site," to compute the **uncontrolled runoff** and (2) forecasting the uncontrolled runoff and using forecasted information from other sources to predict the flow at the Montague site with adequate advance time to direct releases. The forecasting process determines whether the ODRM directs New York City reservoir releases to maintain, at a minimum, the flow objective at the Montague site, which is defined in table 1 of appendix 1.

Segregating Streamflow Components

The segregation of streamflow at the Montague site involves determining the flow components, including releases from New York City's Delaware River Basin reservoirs, releases from Lake Wallenpaupack and Rio Reservoir for generation of hydroelectric power, and uncontrolled runoff. For the segregation of components of daily mean flow at the Montague site, the following data are used:

1. **controlled releases** from the Pepacton, Cannonsville, and Neversink Reservoirs of New York City;
2. controlled releases from Lake Wallenpaupack on Wallenpaupack Creek to produce hydroelectric power; and
3. controlled releases from Rio Reservoir on the Mongaup River to produce hydroelectric power.

To determine the contributions of each of these releases, the amount of time it takes the water to travel from the release point to the Montague site (traveltime) is required. The traveltimes determine the appropriate time-delayed flow contributions from the controlled releases. The time-adjusted controlled releases are subtracted from the total streamflow measured at the Montague site to determine the uncontrolled runoff (including reservoir spills and groundwater) from the drainage area upstream from the Montague site.

The traveltimes were computed from the reservoir and powerplant operations data and historical streamflow records. The traveltimes are adequate for ODRM operations. Occasionally, however, significant exceptions are observed. For example, during a large increase in directed release from Cannonsville Reservoir, the arrival time of the water at the Montague site can be delayed as long as 1.5 days because a substantial amount of water must first fill the channel before a steady flow arrives at the Montague site. During winter, ice formation and lower streamflow gradually increase the resistance to water flow, resulting in increased traveltimes. Because ice-affected traveltimes increase gradually across several days and releases were not directed to meet the **Montague flow objective** during periods of ice, no adjustments were made to compensate for these increased traveltimes during the report year. The average traveltimes, in hours, for the effective travel of water from the various sources of controlled supply to the Montague site were used for flow routing during the report year: Pepacton Reservoir, 60; Cannonsville Reservoir, 48; Neversink Reservoir, 33; Lake Wallenpaupack, 24; and Rio Reservoir, 8. The traveltime used for Lake Wallenpaupack controlled releases, in 2016, changed from 16 hours to 24 hours based on data from Brookfield Renewable U.S.

Forecasting Streamflow

The releases from New York City's reservoirs necessary for meeting the Montague flow objective were computed based on the forecasted streamflow, exclusive of releases from New York City's Delaware River Basin reservoirs. The flow must be forecast 3 days in advance to account for the longest traveltime needed for the flow to reach the Montague site from the New York City reservoirs.

The electric utilities Brookfield Renewable U.S. and Eagle Creek Renewable Energy, LLC, provided daily forecasts of power generation and releases to the Delaware River Basin from Lake Wallenpaupack and Rio Reservoir, respectively, to the ODRM. Because the hydroelectric powerplants were primarily used for meeting rapidly varying peak power demands, those 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 the local service area can unexpectedly affect power-generation schedules. Consequently, the actual release of water for power generation can differ from the forecasts used in the design of reservoir releases.

For computational purposes during low-flow periods, estimates of uncontrolled runoff at the Montague site were treated as two components: (1) current runoff and (2) forecasted runoff from precipitation. An estimate of uncontrolled runoff was computed using a recession procedure. A recession curve of uncontrolled inputs was developed using the discharge at the Montague site and is used to forecast the uncontrolled portion of flow at the Montague site 3 days in advance.

Forecasted runoff was determined using data from the National Weather Service office in Binghamton, N.Y., which provided quantitative forecasts of average precipitation and air temperatures for the 3,480-square-mile (mi^2) drainage basin upstream from the Montague site. During winter, runoff was estimated based on the 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 the Montague site, exclusive of releases from New York City's Delaware River Basin reservoirs, is computed as the sum of forecasted releases from hydroelectric power reservoirs, estimated uncontrolled runoff, including **conservation releases** from Rio Reservoir, and estimated runoff from predicted rainfall. All of these inputs are adjusted for traveltime. If the computed total flow is less than the flow objective at the Montague site, the deficiency is compensated with releases from New York City's reservoirs, as directed by the ODRM.

When updated forecasts of precipitation or hydroelectric powerplant releases showed significant changes after a release was directed, the release required from New York City's reservoirs was recomputed based on the updated forecasts. Commonly, this procedure resulted in a reduced release requirement for the New York City reservoirs that day. Only the final directed release values for New York City reservoirs are presented in this report.

A **balancing adjustment** is applied to **directed releases** based on the performance of the flow forecast beginning June 15 of each year. The balancing adjustment calls for more water to be released when previous directed releases (or a lack of releases) were insufficient to meet the Montague flow objective. The adjustment calls for less water to be released when previous directed releases were higher than required to meet the Montague flow objective. The balancing adjustment is computed as 10 percent of the difference between the cumulative directed release and the cumulative directed release required for exact forecasting and is limited to a maximum of 50 cubic feet per second (ft^3/s). As part of several studies defined in FFMP2017, it was determined that the "Decree Parties shall study, evaluate, and consider the River Master's balancing adjustment procedure" (Parties of the 1954 U.S. Supreme Court Decree, 2017).

A cursory review of the balancing adjustment procedure in 2018 resulted in an immediate proposed refinement. New York City reservoir operations include conservation releases unrelated to flow at the Montague site (refer to the "Habitat Protection Program" section). The conservation releases can be greater than releases directed by the ODRM to meet the flow target at the Montague site. In these instances, the accuracy of the directed release does not affect the operations of the reservoirs and the flow target is met, yet the forecast error is still accumulated and applied in the balancing adjustment. The proposed refinement limits the error accumulation, and the applied adjustment occurs only when directed releases are greater than the conservation releases. The change in the procedure was implemented on July 15, 2018, with a more detailed assessment planned for the following years as part of the "FFMP 2017 Balancing Adjustment Study" (Russell and others, 2024).

Hydrologic Conditions

Precipitation

The sum of the monthly average precipitation across the Delaware River Basin upstream of the Montague site was 60.39 inches (in.) during the report year and was 136 percent of the long-term (77-year) average (table 1). Monthly precipitation ranged from 46 percent of the long-term average in December 2017 to 231 percent of the long-term average in August 2018 (table 1; fig. 2). Precipitation data for the report year were computed from records for five geographically distributed stations: the Pepacton, Neversink, and Cannonsville Reservoirs; Hawley, Pennsylvania (Pa.); and Milford, Pa. These stations were operated by the New York City Department of Environmental Protection (NYCDEP) Bureau of Water Supply, the National Weather Service, and the ODRM.

The seasonal period from December to May is typically when surface-water and groundwater reservoirs refill. For the 2018 report year, total precipitation was 20.51 in., which is 100 percent of the 77-year long-term average (table 1). During the June–November period, total precipitation was 39.88 in., which is about 166 percent of the 77-year long-term average (table 1).

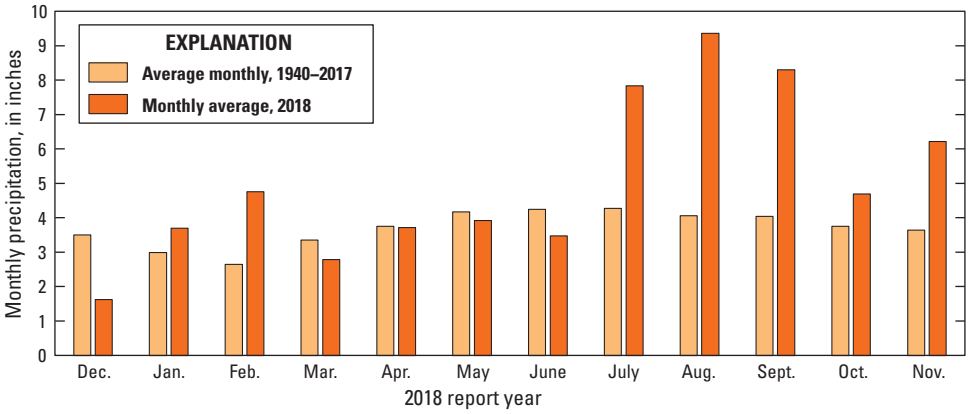

Figure 2. Graph showing monthly precipitation, in inches, in the Delaware Rive Basin upstream of Montague, New Jersey, for the 2018 report year (December 1, 2017–November 30, 2018) compared with the 1940–2017 monthly average.

Reservoir Storage

Pertinent levels and **contents** of the Pepacton, Cannonsville, and Neversink Reservoirs are shown in table 2. The NYCDEP provided this information.

Daily **storage** in the 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, and combined storage during the report year is shown in figure 3. On December 1, 2017, combined useable storage in the three reservoirs was 193.230 billion gallons or 71.35 percent of the combined **capacity** of 270.837 billion gallons. Combined storage increased to about 100 percent of usable capacity during April 7–May 31, 2018. Combined storage remained high (above 80 percent combined capacity) through November 30, 2018. The lowest combined storage was 181.198 billion gallons (67.7 percent of combined capacity) on January 11, 2018; the maximum combined storage was 274.347 billion gallons on April 19, 2018. The combined storage was 264.292 billion gallons (98.8 percent of combined capacity) on November 30, 2018.

The three reservoirs spilled a total of 80.566 billion gallons during the report year when reservoirs reached maximum capacity. The first spill occurred on February 28, 2017, at Neversink Reservoir. Pepacton Reservoir spilled on 85 days, Cannonsville Reservoir spilled on 64 days, and Neversink Reservoir spilled on 132 days (fig. 4).

Table 2. Elevations and capacities of structures of the Pepacton, Cannonsville, and Neversink Reservoirs.

[Sum of all volumes for each reservoir is gross storage, above sill of diversion tunnel is available storage, and at **point of maximum depletion** is usable storage. Reservoir storage volumes were modified based on a survey conducted by the U.S. Geological Survey for the New York City Department of Environmental Protection (Nystrom, 2018). Updated values for report year used starting June 1, 2018. ft, foot; Mgal, million gallons; —, not applicable]

Level description	Reservoir volume (Mgal)			Updated reservoir volume (Mgal), beginning June 1, 2018			Reservoir elevation (ft)		
	Pepacton	Cannonsville	Neversink	Pepacton	Cannonsville	Neversink	Pepacton	Cannonsville	Neversink
Full pool or spillway crest	—	—	—	—	—	—	1,280	1,150	1,440
Point of maximum depletion	[1]140,190	[1]95,706	[1]34,941	[1]139,320	[1]93,448	34,692	1,152	1,040	1,319
Sill of diversion tunnel	[2]3,511	[2]1,020	[2]525	[2]3,468	[2]931	[2]471	1,143	[3]1,035	1,314
Sill of river outlet tunnel	[4]4,200	[4]1,564	—	[4]4,453	[4]1,446	—	1,126.50	1,020.5	1,314
Dead storage	1,800	328	1,680	1,449	179	1,484	—	—	—

[1]This quantity is stored between the full pool or spillway crest and the point of maximum depletion.

[2]This quantity is stored between the point of maximum depletion and the sill of the diversion tunnel.

[3]This elevation is at the mouth of the inlet channel of the diversion works.

[4]This quantity is stored between the sill of diversion tunnel and the sill of the river outlet tunnel.

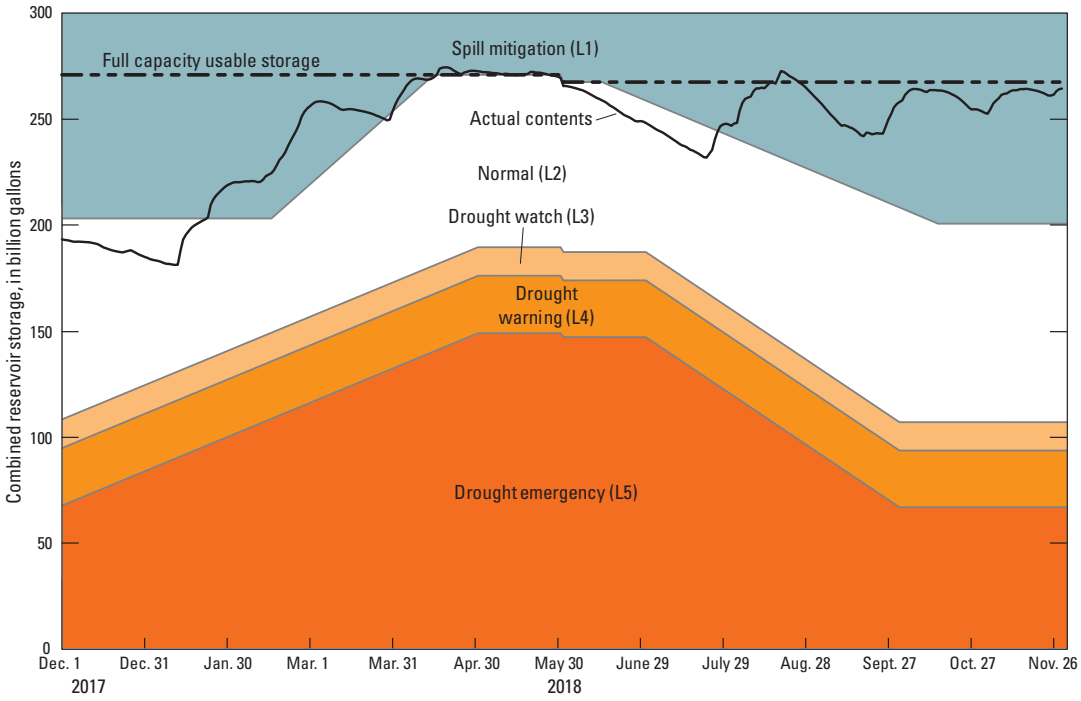

Figure 3. Graph showing rule curves and actual stored water, in billion gallons, for New York City reservoirs in the Delaware River Basin for the report year (December 1, 2017–November 30, 2018). Full capacity usable storage line and the five conservation release rate zones (L1–L5) are shown. The conservation release rate zones are defined in the "conservation release" definition in the "Glossary" section. The total capacities of the Pepacton, Cannonsville and Neversink Reservoirs were updated on June 1, 2018, based on a survey conducted by the U.S. Geological Survey for the New York City Department of Environmental Protection (Nystrom, 2018).

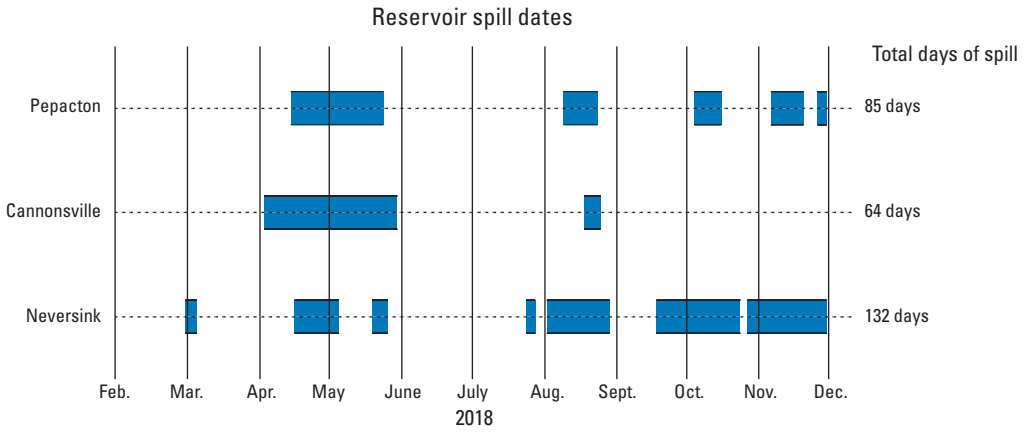

Figure 4. Timeline bar graph showing the reservoir spill dates and total days of spill for when the Pepacton, Cannonsville, and Neversink Reservoirs reached maximum capacity and spilled between February 28 and November 30, 2018.

Operations

Operations from December 1, 2017, through November 30, 2018, were conducted as described by the FFMP2017 (app. 1). The allowable diversion to New York City was 800 million gallons per day (Mgal/d) throughout the year. The Montague flow objective was 1,750 ft^3/s. The allowable diversion to New Jersey was a monthly average of 100 Mgal/d, with a daily maximum of 120 Mgal/d. Conservation releases from New York City reservoirs were made at the rates described in FFMP2017 (app. 1; Russell and others, 2024).

Diversions to New York City Water Supply

The 1954 Amended Decree (*New Jersey* v. *New York*, 347 U.S. 995) 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. Under the FFMP2017, New York City diversion limits are reduced during the "drought watch," "warning," and "emergency" conditions.

The records of daily diversions through the East Delaware, West Delaware, and Neversink Tunnels (fig. 1) were provided to the ODRM by the NYCDEP. These records were obtained from calibrated instruments belonging to New York City that were connected to Venturi meters installed in the tunnel conduits. The flow measurements were transmitted electronically on a 15-second interval to New York City computers; 5-minute interval 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 daily to the ODRM. Each week, the computed diversion values were checked against the flow-meter totalizer readings by the NYCDEP and corrected when necessary.

For the report year, daily diversions from the Pepacton, Cannonsville, and Neversink Reservoirs to the New York City water-supply system (Rondout Reservoir) are given in table 6 and figure 5. A running account of the average rates of combined diversions from the three reservoirs from June 1, computed as stipulated by the Decree, is also shown in table 6 and figure 5. A total of 166.862 billion gallons of water was diverted to the New York City water-supply system during the report year, with a daily average of 457 million gallons (Mgal), which is below the maximum diversion rate (table 6).

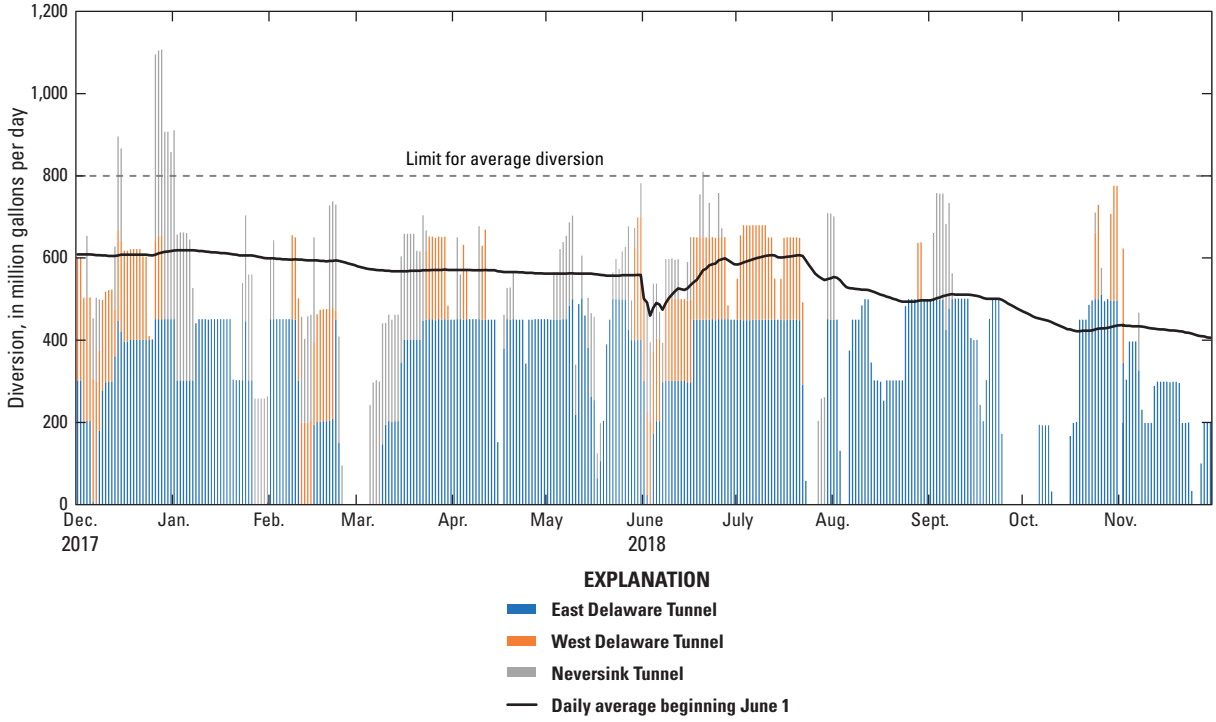

Figure 5. Bar graph showing total daily diversions, in million gallons per day (Mgal/d), from Pepacton, Cannonsville, and Neversink Reservoirs in the Delaware River Basin for New York City water supply and the daily average diversion (computed starting on June 1 of each year) from all three sources for the report year (December 1, 2017–November 30, 2018). The method or combined methods of diversion for each day—East Delaware Tunnel, West Delaware Tunnel, and Neversink Tunnel—are shown. The standard limit for average diversion (800 Mgal/d) is also labeled.

The maximum daily diversion from a single reservoir was 511 Mgal on October 26, 2018, from the Pepacton Reservoir (table 6). The maximum daily combined diversion from all three reservoirs was 1,107 Mgal on December 28, 2017 (table 6). Diversions by New York City did not exceed the limits stipulated by the Decree and FFMP2017. The 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.

In addition to diversions for water supply by New York City, the diversion tunnels serving as conduits for that water can also leak under varying conditions. Such leakages are not included in diversion numbers. The East Delaware Tunnel is used to divert water from the Pepacton Reservoir to the 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 operating, some water leaked through the wicket gates and was not recorded on the totalizer. A current-meter measurement made in 1989 showed that the (assumed constant) leakage rate is about 12.4 ft^3/s (8.0 Mgal/d). Because the powerplant was not in operation for the equivalent of 40 days during the report year, the estimated quantity of unmeasured leakage (diverted but not recorded) was about 0.3 billion gallons.

The West Delaware Tunnel is used to divert water from the Cannonsville Reservoir to the Rondout Reservoir. When the valves were closed, inspections of the channel below the outlet revealed 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 the Neversink Reservoir to the 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 meters. One current-meter measurement made in 1999 showed a leakage rate of 16.2 ft^3/s (10.5 Mgal/d). The leakage is included in the recorded flow when the powerplant is operating. No leakage occurs when the main valve on the tunnel is closed. During the report year, the powerplant operated part of the day on most days and was not operated for the equivalent of 315 days. About 3.3 billion gallons of water was diverted but not recorded, according to the leakage rate noted above and records of powerplant operation.

Diversions by New Jersey

The 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. The Decree specifies that New Jersey diversions shall not exceed 100 Mgal/d as a monthly average, and the daily diversion shall not exceed 120 Mgal/d. Under the FFMP2017 (app. 1), New Jersey diversion limits are reduced during “drought warning” and “emergency” conditions.

The USGS streamgage on the Delaware and Raritan Canal at Port Mercer, N.J. (site number 01460440; fig. 1) is used as the official control point for measuring the diversions by New Jersey. Based on data collected by the USGS at this site, the maximum monthly average diversion was 97.6 Mgal/d in June 2018 (table 8; fig. 6.) (USGS, 2019e). The maximum daily mean diversions were 101 Mgal/d on June 22, 34, 25, and 27, 2018 (table 8; fig. 6). Negative diversion quantities of –122 and –90 Mgal/d on May 27 and November 25, 2018, respectively, indicate the return of diverted water from the Delaware and Raritan Canal back to the Delaware River (table 8; fig. 6). Diversions by New Jersey did not exceed the limits stipulated by the Decree and the FFMP2017 (app. 1).

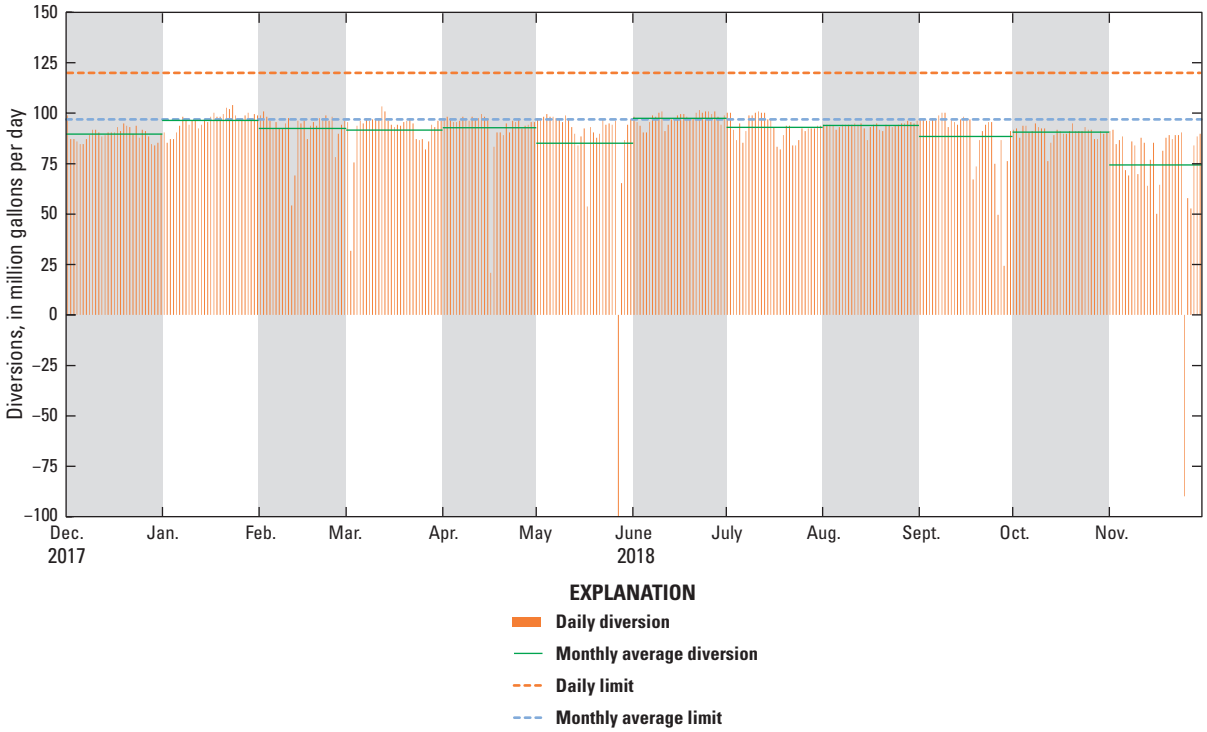

Figure 6. Bar graph showing daily total and monthly average diversions by New Jersey, in million gallons per day, from the Delaware River Basin through the Delaware and Raritan Canal for the report year (December 1, 2017–November 30, 2018). Negative values indicate water returned to the Delaware River. The daily limit and monthly average limit are also shown.

Montague Flow Objective

The components of forecasted flow at the Montague site during low flow—forecasted releases from hydroelectric power reservoirs, estimated uncontrolled runoff (including conservation releases from Rio Reservoir), and forecasted increase in runoff from precipitation—and the sums of flows exclusive of releases from New York City's reservoirs are given in table 9. If the computed sum of the components is less than the Montague flow objective, then the deficiency is made up by releases from New York City's reservoirs, as directed by the ODRM. Table 10 presents the ODRM daily operations record of reservoir releases and segregation of the various components contributing to the flow of the Delaware River at the Montague site.

The forecasted flow of the Delaware River at the Montague site, based on provisional data and exclusive of water released from the New York City reservoirs, was less than the flow objective, and directed releases were required for a total of 42 days. On 2 days in December 2017 and 2 days in July 2018, the observed flow was less than the flow objective (table 10, col. 11) (USGS, 2019d)—all four observed flows were within 16 percent of the flow objective.

The components of the total flow observed at the Montague site for December 1, 2017–January 8, 2018, and June 15–July 26, 2018, are segregated into the portion derived from the New York City reservoirs, the portion contributed by the powerplant reservoirs, and the uncontrolled runoff from the drainage area below the reservoirs in figure 7. As previously described, the uncontrolled runoff was computed as the residual of observed flow minus releases and was subject to errors in the observations, transit times, and routings of the various flow components. The conservation release from the Rio Reservoir is included in the power reservoir contribution.

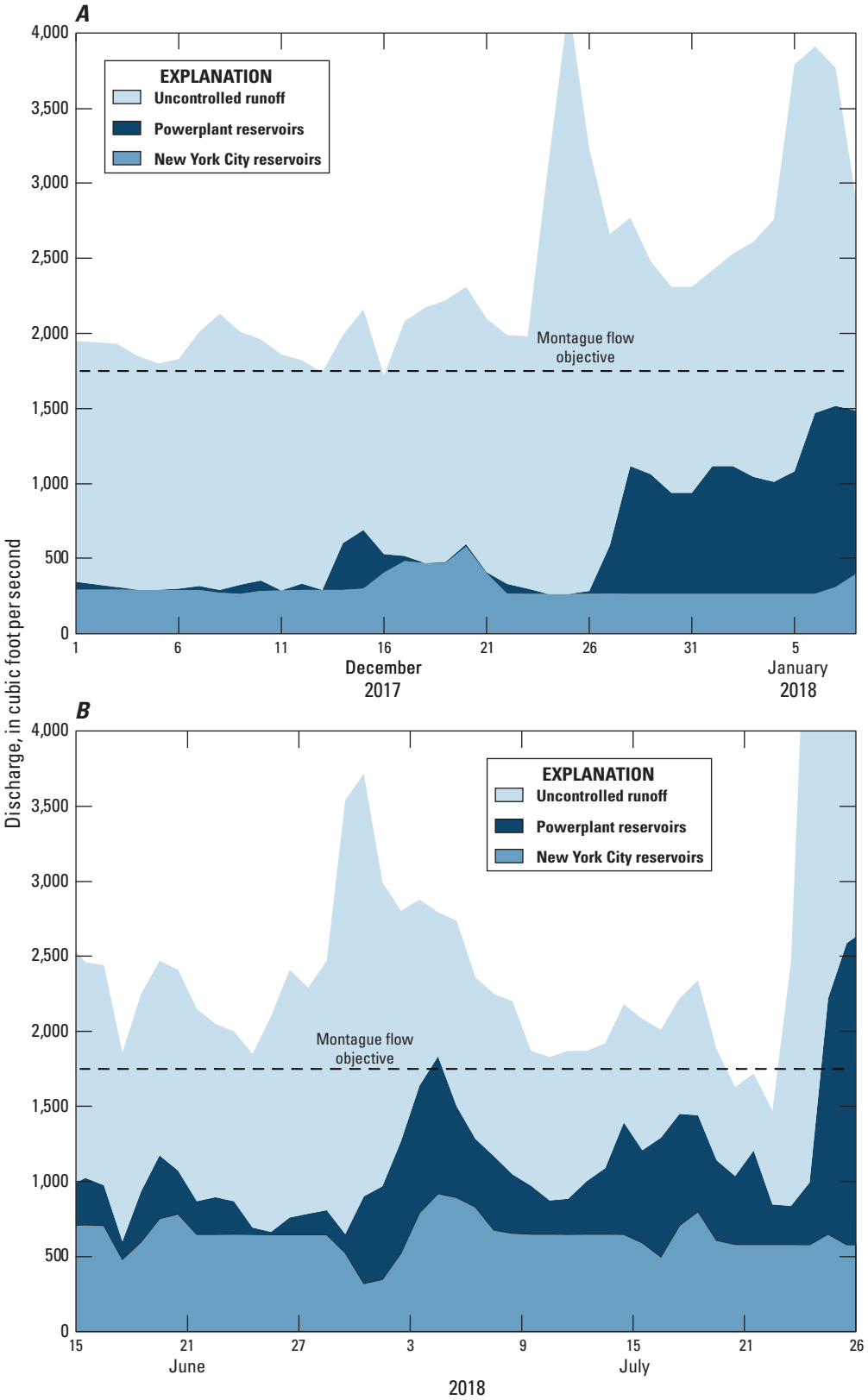

Figure 7. Graphs showing flow components—uncontrolled runoff, powerplant reservoirs, and New York City reservoirs—for the Delaware River at Montague, New Jersey (U.S. Geological Survey, 2019d) from (*A*) December 1, 2017–January 8, 2018, and (*B*) June 15–July 26, 2018. The Montague flow objective is also shown.

Excess Release Quantity and Interim Excess Release Quantity

Per sections 4b and 4c of FFMP2017 (app. 1), the Decree Parties agreed to use the **Excess Release Quantity**, as defined in the Decree, in support of an **Interim Excess Release Quantity** (IERQ). Four IERQ banks of water were established to be used each year to enhance base releases as needed from the New York City reservoirs. Table 10 shows the daily usage of those banks throughout the report year. All bank usages are reset to zero on June 1 of each year. From June 1, 2017, to May 31, 2018, 634 cubic feet per second accumulated daily ([ft^3/s]-d) was released from the rapid flow change mitigation bank (Russell and others, 2024). No other banks were used through May 31, 2018. From June 1, 2018, through the remainder of the report year, the usage for each bank was—

1. Trenton Equivalent Flow Objective: No requests were made, and this bank was not used.
2. Thermal Mitigation: The NYCDEP requested a total of 1,648 (ft^3/s)-d be released to mitigate thermal events affecting fisheries. This amount was released June 17, 2018–July 16, 2018.
3. Rapid Flow Change Mitigation: No requests were made, and this bank was not used.
4. New Jersey Diversion Amelioration: This bank is reserved for use during drought conditions, which did not occur during the report year.

Habitat Protection Program

The FFMP2017 (app. 1) established a Habitat Protection Program (HPP) to protect the cold-water fishery in the basin while maintaining aquatic community diversity, structure, and function through improved ecological flow releases. Conservation releases above the base releases given in table 4a (FFMP2017) are made under the HPP when an assessment by New York City, using its Operations Support Tool (OST) as guidance, determines that additional water is available for releases and that any risk to the New York City water supply is acceptable (app. 1; Russell and others, 2024).

Controlled releases were made from New York City's Delaware River Basin reservoirs in accordance with the FFMP2017. From December 1, 2017, to November 30, 2018, 305.314 billion gallons was released from the New York City Delaware River Basin reservoirs in accordance with the HPP. Release tables 4g, 4f, 4e, and 4d from FFMP2017 (app. 1) were used during the report year as determined by the status of usable reservoir storage and OST guidance (fig. 8; refer to "Archived OST Summary Data" at https://webapps.usgs.gov/odrm/data/data.html).

Section 4d of FFMP2017 (app. 1) established the New Jersey Diversion Offset Bank for use during drought conditions. The bank accumulates in increments according to the release table in use—per the FFMP2017 operations plan—not to exceed 2,300 (ft^3/s)-d. The bank accumulation reached 2,300 (ft^3/s)-d on November 11, 2018; it was not available for use during the report year as drought conditions did not occur.

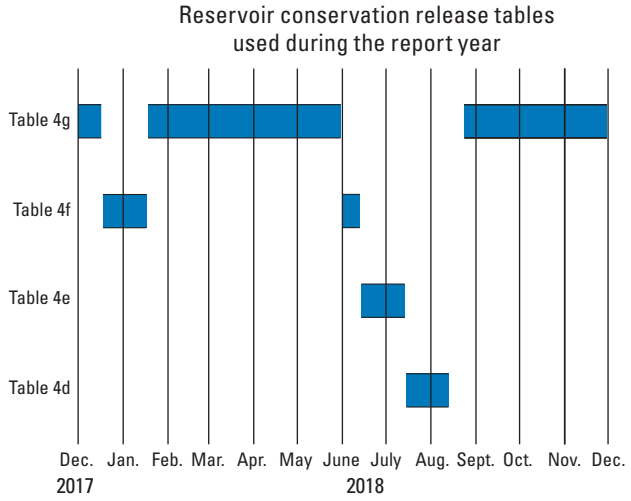

Figure 8. Graphic showing Flexible Flow Management Program 2017 tables used for releases from New York City Delaware River Basin Reservoirs for the report year (December 1, 2017–November 30, 2018) (app. 1).

Comparison of River Master Operations Data With Other Records

The ODRM operations are conducted daily and, by necessity, use preliminary data on streamflow. This section compares forecasted and actual releases for hydroelectric power generation, forecasted versus observed runoff from uncontrolled areas, and records used in the ODRM operations compared with final streamflow data published for selected USGS streamgages. The release data were reported in million gallons per day and converted to cubic feet per second for comparisons.

Analysis of Forecasts

Based on anticipated contributions from the flow components described previously, but excluding releases from New York City reservoirs, forecasted streamflow at the Montague site differed from observed flow on most days. Occasionally, component variations were partially compensating and observed flows are comparable to flows. The forecasted flow of the Delaware River at the Montague site, exclusive of releases from the New York City-reservoirs, was less than the flow objective on 19 days in December 2017, 3 days in January 2018, 10 days in June 2018, and 11 days in July 2018 (table 9).

As described in the "Forecasting Streamflow" section of this report, the forecasted and actual flow releases from hydroelectric power generations can vary due to changes in demand and hydrologic conditions. Forecasted and actual releases from Lake Wallenpaupack and Rio Reservoir can differ considerably on any day. The total actual and forecasted releases from the hydroelectric plants and for the periods when ODRM was directing releases—December 1–26, 2017; January 7–12, 2018; and June 16–July 26, 2018—are shown in table 11. Forecasted releases at Lake Wallenpaupack differed from 1,458 ft^3/s less than to 108 ft^3/s greater than actual releases. Forecasted releases at Rio Reservoir differed from 603 ft^3/s less than to 213 ft^3/s greater than actual releases. Forecasted releases from Lake Wallenpaupack and Rio Reservoir averaged 19 and 22 percent less than the actual releases, respectively. Powerplant forecasted releases are calculated from columns 1 and 2 in table 9; powerplant actual releases are calculated from columns 5 and 6 in table 10.

A comparison of forecasted and computed runoff from the uncontrolled area (table 11 and fig. 9) indicated that the forecasts were generally suitable for use in designing releases from New York City Delaware River Basin reservoirs. Forecasted runoff (columns 3 + 4 in table 9) from the uncontrolled area was 10 percent less than observed runoff (column 10 in table 10). Numerical adjustments to the designs were made when needed to compensate for forecast errors. However, because of traveltimes, the effects of the adjustments on flows at the Montague site were not evident until several days after the design dates.

Based on gaged streamflow at the Montague site, total directed releases from New York City reservoirs during the report year (column 9 in table 9) were about 0.5 percent less than required for exact forecasting (column 11 in table 9).

Releases From New York City Reservoirs

The ODRM operations data of controlled releases from the Pepacton, Cannonsville, and Neversink Reservoirs were provided by the NYCDEP to the ODRM. These data were collected from calibrated instruments connected to Venturi meters installed in the outlet conduits of the reservoirs. In this section, those data are compared with streamflow data observed at three USGS streamflow gaging stations downstream of those reservoirs.

Figure 10 shows the measured flow from the Pepacton, Cannonsville, and Neversink Reservoirs, including spillway, conservation, and directed releases, as reported by New York City, compared with records for the USGS streamgages located downstream of each reservoir (table 11; USGS, 2019a), from December 1, 2017, to November 30, 2018. Table 12 lists the locations of those USGS streamflow gaging stations and descriptions of the discharges measured, upstream drainage areas, records ratings, mean percent differences between New York City and USGS reported daily streamflows, and the 95th percentile of differences between those streamflows.

The mean differences between New York City and USGS reported daily streamflows are 5.7, 5.5, and 9.1 percent; 95 percent of the daily differences between the USGS streamgage readings and New York City records are within 16.2, 16.8, and 31.1 percent, respectively. Large differences rarely occur and can be due to rainfall. Instruments connected to the Venturi meters were recalibrated periodically by New York City to improve the accuracy of the recorded flow data.

Delaware River at Montague, New Jersey

The ODRM operations record for the Delaware River at Montague, N.J. (table 10), showed about 0.02 percent more discharge for the report year than the published USGS record for the streamgage (table 13). Daily values for the two records agreed closely, except during ice-affected periods and the summer vegetation-growth season.

Table 11. Forecasted and actual release volumes from Lake Wallenpaupack, Rio Reservoir, uncontrolled runoff, and directed releases for December 1–26, 2017; January 7–12, 2018; and June 16–July 26, 2018.

[(ft^3/s)-d, cubic feet per second accumulated daily]

Releases and runoff	Forecasted volume ($[ft^3/s]$-d)	Actual volume ($[ft^3/s]$-d)
Lake Wallenpaupack	11,288	13,989
Rio Reservoir	7,652	9,813
Runoff from uncontrolled area	120,295	133,663
Directed releases	12,413	12,351

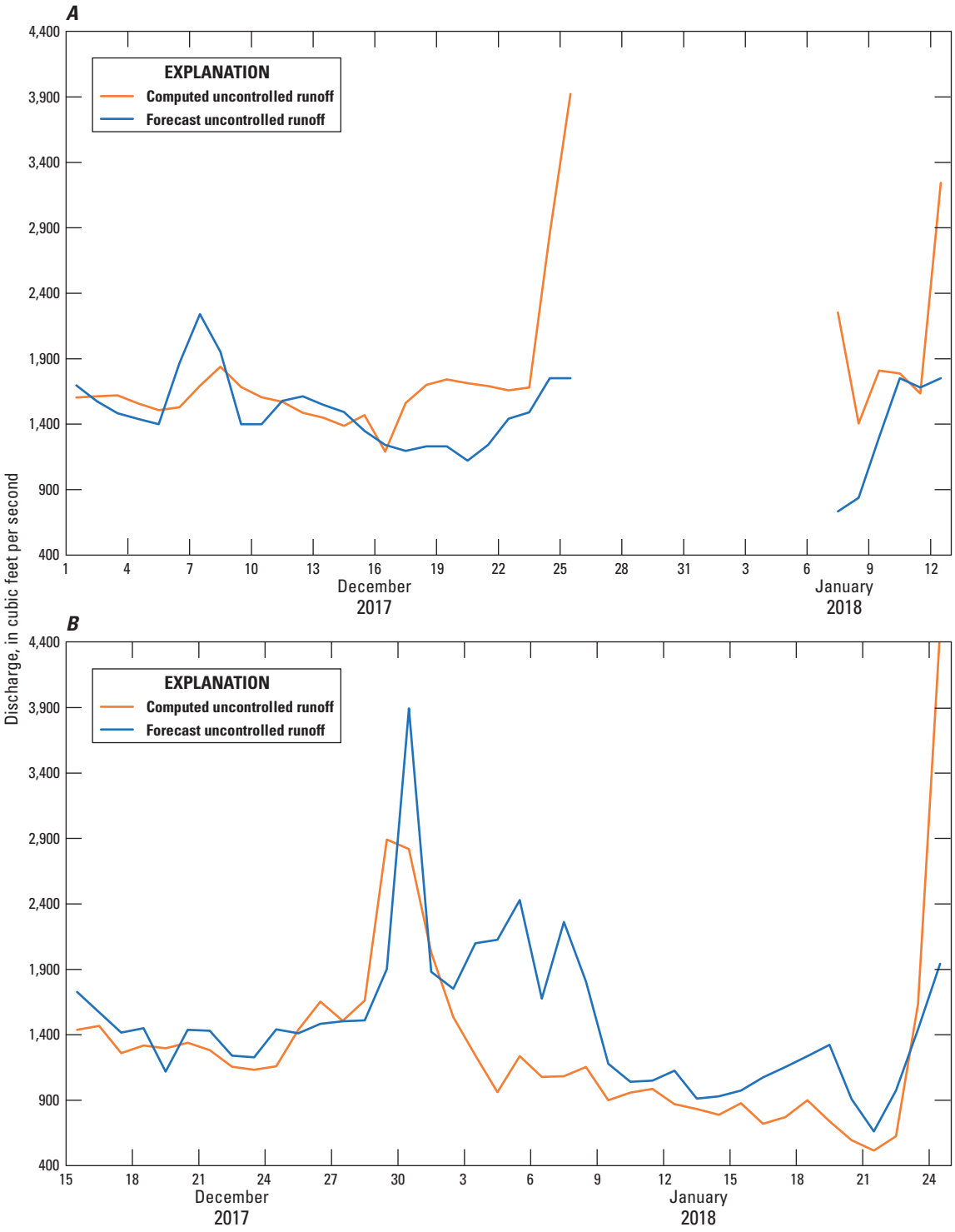

Figure 9. Hydrographs of computed and forecasted uncontrolled runoff components, Delaware River at Montague, New Jersey (U.S. Geological Survey, 2019d), (*A*) December 1, 2017–January 12, 2018, and (*B*) June 15–July 24, 2018. Discharge is shown in cubic feet per second. The forecast uncontrolled runoff was greater than the flow target and not computed December 27, 2017–January 6, 2018.

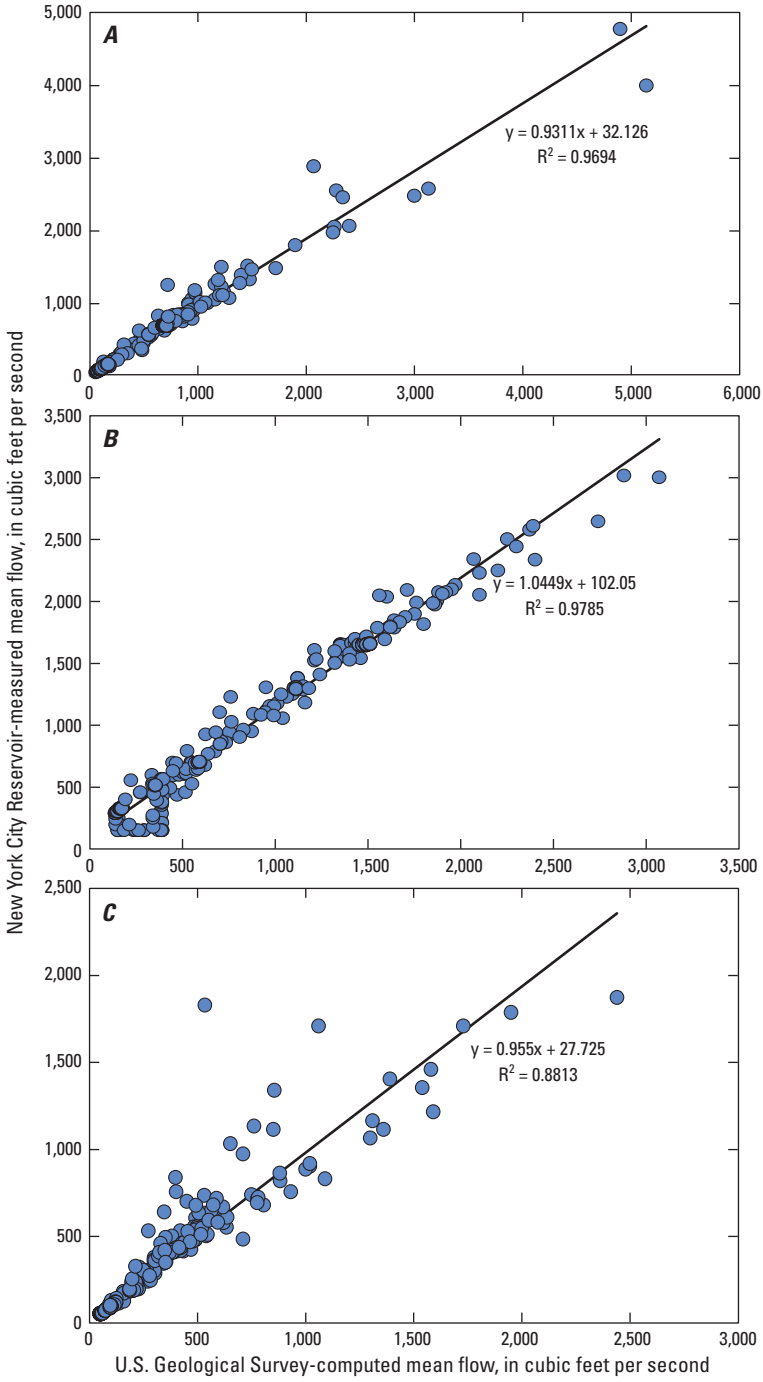

Figure 10. Graphs showing New York City-measured mean flow, in cubic feet per second, compared with computed mean flow records for U.S. Geological Survey (USGS) streamgaging sites downstream from their respective reservoirs: (*A*) East Branch Delaware River at Downsville, New York (N.Y.) (site number 01417000), downstream from Pepacton Reservoir (data from USGS, 2019a); (*B*) West Branch Delaware River at Stilesville, N.Y. (site number 01425000), downstream from Cannonsville Reservoir (data from USGS, 2019b); and (*C*) Neversink River at Neversink, N.Y. (site number 01436000), downstream from Neversink Reservoir (data from USGS, 2019c), December 1, 2017–November 30, 2018.

Table 12. Characteristics of U.S Geological Survey streamflow gaging stations from which measured streamflow data are compared with Office of the Delaware River Master streamflow data, December 2017–November 2018.

[U.S. Geological Survey (USGS) streamflow gaging station records rating of "good" indicates that 95 percent of records are within 10 percent of true discharge, and "fair" indicates that 95 percent of records are within 15 percent of true discharge. %, percent; mi, mile; mi^2, square mile]

USGS streamgaging station name and no.	Drainage area (mi^2)	USGS streamgaging station location	Discharge-type measured	Records rating	Mean difference between New York City and USGS reported daily streamflow data (%)	95th percentile of differences between New York City and USGS reported daily streamflow data (%)
East Branch Delaware River at Downsville, NY, 01417000	372	0.5 mi downstream from Downsville Dam	Releases from Pepacton Reservoir, seepage from the dam, and runoff from 1 mi^2 between the dam and station.	Good	5.7	16.2
West Branch Delaware River at Stilesville, NY, 01425000	456	1.4 mi downstream from Cannonsville Dam	Releases from Cannonsville Reservoir and runoff from 2 mi^2 between the dam and station.	Fair	5.5	16.8
Neversink River at Neversink, NY, 0143600	92.6	0.3 mi downstream from Neversink Dam	Releases from Neversink Reservoir and runoff from 0.1 mi^2 between the dam and the station.	Good	9.1	31.1

Conformance of Operations Under the Amended Decree of the Supreme Court of the United States Entered June 7, 1954

From December 1, 2017, to November 30, 2018, operations of the ODRM were conducted as stipulated by the Decree and the FFMP2017 (app. 1).

The diversions from the Delaware River Basin to the New York City water supply system did not exceed those authorized by the Decree and the FFMP2017. New York City released water from its reservoirs at rates directed by the ODRM to meet the applicable Montague flow objectives. During the report year, New York City complied fully with all directives and requests of the ODRM.

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 ODRM.

The Excess Release Quantity was used in support of the IERQ throughout the report year as defined in the FFMP2017 (app. 1; table 10).

Tables 1, 3–10, 13

Table 1. Precipitation in the Delaware River Basin upstream of Montague, New Jersey.

[Data from the National Weather Service, New York City Department of Environmental Protection, and Office of the Delaware River Master. in., inch; —, not applicable]

Month	Monthly average precipitation (in.) December 1940–November 2017	December 2017–November 2018			
		Precipitation (in.)	Percent of average	Excess (+) or deficit (–) precipitation compared with long-term average	
				Month	Cumulative
December	3.50	1.62	46	–1.88	–1.88
January	2.99	3.70	124	0.71	–1.17
February	2.65	4.76	179	2.11	0.94
March	3.35	2.79	83	–0.56	0.38
April	3.75	3.72	99	–0.03	0.34
May	4.17	3.92	94	–0.25	0.09
June	4.25	3.47	82	–0.78	–0.69
July	4.27	7.84	184	3.57	2.88
August	4.06	9.36	231	5.30	8.18
September	4.04	8.30	206	4.26	12.44
October	3.75	4.69	125	0.94	13.38
November	3.64	6.22	171	2.58	15.97
Total	**44.42**	**60.39**	**136**	—	—

Table 3. Storage in Pepacton Reservoir, New York, for year ending November 30, 2018.

[Delaware River Master daily operations record; gage reading at 0800 hours; data provided by New York City Department of Environmental Protection. Storage is given in millions of gallons (Mgal) above the elevation of 1,152.00 feet (ft). Add 7,711 Mgal before June 1st or 7,921 Mgal thereafter for total contents above sill of outlet tunnel at the elevation of 1,126.50 ft. Storage at spillway level is 140,190 Mgal before June 1st and 139,320 Mgal on or after June 1st. —, not applicable; Mgal/d, million gallons per day; ft^3/s, cubic foot per second]

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.
1	112,185	107,782	118,579	130,972	131,809	140,597	138,070	130,140	129,740	135,280	135,789	134,100
2	112,037	107,476	118,495	131,612	132,773	140,542	137,980	129,720	129,880	134,560	136,530	134,030
3	111,939	107,300	118,293	132,237	133,617	140,468	138,100	129,260	129,910	133,910	137,900	135,390
4	111,857	107,156	118,124	132,541	134,444	140,616	138,200	128,780	133,710	133,190	138,750	137,210
5	111,776	107,044	117,972	132,718	135,475	140,634	138,140	128,280	136,240	132,470	139,390	138,100
6	111,792	106,900	117,770	132,897	136,417	140,579	138,090	127,930	137,450	131,770	139,760	138,710
7	112,021	106,708	117,551	133,078	137,255	140,505	137,980	127,540	137,830	131,340	139,740	139,480
8	112,168	106,532	117,434	133,132	137,784	140,579	137,760	127,100	137,880	130,700	139,630	139,740
9	112,234	106,276	117,199	133,168	138,149	140,542	137,540	126,640	139,320	129,970	139,540	139,870
10	112,135	105,988	116,830	133,078	138,443	140,431	137,280	126,170	139,960	129,260	139,300	140,240
11	112,053	105,653	116,763	132,862	138,590	140,653	137,030	125,660	139,890	129,200	139,320	140,220
12	111,922	105,478	117,484	132,665	138,645	140,486	136,750	125,230	139,960	128,800	139,680	140,070
13	111,726	107,766	118,208	132,629	138,682	140,449	136,480	124,700	139,720	128,340	139,680	140,000
14	111,513	109,705	118,748	132,683	138,921	140,357	136,240	124,220	140,740	128,000	139,700	139,960
15	111,203	110,517	119,240	132,629	139,509	140,227	135,950	123,900	141,350	127,540	139,630	139,830
16	110,908	111,089	119,987	132,505	140,301	140,412	135,720	123,490	140,940	127,034	139,680	139,830
17	110,680	111,447	120,855	132,237	141,894	140,486	135,370	123,000	140,400	126,450	139,440	139,680
18	110,404	111,644	121,643	132,004	141,876	140,653	134,920	122,670	141,530	126,310	139,280	139,550
19	110,176	111,759	122,138	131,702	141,543	140,690	134,560	122,210	142,180	127,030	139,080	139,430
20	109,932	111,824	122,877	131,416	141,153	140,968	134,160	121,780	141,480	126,930	138,650	139,350
21	109,721	111,988	123,739	131,096	140,820	140,857	133,670	121,280	140,920	126,560	138,250	139,210
22	109,526	112,102	124,603	130,848	140,579	140,634	133,240	120,850	140,370	126,520	137,830	139,080
23	109,283	112,266	125,175	130,546	140,320	140,431	132,740	120,760	140,010	126,490	137,280	138,870
24	109,316	114,230	126,149	130,280	140,061	140,320	132,430	121,280	139,720	126,210	136,680	138,670
25	109,251	115,061	127,250	129,890	139,951	140,171	132,130	121,900	139,320	126,210	136,130	138,800
26	109,218	115,742	128,761	129,589	140,190	139,969	131,680	125,210	138,840	127,910	135,550	139,080
27	108,959	116,194	129,731	129,253	140,320	139,767	131,200	127,470	138,380	130,200	134,920	139,960
28	108,733	116,846	130,457	129,042	140,653	139,712	131,000	129,310	137,810	132,110	134,892	140,290
29	108,508	117,451	—	128,778	140,727	139,583	130,880	129,950	137,170	133,982	134,749	140,140
30	108,282	117,888	—	129,095	140,746	139,418	130,550	130,340	136,610	135,060	134,540	139,960
31	108,040	118,208	—	130,635	—	139,160	—	130,090	135,950	—	134,374	—
Change[1]	–4,145	+10,426	+11,878	–337	+8,937	–1,437	–7,520	–50	–6,210	–220	–1,415	+5,860
[2]Equivalent change (Mgal/d)	–134	+336	+424	–10.9	+298	–46.4	–251	–1.6	–200	–7.3	–45.6	+195
[3]Equivalent change (ft^3/s)	–207	+520	+656	–16.9	+461	–71.8	–388	–2.5	–310	–11.3	–70.5	+302

[1]Change is calculated as the storage on the last day of each month minus the storage on the first day of each month. Net change for the year is +27,775 million gallons; minimum and maximum storage for December– May are 105,478 and 141,894 million gallons, respectively; minimum and maximum storage for June–November are 120,760 and 142,180 million gallons, respectively.

[2]The net equivalent change for the year is +76.1 million gallons per day.

[3]The net equivalent change for the year is +117 cubic feet per second.

Table 4. Storage in Cannonsville Reservoir, New York, for year ending November 30, 2018.

[Delaware River Master daily operations record; gage reading at 0800 hours; data provided by New York City, Department of Environmental Protection. Storage is given in millions of gallons above the elevation of 1,040.00 feet. Add 2,584 million gallons before June 1st or 2,377 million gallons thereafter for total contents above sill of outlet tunnel at the elevation of 1,020.50 feet. Storage at spillway level is 95,706 before June 1st and 93,448 million gallons on or after June 1st. —, not applicable; Mgal/d, million gallons per day; ft^3/s, cubic foot per second]

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.
1	49,866	47,669	69,185	90,016	92,755	96,848	92,973	84,772	83,275	89,570	87,319	84,022
2	49,725	47,780	69,609	90,351	94,261	96,768	92,851	84,397	83,318	88,991	87,441	83,663
3	49,562	47,925	69,874	90,640	95,402	96,575	92,622	84,065	83,390	88,443	88,458	84,080
4	49,375	48,047	70,112	90,686	96,398	96,478	92,409	83,821	84,816	87,897	89,035	85,033
5	49,189	48,170	70,443	90,579	97,122	96,414	92,181	83,548	86,328	87,368	89,451	85,570
6	49,037	48,236	70,682	90,397	97,396	96,285	91,923	83,275	87,118	86,840	89,600	86,138
7	48,959	48,236	70,907	90,199	97,573	96,285	91,636	83,018	87,456	86,357	89,615	86,810
8	48,826	48,236	71,132	89,956	97,540	96,205	91,515	82,704	87,853	85,847	89,511	87,177
9	48,781	48,314	71,159	89,667	97,251	96,108	91,200	82,348	88,961	85,265	89,258	87,353
10	48,703	48,414	71,119	89,302	96,945	96,124	90,854	81,978	89,630	84,714	88,932	87,765
11	48,614	48,514	71,172	88,921	96,478	96,189	90,510	81,595	89,719	84,686	88,621	88,414
12	48,526	48,703	71,569	88,465	96,060	96,108	90,166	81,228	90,017	84,512	89,006	88,665
13	48,414	50,811	72,457	88,328	95,867	96,076	89,779	80,847	90,002	84,166	89,080	88,858
14	48,359	53,062	72,854	88,632	95,770	96,012	89,451	80,565	89,913	83,893	89,124	89,288
15	48,114	54,217	73,185	89,028	95,676	95,835	89,065	80,551	90,914	83,333	89,035	89,421
16	47,814	55,152	73,954	89,362	95,615	95,899	88,724	80,270	91,395	82,716	88,961	89,570
17	47,591	56,104	75,141	89,651	96,382	95,947	88,340	79,849	91,515	81,964	88,946	89,555
18	47,336	56,812	76,675	89,910	97,122	95,931	87,853	79,737	92,653	81,482	88,798	89,466
19	47,069	57,325	77,448	90,153	97,669	95,867	87,500	79,597	95,445	81,638	88,576	89,258
20	46,958	57,838	78,498	90,382	98,088	96,173	87,147	79,318	95,852	81,553	88,266	89,095
21	46,924	58,339	80,308	90,549	98,023	96,253	86,810	78,997	95,570	81,411	88,030	88,858
22	46,858	58,778	81,871	90,655	97,396	96,221	86,415	78,690	95,134	81,638	87,691	88,561
23	46,780	59,389	83,504	90,762	96,881	96,382	86,021	78,398	94,745	81,950	87,294	88,133
24	46,869	62,326	84,849	90,640	96,446	96,382	85,715	78,510	94,280	82,063	86,854	87,647
25	47,202	64,033	86,294	90,382	96,108	96,285	85,497	78,746	93,817	82,134	86,255	87,456
26	47,469	65,166	88,057	90,153	96,527	96,140	85,265	80,017	93,356	83,361	85,541	87,514
27	47,447	66,057	89,073	89,910	96,768	96,044	84,917	81,780	92,866	84,368	85,048	88,059
28	47,347	66,847	89,667	89,499	96,929	96,028	84,758	82,490	92,318	85,120	84,967	88,843
29	47,269	67,609	—	88,952	96,929	96,044	84,903	82,932	91,561	86,429	84,981	89,273
30	47,369	68,232	—	88,921	96,848	95,835	84,932	83,132	90,810	87,030	84,772	89,496
31	47,536	68,762	—	90,944	—	95,523	—	83,233	90,211	—	84,440	—
Change[1]	–2,330	+21,093	+20,482	+928	+4,093	–1,325	–8,041	–1,539	+6,936	–2,540	–2,879	+5,474
[2]Equivalent change (Mgal/d)	–75.2	+680	+732	+29.9	+136	–42.7	–268	–49.6	+224	–84.7	–92.9	+182
[3]Equivalent change (ft^3/s)	–116	+1,053	+1,132	+46.3	+210	–66.1	–415	–76.7	+347	–131	–144	+282

[1]Change is calculated as the storage on the last day of each month minus the storage on the first day of each month. Net change for the year is +39,630 million gallons; minimum and maximum storage for December through May are 46,780 and 98,088 million gallons, respectively; minimum and maximum storage for June through November are 78,398 and 95,852 million gallons, respectively.

[2]The net equivalent change for the year is +109 million gallons per day.

[3]The net equivalent change for the year is +168 cubic feet per second.

Table 5. Storage in Neversink Reservoir, New York, for year ending November 30, 2018.

[Delaware River Master daily operations record; gage reading at 0800 hours; data provided by New York City, Department of Environmental Protection. Storage is given in millions of gallons above the elevation of 1,319.00 feet. Add 525 million gallons before June 1st or 471 million gallons thereafter for total contents above the sill of outlet tunnel at the elevation of 1,314.00 feet. Storage at spillway level is 34,941 million gallons before June 1st and 34,692 million gallons on or after June 1st. —, not applicable; Mgal/d, million gallons per day; ft^3/s, cubic foot per second]

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.
1	31,179	29,083	32,222	35,036	32,288	35,090	34,503	33,247	33,833	34,637	34,895	34,771
2	31,225	28,690	32,137	35,145	32,496	35,055	34,707	33,228	34,652	34,587	34,846	34,786
3	31,266	28,381	32,000	35,125	32,496	35,060	34,572	33,199	34,891	34,409	35,031	35,106
4	31,313	28,084	32,037	35,075	32,596	35,011	34,468	33,121	35,256	34,123	34,921	34,986
5	31,193	27,783	32,127	35,060	32,962	34,956	34,374	33,088	35,026	33,813	34,891	34,916
6	31,285	27,460	32,155	34,882	33,211	34,902	34,295	33,068	34,926	33,505	34,836	34,921
7	31,206	27,159	32,160	34,670	33,437	34,843	34,290	33,063	34,851	33,247	34,821	35,031
8	31,090	26,970	32,232	34,463	33,591	34,774	34,231	33,030	34,786	32,972	34,811	34,941
9	31,017	27,000	32,260	34,219	33,736	34,675	34,147	32,996	34,821	32,856	34,801	34,871
10	31,099	27,000	32,307	33,969	33,639	34,552	34,063	32,962	34,801	32,812	34,791	34,941
11	31,155	27,031	32,368	33,756	33,751	34,562	33,980	32,938	34,786	33,218	34,771	34,896
12	31,159	27,094	32,349	33,534	33,872	34,621	33,901	32,870	34,821	33,369	34,961	34,851
13	31,211	29,369	32,373	33,355	34,008	34,596	33,798	32,832	34,811	33,510	34,891	34,861
14	31,085	30,396	32,217	33,173	34,204	34,695	33,818	32,793	35,166	33,705	34,836	34,901
15	30,900	30,693	32,037	32,972	34,557	34,626	33,818	32,769	34,996	33,813	34,821	34,851
16	30,726	30,914	31,981	32,767	34,818	34,645	33,720	32,740	34,891	33,872	34,821	34,876
17	30,762	31,132	32,292	32,557	35,369	34,582	33,573	32,707	34,821	33,896	34,811	34,826
18	30,818	31,299	32,505	32,349	35,199	34,626	33,564	32,687	35,386	34,127	34,781	34,811
19	30,854	31,425	32,647	32,132	35,135	34,611	33,573	32,649	35,016	34,931	34,771	34,816
20	30,914	31,560	32,871	31,911	35,095	35,060	33,456	32,601	34,901	34,886	34,776	34,821
21	30,887	31,681	33,062	31,747	35,075	35,145	33,277	32,562	34,851	34,826	34,766	34,816
22	30,919	31,808	33,269	31,587	35,090	35,090	33,257	32,529	34,816	34,886	34,736	34,776
23	30,980	31,958	33,331	31,378	35,090	35,070	33,160	32,658	34,836	34,876	34,741	34,751
24	31,215	33,019	33,360	31,378	35,070	35,026	33,150	33,852	34,806	34,826	34,731	34,756
25	31,364	33,153	33,693	31,420	35,095	35,026	33,170	34,781	34,786	34,831	34,662	34,861
26	31,443	33,101	34,340	31,457	35,214	35,006	33,049	35,151	34,766	35,201	34,657	34,911
27	31,053	33,005	34,660	31,490	35,155	34,961	33,005	34,946	34,756	35,161	34,577	35,096
28	30,639	32,895	34,892	31,537	35,145	34,764	33,073	34,741	34,741	35,055	34,739	34,966
29	30,236	32,771	—	31,620	35,145	34,705	33,228	34,562	34,721	35,029	34,814	34,886
30	29,838	32,615	—	31,738	35,115	34,715	33,247	34,340	34,687	34,926	34,814	34,836
31	29,441	32,386	—	32,056	—	34,778	—	34,098	34,652	—	34,804	—
Change[1]	–1,738	+3,303	+2,670	–2,980	+2,827	–312	–1,256	+851	+819	+289	–91	+65
[2]Equivalent change (Mgal/d)	–56.1	+107	+95.4	–96.1	+94.2	–10.1	–41.9	+27.5	+26.4	+9.6	–2.9	+2.2
[3]Equivalent change (ft^3/s)	–86.8	+165	+148	–149	+146	–15.6	–64.8	+43.0	+40.8	+14.9	–4.5	+3.4

[1]Change is calculated as the storage on the last day of each month minus the storage on the first day of each month. Net change for the year +3,657 million gallons; minimum and maximum storage for December–May are 26,970 35,369 million gallons, respectively; minimum and maximum storage for June–November are 35,529 and 35,386 million gallons, respectively.

[2]The net equivalent change for the year is +10.0 million gallons per day.

[3]The net equivalent change for the year is +15.5 cubic feet per second.

Table 6. Diversions to New York City water-supply system for the year ending November 30, 2018.

[Delaware River Master daily operations record; data provided by the New York City Department of Environmental Protection. Diversions are in million gallons per day. For December 1–May 31, the average is computed for June 1, 2017, to the given date. For June 1–November 30, the average is computed beginning June 1, 2018, to the given date. The diversion calculation is computed as authorized by the Decree. —, not applicable]

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
12/1/2017	302	300	0	609
12/2/2017	302	300	0	609
12/3/2017	201	300	3	609
12/4/2017	204	300	150	609
12/5/2017	204	300	0	609
12/6/2017	7	300	146	608
12/7/2017	0	300	203	607
12/8/2017	180	194	125	607
12/9/2017	278	220	0	606
12/10/2017	298	220	0	606
12/11/2017	300	222	0	605
12/12/2017	300	222	2	605
12/13/2017	361	113	154	605
12/14/2017	447	221	228	606
12/15/2017	421	221	225	608
12/16/2017	397	221	0	608
12/17/2017	397	221	0	608
12/18/2017	401	220	0	608
12/19/2017	401	221	0	608
12/20/2017	401	221	0	608
12/21/2017	401	221	0	608
12/22/2017	401	203	0	608
12/23/2017	401	202	0	608
12/24/2017	401	9	0	607
12/25/2017	402	0	0	606
12/26/2017	451	192	452	608
12/27/2017	451	202	452	611
12/28/2017	451	202	454	613
12/29/2017	451	0	456	615
12/30/2017	451	0	456	616
12/31/2017	451	0	407	617
Total	**10,514**	**6,068**	**3,913**	—

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
1/1/2018	451	0	460	618
1/2/2018	302	0	355	619
1/3/2018	302	0	360	619
1/4/2018	302	0	360	619
1/5/2018	302	0	359	619
1/6/2018	302	0	343	619
1/7/2018	302	0	225	619
1/8/2018	441	0	0	618
1/9/2018	451	0	0	617
1/10/2018	451	0	0	617
1/11/2018	451	0	0	616
1/12/2018	450	0	0	615
1/13/2018	451	0	0	614
1/14/2018	451	0	0	614
1/15/2018	451	0	0	613
1/16/2018	451	0	0	612
1/17/2018	451	0	0	612
1/18/2018	451	0	0	611
1/19/2018	451	0	0	610
1/20/2018	304	0	0	609
1/21/2018	303	0	0	608
1/22/2018	303	0	0	606
1/23/2018	303	0	236	606
1/24/2018	446	0	258	606
1/25/2018	302	0	258	606
1/26/2018	302	0	258	606
1/27/2018	0	0	258	605
1/28/2018	0	0	258	603
1/29/2018	0	0	258	602
1/30/2018	0	0	258	600
1/31/2018	6	0	258	599
Total	**9,933**	**0**	**4,762**	—

Table 6. Diversions to New York City water-supply system for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record; data provided by the New York City Department of Environmental Protection. Diversions are in million gallons per day. For December 1–May 31, the average is computed for June 1, 2017, to the given date. For June 1–November 30, the average is computed beginning June 1, 2018, to the given date. The diversion calculation is computed as authorized by the Decree. —, not applicable]

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
2/1/2018	451	0	147	599
2/2/2018	451	0	192	599
2/3/2018	451	0	0	598
2/4/2018	451	0	0	598
2/5/2018	451	0	0	597
2/6/2018	451	0	0	597
2/7/2018	451	0	0	596
2/8/2018	451	204	0	596
2/9/2018	450	200	0	597
2/10/2018	302	200	0	596
2/11/2018	0	200	257	596
2/12/2018	0	200	203	595
2/13/2018	0	200	258	594
2/14/2018	3	201	258	594
2/15/2018	194	201	255	594
2/16/2018	202	261	0	594
2/17/2018	202	272	0	593
2/18/2018	203	272	0	593
2/19/2018	203	273	0	592
2/20/2018	204	272	252	593
2/21/2018	208	272	258	593
2/22/2018	450	22	258	594
2/23/2018	150	0	259	593
2/24/2018	0	0	95	591
2/25/2018	0	0	0	589
2/26/2018	0	0	0	587
2/27/2018	0	0	0	585
2/28/2018	0	0	0	583
Total	**6,379**	**3,250**	**2,692**	—

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
3/1/2018	0	0	0	580
3/2/2018	0	0	0	578
3/3/2018	0	0	0	576
3/4/2018	0	0	0	574
3/5/2018	0	0	242	573
3/6/2018	0	0	297	572
3/7/2018	0	0	303	571
3/8/2018	0	0	300	570
3/9/2018	147	0	294	570
3/10/2018	194	0	248	569
3/11/2018	203	0	259	569
3/12/2018	202	0	248	568
3/13/2018	203	0	259	568
3/14/2018	203	0	259	568
3/15/2018	346	0	258	568
3/16/2018	401	0	258	568
3/17/2018	401	0	258	568
3/18/2018	401	0	258	569
3/19/2018	401	0	258	569
3/20/2018	401	0	216	569
3/21/2018	401	0	215	569
3/22/2018	447	0	257	570
3/23/2018	450	168	49	570
3/24/2018	451	201	0	570
3/25/2018	451	201	0	571
3/26/2018	449	200	0	571
3/27/2018	451	201	0	571
3/28/2018	450	201	0	571
3/29/2018	451	201	0	572
3/30/2018	450	34	0	571
3/31/2018	450	0	0	571
Total	**8,404**	**1,407**	**4,736**	—

Table 6. Diversions to New York City water-supply system for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record; data provided by the New York City Department of Environmental Protection. Diversions are in million gallons per day. For December 1–May 31, the average is computed for June 1, 2017, to the given date. For June 1–November 30, the average is computed beginning June 1, 2018, to the given date. The diversion calculation is computed as authorized by the Decree. —, not applicable]

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
4/1/2018	450	0	0	571
4/2/2018	451	0	199	571
4/3/2018	451	0	109	571
4/4/2018	450	182	0	571
4/5/2018	451	118	0	571
4/6/2018	451	0	0	571
4/7/2018	451	0	0	570
4/8/2018	451	0	0	570
4/9/2018	451	0	226	570
4/10/2018	450	180	0	570
4/11/2018	450	219	0	571
4/12/2018	450	0	0	570
4/13/2018	450	0	0	570
4/14/2018	450	0	0	570
4/15/2018	152	0	0	568
4/16/2018	0	0	0	567
4/17/2018	380	0	82	566
4/18/2018	451	0	76	566
4/19/2018	450	0	78	566
4/20/2018	451	0	115	566
4/21/2018	450	0	0	566
4/22/2018	450	0	0	565
4/23/2018	450	0	0	565
4/24/2018	343	0	0	564
4/25/2018	450	0	0	564
4/26/2018	450	0	0	564
4/27/2018	451	0	0	563
4/28/2018	451	0	0	563
4/29/2018	451	0	0	563
4/30/2018	451	0	0	562
Total	**12,588**	**699**	**885**	—

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
5/1/2018	451	0	0	562
5/2/2018	450	0	0	562
5/3/2018	450	0	116	562
5/4/2018	450	0	116	562
5/5/2018	450	0	172	562
5/6/2018	451	0	188	562
5/7/2018	451	0	203	562
5/8/2018	484	0	203	563
5/9/2018	500	0	203	563
5/10/2018	219	0	122	562
5/11/2018	488	0	0	562
5/12/2018	502	0	104	562
5/13/2018	460	0	0	562
5/14/2018	382	0	121	562
5/15/2018	263	0	203	562
5/16/2018	254	0	203	561
5/17/2018	64	0	61	560
5/18/2018	106	0	92	559
5/19/2018	204	0	0	558
5/20/2018	390	0	0	557
5/21/2018	450	0	0	557
5/22/2018	500	0	65	557
5/23/2018	500	0	98	557
5/24/2018	499	0	74	557
5/25/2018	499	0	117	558
5/26/2018	499	0	128	558
5/27/2018	425	0	252	558
5/28/2018	400	0	97	558
5/29/2018	400	224	49	558
5/30/2018	401	298	0	559
5/31/2018	401	299	82	559
Total	**12,443**	**821**	**3,069**	—

Table 6. Diversions to New York City water-supply system for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record; data provided by the New York City Department of Environmental Protection. Diversions are in million gallons per day. For December 1–May 31, the average is computed for June 1, 2017, to the given date. For June 1–November 30, the average is computed beginning June 1, 2018, to the given date. The diversion calculation is computed as authorized by the Decree. —, not applicable]

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
6/1/2018	301	200	0	501
6/2/2018	24	201	258	492
6/3/2018	0	201	194	460
6/4/2018	172	201	165	479
6/5/2018	203	201	134	491
6/6/2018	203	201	65	487
6/7/2018	298	0	96	474
6/8/2018	301	199	98	490
6/9/2018	301	200	97	502
6/10/2018	301	200	98	511
6/11/2018	301	200	95	519
6/12/2018	301	199	97	526
6/13/2018	301	199	0	524
6/14/2018	301	199	0	522
6/15/2018	298	198	94	526
6/16/2018	298	201	152	534
6/17/2018	450	201	0	541
6/18/2018	450	200	0	547
6/19/2018	450	200	105	558
6/20/2018	450	200	159	570
6/21/2018	450	200	0	574
6/22/2018	450	200	84	582
6/23/2018	451	200	0	585
6/24/2018	449	200	0	587
6/25/2018	451	200	107	594
6/26/2018	451	200	21	597
6/27/2018	451	200	0	599
6/28/2018	451	34	0	595
6/29/2018	450	0	0	590
6/30/2018	450	0	0	585
Total	**10,208**	**5,235**	**2,119**	—

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
7/1/2018	450	100	0	584
7/2/2018	450	205	0	586
7/3/2018	449	231	0	589
7/4/2018	449	230	0	592
7/5/2018	449	230	0	594
7/6/2018	450	230	0	597
7/7/2018	450	230	0	599
7/8/2018	450	230	0	601
7/9/2018	450	230	0	603
7/10/2018	450	230	0	605
7/11/2018	450	200	0	606
7/12/2018	450	200	0	607
7/13/2018	450	100	0	606
7/14/2018	450	0	0	602
7/15/2018	450	99	0	601
7/16/2018	449	200	0	602
7/17/2018	450	200	0	603
7/18/2018	450	200	0	604
7/19/2018	450	200	0	605
7/20/2018	450	200	0	606
7/21/2018	449	200	0	607
7/22/2018	292	200	0	605
7/23/2018	58	0	0	594
7/24/2018	0	0	0	583
7/25/2018	0	0	0	573
7/26/2018	0	0	0	562
7/27/2018	0	0	204	556
7/28/2018	0	0	258	551
7/29/2018	1	0	260	546
7/30/2018	451	0	258	549
7/31/2018	450	0	258	551
Total	**10,697**	**4,145**	**1,238**	—

Table 6. Diversions to New York City water-supply system for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record; data provided by the New York City Department of Environmental Protection. Diversions are in million gallons per day. For December 1–May 31, the average is computed for June 1, 2017, to the given date. For June 1–November 30, the average is computed beginning June 1, 2018, to the given date. The diversion calculation is computed as authorized by the Decree. —, not applicable]

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
8/1/2018	450	0	251	554
8/2/2018	450	0	0	552
8/3/2018	131	0	0	546
8/4/2018	0	0	0	537
8/5/2018	0	0	0	529
8/6/2018	375	0	0	527
8/7/2018	450	0	0	526
8/8/2018	450	0	0	525
8/9/2018	450	0	0	524
8/10/2018	485	0	0	523
8/11/2018	500	0	0	523
8/12/2018	499	0	0	522
8/13/2018	346	0	0	520
8/14/2018	302	0	0	517
8/15/2018	302	0	0	514
8/16/2018	299	0	0	511
8/17/2018	253	0	0	509
8/18/2018	302	0	0	506
8/19/2018	302	0	0	504
8/20/2018	302	0	0	501
8/21/2018	302	0	0	499
8/22/2018	302	0	0	496
8/23/2018	302	0	0	494
8/24/2018	483	0	0	494
8/25/2018	500	0	0	494
8/26/2018	500	0	0	494
8/27/2018	500	0	0	494
8/28/2018	500	137	0	496
8/29/2018	499	139	0	497
8/30/2018	499	0	0	497
8/31/2018	500	0	0	497
Total	**11,535**	**276**	**251**	—

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
9/1/2018	500	0	0	497
9/2/2018	500	0	161	499
9/3/2018	500	0	258	502
9/4/2018	499	0	258	504
9/5/2018	499	0	258	507
9/6/2018	425	0	258	509
9/7/2018	477	0	257	511
9/8/2018	500	0	63	512
9/9/2018	501	0	0	511
9/10/2018	501	0	1	511
9/11/2018	501	0	0	511
9/12/2018	501	0	0	511
9/13/2018	501	0	0	511
9/14/2018	405	0	0	510
9/15/2018	401	0	0	509
9/16/2018	401	0	0	508
9/17/2018	242	0	0	506
9/18/2018	203	0	0	503
9/19/2018	303	0	0	501
9/20/2018	452	0	0	501
9/21/2018	501	0	0	501
9/22/2018	501	0	0	501
9/23/2018	501	0	0	501
9/24/2018	172	0	0	498
9/25/2018	0	0	0	494
9/26/2018	0	0	0	489
9/27/2018	0	0	0	485
9/28/2018	0	0	0	481
9/29/2018	0	0	0	477
9/30/2018	0	0	0	473
Total	**10,487**	**0**	**1,514**	—

Table 6. Diversions to New York City water-supply system for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record; data provided by the New York City Department of Environmental Protection. Diversions are in million gallons per day. For December 1–May 31, the average is computed for June 1, 2017, to the given date. For June 1–November 30, the average is computed beginning June 1, 2018, to the given date. The diversion calculation is computed as authorized by the Decree. —, not applicable]

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
10/1/2018	0	0	0	469
10/2/2018	0	0	0	466
10/3/2018	0	0	0	462
10/4/2018	0	0	0	458
10/5/2018	1	0	1	455
10/6/2018	194	0	0	453
10/7/2018	193	0	0	451
10/8/2018	193	0	0	449
10/9/2018	193	0	0	447
10/10/2018	32	0	0	444
10/11/2018	0	0	0	440
10/12/2018	0	0	0	437
10/13/2018	0	0	0	434
10/14/2018	0	0	0	431
10/15/2018	0	0	0	427
10/16/2018	167	0	0	426
10/17/2018	199	0	0	424
10/18/2018	201	0	0	422
10/19/2018	450	0	0	422
10/20/2018	450	0	0	423
10/21/2018	450	0	0	423
10/22/2018	486	0	0	423
10/23/2018	497	0	0	424
10/24/2018	500	162	49	426
10/25/2018	500	229	0	428
10/26/2018	511	0	65	429
10/27/2018	495	0	0	429
10/28/2018	500	0	0	430
10/29/2018	497	210	0	432
10/30/2018	497	279	0	434
10/31/2018	497	279	0	436
Total	**7,703**	**1,159**	**115**	—

Date	East Delaware Tunnel	West Delaware Tunnel	Neversink Tunnel	Average from 1 June
11/1/2018	345	278	0	437
11/2/2018	199	0	0	436
11/3/2018	304	0	0	435
11/4/2018	397	0	0	435
11/5/2018	397	0	0	434
11/6/2018	397	0	0	434
11/7/2018	327	0	140	434
11/8/2018	231	0	0	433
11/9/2018	199	0	0	432
11/10/2018	199	0	0	430
11/11/2018	199	0	0	429
11/12/2018	289	0	0	428
11/13/2018	299	0	0	427
11/14/2018	299	0	0	426
11/15/2018	299	0	0	426
11/16/2018	299	0	0	425
11/17/2018	298	0	0	424
11/18/2018	299	0	0	424
11/19/2018	299	0	0	423
11/20/2018	296	0	0	422
11/21/2018	199	0	0	421
11/22/2018	199	0	0	419
11/23/2018	200	0	0	418
11/24/2018	33	0	0	416
11/25/2018	0	0	0	414
11/26/2018	0	0	0	411
11/27/2018	100	0	0	410
11/28/2018	199	0	0	409
11/29/2018	199	0	0	407
11/30/2018	199	0	0	406
Total	**7,199**	**278**	**140**	—

Table 7. Consumption of Water by New York City, 1950–2018.

[Data provided by New York City, Department of Environmental Protection, Bureau of Water Supply. Mgal/d, million gallons per day]

Year	Average daily consumption			Annual consumption (billion gallons)
	City proper (Mgal/d)	Outside communities (Mgal/d)	Total (Mgal/d)	
1950	953.3	29.1	982.4	358.6
1951	1,041.9	28.1	1,070.0	390.6
1952	1,087.0	32.7	1,119.7	409.8
1953	1,093.9	44.6	1,138.5	415.6
1954	1,063.4	46.3	1,109.7	405.0
1955	1,109.9	45.3	1,155.2	421.6
1956	1,111.3	48.9	1,160.2	424.6
1957	1,169.0	57.2	1,226.2	447.6
1958	1,152.9	49.6	1,202.5	438.9
1959	1,204.3	60.3	1,264.6	461.6
1960	1,199.4	58.9	1,258.3	460.5
1961	1,221.0	64.0	1,285.0	469.0
1962	1,207.6	68.8	1,276.4	465.9
1963	1,218.0	76.7	1,294.7	472.6
1964	1,189.2	79.4	1,268.6	464.3
1965	1,052.1	71.2	1,123.3	410.0
1966	1,044.9	73.2	1,118.1	408.1
1967	1,135.3	71.0	1,206.3	440.3
1968	1,242.0	78.2	1,320.2	483.2
1969	1,328.7	80.1	1,408.8	514.2
1970	1,400.3	90.4	1,490.7	544.1
1971	1,423.6	87.9	1,511.5	551.7
1972	1,412.4	83.0	1,495.4	547.3
1973	1,448.9	95.4	1,544.3	563.7
1974	1,441.8	96.3	1,538.1	561.4
1975	1,415.0	92.1	1,507.1	550.1
1976	1,435.0	95.8	1,530.8	560.3
1977	1,483.0	104.7	1,587.7	579.5
1978	1,479.4	103.0	1,582.4	577.6
1979	1,513.0	104.6	1,617.6	590.4
1980	1,506.3	110.1	1,616.3	591.6
1981	1,309.5	100.0	1,409.5	514.5
1982	1,383.0	104.8	1,487.8	543.1
1983	1,424.2	112.6	1,536.8	561.0
1984	1,465.2	113.9	1,579.1	578.0
1985	1,325.4	106.5	1,431.9	522.7
1986	1,351.1	115.2	1,466.3	535.2
1987	1,447.1	119.8	1,566.9	571.9
1988	1,484.3	125.6	1,609.9	589.1
1989	1,402.0	113.4	1,515.4	553.2
1990	1,424.4	122.4	1,546.8	564.6

Table 7. Consumption of Water by New York City, 1950–2018.—Continued

[Data provided by New York City, Department of Environmental Protection, Bureau of Water Supply. Mgal/d, million gallons per day]

Year	Average daily consumption			Annual consumption (billion gallons)
	City proper (Mgal/d)	Outside communities (Mgal/d)	Total (Mgal/d)	
1991	1,469.9	123.6	1,593.5	581.6
1992	1,368.7	113.9	1,482.6	542.6
1993	1,368.9	118.8	1,487.7	543.0
1994	1,357.8	119.2	1,477.0	539.1
1995	1,326.1	123.1	1,449.2	529.0
1996	1,283.5	120.2	1,403.7	512.4
1997	1,201.3	123.5	1,324.8	483.6
1998	1,220.0	124.7	1,344.7	490.8
1999	1,237.2	128.6	1,365.8	498.5
2000	1,240.4	124.9	1,365.3	499.7
2001	1,184.0	128.4	1,312.4	479.0
2002	1,135.6	121.1	1,256.7	458.7
2003	1,093.7	115.9	1,209.6	441.5
2004	1,099.6	117.5	1,217.1	445.5
2005	1,107.6	123.8	1,231.4	449.5
2006	1,069.2	116.8	1,186.0	432.9
2007	1,114.0	122.9	1,237.0	451.5
2008	1,082.9	114.8	1,197.7	438.4
2009	1,007.2	109.4	1,116.6	407.6
2010	1,039.0	119.0	1,158.0	422.7
2011	1,021.0	116.0	1,137.0	415.0
2012	1,009.1	110.2	1,119.3	409.7
2013	1,006.1	110.1	1,116.2	407.4
2014	996.0	109.6	1,105.6	403.5
2015	1,009.8	114.1	1,123.9	410.2
2016	1,001.6	113.5	1,115.1	408.1
2017	990.2	109.3	1,099.5	401.3
2018	1,006.5	105.9	1,112.4	406.0

Table 8. Diversions by New Jersey, daily mean discharge, Delaware and Raritan Canal at Port Mercer, New Jersey (U.S. Geological Survey site number 01460440), for the year ending November 30, 2018.

[Data from U.S. Geological Survey (2019e). All values except total are in million gallons per day (Mgal/d). Negative values indicate flow into the Delaware River Basin. Total in million gallons, Mgal; e, estimated; —, not applicable]

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	99	90	99	96	97	98	98	100	94	97	92	91
2	87	85	101	32	98	98	96	100	94	97	92	92
3	87	87	98	76	98	98	94	92	94	96	88	85
4	86	87	96	94	96	100	90	87	94	96	94	87
5	85	90	92	96	96	98	90	95	92	98	94	89
6	85	94	96	95	96	98	96	85	93	97	90	72
7	87	98	92	98e	98	98	99	91	94	99	91	69
8	89	98	92	96	98	97	98	99	94	100	95	86
9	92	94	95	97	96	96	100	99	94	100	93	84
10	92	96	98	97	98	99	101	100	94	93	92	70
11	90	97	54	98	97	98	91	101	95	97	92	88
12	89	92	69	103	98	93	94	100	94	96	76	85
13	89	94	96	101	100	90	97	100	95	94	85	64
14	90	96	95	96	98	84	97	97	92	97	89	77
15	90	96	96	94	98	89	99	97	87	98	92	85
16	90	98	87	93	21	92	100	93	93	98	91	50
17	93	100	94e	94	83	54	100	83	94	97	90	65
18	91	98	96e	94	90	93	98	82	95	67	90	81
19	95	98	94	96	90	90	98	89	92	74	91	88
20	94	100	98	96	89	88	98	94	91	87	95	89
21	93	103	98	98	95	90	100	94	94	91	91	87
22	90	102	99	95	90	97	101	84	94	94	91	89
23	94	104	96	87	96	94	100	84	93	96	91	89
24	88	99	98	87	96	95	101	87	94	96	93	90
25	92	96	78	87	98	94	101	92	94	75	92	–90
26	91	97	90	82	92	96	100	91	95	50	92	58
27	89	99	94	86	94	–122	101	92	95	87	87	53
28	85	100	96	94	94	65	98	92	96	24	87	84
29	84	98	—	93	96	87	94	92	96	76	91	89
30	85	100	—	96	96	94	99	94	95	91	90	90
31	90	99	—	96	—	97	—	94	96	—	90	—
Total[1]	2,781	2,985	2,587	2,843	2,782	2,638	2,929	2,880	2,907	2,658	2,807	2,236
Mean[2]	89.7	96.3	92.4	91.7	92.7	85.1	97.6	92.9	93.8	88.6	90.5	74.5

[1]The year's total is 33,033 million gallons.

[2]The combined mean is 90.5 million gallons per day.

Table 9. New York City reservoir release design data for the year ending November 30, 2018.

[Delaware River Master daily operations record. The Montague design rate was 1,750 ft³/s from December 1, 2017, through January 18, 2018. Column (col.) 1 was provided by electric utility Brookfield Renewable Partners, U.S. Col. 2 was provided by electric utility Eagle Creek Renewable Energy, LLC. Col. 3 computed from recession method. 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, directed release amount from the Office of the Delaware River Master = col. 6 + col. 7, when positive, otherwise col. 8 = 0. Col. 9 = col. 7 from table 10. Col. 10 = summation of col. 9. Col. 11 = flow objective – (col. 9 + col. 10 from table 10) 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 ft³/s. Cols. 10 and 12 are accumulated from the previous report year starting June 1, 2017, then reset to zero on June 15, 2018. The balancing adjustment standard operating protocol was revised July 15, 2018, to calculate the balancing adjustment only when directed releases are greater than conservation releases, and col. 13 and 14 were set to zero. ft³/s, cubic feet per second; (ft³/s)-d, cubic feet per second accumulated daily]

Advance estimate of discharge of Delaware River at Montague, New Jersey, exclusive of New York City reservoir releases							Indicated deficiency	Balancing adjustment	Directed release (ft³/s)	Computation of balancing adjustment					
Date of advance estimate	Powerplant release forecasts		Uncontrolled runoff		Montague date	Discharge (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)		
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14
11/28/2017	0	53	1,697	0	12/1/2017	1,750	0	–50	0	0	45,592	93	40,916	4,676	–50
11/29/2017	0	53	1,549	25	12/2/2017	1,627	123	–50	73	73	45,665	103	41,019	4,646	–50
11/30/2017	0	0	1,483	0	12/3/2017	1,483	267	–50	217	217	45,882	113	41,132	4,750	–50
12/1/2017	0	0	1,440	0	12/4/2017	1,440	310	–50	260	260	46,142	193	41,325	4,817	–50
12/2/2017	0	53	1,400	0	12/5/2017	1,453	297	–50	247	247	46,389	243	41,568	4,821	–50
12/3/2017	0	18	1,400	465	12/6/2017	1,883	0	–50	0	0	46,389	210	41,778	4,611	–50
12/4/2017	0	18	1,400	840	12/7/2017	2,258	0	–50	0	0	46,389	32	41,810	4,579	–50
12/5/2017	0	53	1,360	592	12/8/2017	2,005	0	–50	0	0	46,389	0	41,810	4,579	–50
12/6/2017	0	35	1,400	0	12/9/2017	1,435	315	–50	265	266	46,655	6	41,816	4,839	–50
12/7/2017	0	18	1,400	0	12/10/2017	1,418	332	–50	282	284	46,939	74	41,890	5,049	–50
12/8/2017	0	0	1,560	0	12/11/2017	1,560	190	–50	140	140	47,079	179	42,069	5,010	–50
12/9/2017	0	53	1,560	52	12/12/2017	1,665	85	–50	35	35	47,114	221	42,290	4,824	–50
12/10/2017	0	53	1,480	66	12/13/2017	1,599	151	–50	101	101	47,215	302	42,592	4,623	–50
12/11/2017	0	71	1,394	99	12/14/2017	1,564	186	–50	136	136	47,351	52	42,644	4,707	–50
12/12/2017	0	53	1,310	38	12/15/2017	1,401	349	–50	299	301	47,652	0	42,644	5,008	–50
12/13/2017	0	53	1,240	0	12/16/2017	1,293	457	–50	407	406	48,058	436	43,080	4,978	–50
12/14/2017	0	18	1,195	0	12/17/2017	1,213	537	–50	487	483	48,541	153	43,233	5,308	–50
12/15/2017	0	0	1,230	0	12/18/2017	1,230	520	–50	470	471	49,012	51	43,284	5,728	–50
12/16/2017	0	0	1,230	0	12/19/2017	1,230	520	–50	470	471	49,483	1	43,285	6,198	–50
12/17/2017	0	0	1,120	0	12/20/2017	1,120	630	–50	580	579	50,062	19	43,304	6,758	–50
12/18/2017	0	53	1,240	0	12/21/2017	1,293	457	–50	407	403	50,465	53	43,357	7,108	–50
12/19/2017	0	18	1,442	0	12/22/2017	1,460	290	–50	240	240	50,705	28	43,385	7,320	–50
12/20/2017	0	0	1,490	0	12/23/2017	1,490	260	–50	210	210	50,915	36	43,421	7,494	–50

Table 9. New York City reservoir release design data for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. The Montague design rate was 1,750 ft³/s from December 1, 2017, through January 18, 2018. Column (col.) 1 was provided by electric utility Brookfield Renewable Partners, U.S. Col. 2 was provided by electric utility Eagle Creek Renewable Energy, LLC. Col. 3 computed from recession method. 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, directed release amount from the Office of the Delaware River Master = col. 6 + col. 7, when positive, otherwise col. 8 = 0. Col. 9 = col. 7 from table 10. Col. 10 = summation of col. 9. Col. 11 = flow objective – (col. 9 + col. 10 from table 10) 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 ft³/s. Cols. 10 and 12 are accumulated from the previous report year starting June 1, 2017, then reset to zero on June 15, 2018. The balancing adjustment standard operating protocol was revised July 15, 2018, to calculate the balancing adjustment only when directed releases are greater than conservation releases, and col. 13 and 14 were set to zero. ft³/s, cubic feet per second; (ft³/s)-d, cubic feet per second accumulated daily]

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	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)		
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14
12/21/2017	0	0	1,330	420	12/24/2017	1,750	0	–50	0	0	50,915	0	43,421	7,494	–50
12/22/2017	0	0	1,310	440	12/25/2017	1,750	0	–50	0	0	50,915	0	43,421	7,494	–50
12/23/2017	0	0	1,440	310	12/26/2017	1,750	0	–50	0	0	50,915	0	43,421	7,494	–50
The estimated Montague discharge was greater than the Montague design rate from 12/27/2017 to 01/6/2018															
1/4/2018	339	567	733	0	1/7/2018	1,639	111	–50	61	107	51,022	0	43,421	7,601	–50
1/5/2018	339	124	837	0	1/8/2018	1,300	450	–50	400	398	51,420	0	43,421	7,999	–50
1/6/2018	0	0	1,299	0	1/9/2018	1,299	451	–50	401	401	51,821	0	43,421	8,400	–50
1/7/2018	0	0	1,750	0	1/10/2018	1,750	0	–50	0	186	52,007	0	43,421	8,586	–50
1/8/2018	0	71	1,679	0	1/11/2018	1,750	0	–50	0	0	52,007	116	43,537	8,470	–50
1/9/2018	0	0	1,590	160	1/12/2018	1,750	0	–50	0	0	52,007	0	43,537	8,470	–50
The estimated Montague discharge was greater than the Montague design rate from 1/13/2018 to 6/14/2018															
6/13/2018	226	0	1,497	73	6/16/2018	1,796	0	0	0	0	0	18	18	–18	2
6/14/2018	108	0	1,415	0	6/17/2018	1,523	227	0	227	227	227	373	391	–164	16
6/15/2018	382	0	1,431	17	6/18/2018	1,830	0	0	0	0	227	99	490	–263	26
6/16/2018	452	35	1,116	2	6/19/2018	1,605	145	0	145	145	372	32	522	–150	15
6/17/2018	382	0	1,309	127	6/20/2018	1,818	0	0	0	0	372	124	646	–274	27
6/18/2018	247	0	1,149	281	6/21/2018	1,677	73	16	89	89	461	248	894	–433	43
6/19/2018	247	0	1,199	40	6/22/2018	1,486	264	26	290	290	751	348	1,242	–491	49
6/20/2018	208	71	1,176	51	6/23/2018	1,506	244	15	259	259	1,010	399	1,641	–631	50
6/21/2018	0	0	1,208	231	6/24/2018	1,439	311	27	338	338	1,348	548	2,189	–841	50
6/22/2018	108	0	1,172	238	6/25/2018	1,518	232	43	275	275	1,348	296	2,485	–1137	50
6/23/2018	108	0	1,084	399	6/26/2018	1,591	159	49	208	208	1,348	0	2,485	–1137	50
6/24/2018	108	0	1,067	435	6/27/2018	1,610	140	50	190	190	1,348	106	2,591	–1243	50

Table 9. New York City reservoir release design data for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. The Montague design rate was 1,750 ft³/s from December 1, 2017, through January 18, 2018. Column (col.) 1 was provided by electric utility Brookfield Renewable Partners, U.S. Col. 2 was provided by electric utility Eagle Creek Renewable Energy, LLC. Col. 3 computed from recession method. 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, directed release amount from the Office of the Delaware River Master = col. 6 + col. 7, when positive, otherwise col. 8 = 0. Col. 9 = col. 7 from table 10. Col. 10 = summation of col. 9. Col. 11 = flow objective – (col. 9 + col. 10 from table 10) 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 ft³/s. Cols. 10 and 12 are accumulated from the previous report year starting June 1, 2017, then reset to zero on June 15, 2018. The balancing adjustment standard operating protocol was revised July 15, 2018, to calculate the balancing adjustment only when directed releases are greater than conservation releases, and col. 13 and 14 were set to zero. ft³/s, cubic feet per second; (ft³/s)-d, cubic feet per second accumulated daily]

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	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)		
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14
The estimated Montague discharge was greater than the Montague design rate from 1/13/2018 to 6/14/2018—Continued															
6/25/2018	108	0	1,202	306	6/28/2018	1,616	134	50	184	184	1,532	0	2,591	–1059	50
6/26/2018	108	0	1,286	614	6/29/2018	2,008	0	0	0	0	1,532	0	2,591	–1059	50
6/27/2018	391	0	1,431	2,459	6/30/2018	4,281	0	0	0	0	1,532	0	2,591	–1059	50
6/28/2018	491	0	1,750	129	7/1/2018	2,370	0	0	0	0	1,532	0	2,591	–1059	50
6/29/2018	516	0	1,750	0	7/2/2018	2,266	0	0	0	0	1,532	0	2,591	–1059	50
6/30/2018	545	284	2,097	0	7/3/2018	2,926	0	0	0	0	1,532	0	2,591	–1059	50
7/1/2018	545	160	2,024	100	7/4/2018	2,829	0	0	0	0	1,532	0	2,591	–1059	50
7/2/2018	446	89	1,678	749	7/5/2018	2,962	0	0	0	0	1,532	0	2,591	–1059	50
7/3/2018	348	124	1,447	227	7/6/2018	2,146	0	0	0	0	1,532	221	2,812	–1280	50
7/4/2018	391	35	1,140	1,120	7/7/2018	2,686	0	0	0	0	1,532	176	2,988	–1456	50
7/5/2018	168	120	935	869	7/8/2018	2,092	0	0	0	0	1,532	204	3,192	–1660	50
7/6/2018	168	100	1,157	20	7/9/2018	1,445	305	50	355	355	1,887	529	3,721	–1834	50
7/7/2018	140	155	1,040	0	7/10/2018	1,335	415	50	465	465	2,352	569	4,290	–1938	50
7/8/2018	140	192	1,035	13	7/11/2018	1,380	370	50	420	420	2,772	527	4,817	–2045	50
7/9/2018	140	89	1,083	41	7/12/2018	1,353	397	50	447	447	3,219	529	5,346	–2127	50
7/10/2018	140	258	875	36	7/13/2018	1,309	441	50	491	491	3,710	479	5,825	–2115	50
7/11/2018	373	313	929	0	7/14/2018	1,615	135	50	185	185	3,895	218	6,043	–2148	50
7/12/2018	272	331	953	20	7/15/2018	1,576	174	50	224	224	4,119	258	6,301	–2182	50
7/13/2018	405	479	808	266	7/16/2018	1,958	0	0	0	0	0	238	0	0	0
7/14/2018	391	516	771	382	7/17/2018	2,060	0	0	0	0	0	238	0	0	0
7/15/2018	140	516	727	508	7/18/2018	1,891	0	0	0	0	0	209	0	0	0
7/16/2018	140	516	855	466	7/19/2018	1,977	0	0	0	0	0	478	0	0	0

Table 9. New York City reservoir release design data for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. The Montague design rate was 1,750 ft³/s from December 1, 2017, through January 18, 2018. Column (col.) 1 was provided by electric utility Brookfield Renewable Partners, U.S. Col. 2 was provided by electric utility Eagle Creek Renewable Energy, LLC. Col. 3 computed from recession method. 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, directed release amount from the Office of the Delaware River Master = col. 6 + col. 7, when positive, otherwise col. 8 = 0. Col. 9 = col. 7 from table 10. Col. 10 = summation of col. 9. Col. 11 = flow objective – (col. 9 + col. 10 from table 10) 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 ft³/s. Cols. 10 and 12 are accumulated from the previous report year starting June 1, 2017, then reset to zero on June 15, 2018. The balancing adjustment standard operating protocol was revised July 15, 2018, to calculate the balancing adjustment only when directed releases are greater than conservation releases, and col. 13 and 14 were set to zero. ft³/s, cubic feet per second; (ft³/s)-d, cubic feet per second accumulated daily]

Advance estimate of discharge of Delaware River at Montague, New Jersey, exclusive of New York City reservoir releases							Indicated deficiency	Balancing adjustment	Directed release (ft³/s)	Computation of balancing adjustment					
Date of advance estimate	Powerplant release forecasts		Uncontrolled runoff		Montague date	Discharge (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)		
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14
The estimated Montague discharge was greater than the Montague design rate from 1/13/2018 to 6/14/2018—Continued															
7/17/2018	140	368	665	242	7/20/2018	1,415	335	0	335	335	0	701	0	0	0
7/18/2018	376	450	660	0	7/21/2018	1,486	264	0	264	264	0	611	0	0	0
7/19/2018	140	100	875	98	7/22/2018	1,213	537	0	537	537	0	861	0	0	0
7/20/2018	140	192	660	780	7/23/2018	1,772	0	0	0	0	0	0	0	0	0
7/21/2018	140	248	500	1,440	7/24/2018	2,328	0	0	0	0	0	0	0	0	0
7/22/2018	140	199	450	891	7/25/2018	1,680	70	0	70	70	0	0	0	0	0
7/23/2018	140	117	—	11,782	7/26/2018	12,039	0	0	0	0	0	0	0	0	0
The estimated Montague discharge was greater than the Montague design rate from 7/27/2018 to 11/30/2018															

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey					
Directed								Controlled releases					
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	IERQ bank releases
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
11/28/17	0	80	153	60	11/30/17	0	53	12/1/17	0	293	53	1,604	1,950	0
11/29/17	73	80	153	60	12/1/17	0	35	12/2/17	73	220	35	1,612	1,940	0
11/30/17	217	80	153	60	12/2/17	0	18	12/3/17	217	76	18	1,619	1,930	0
12/1/17	260	80	153	60	12/3/17	0	0	12/4/17	260	33	0	1,557	1,850	0
12/2/17	247	80	153	60	12/4/17	0	0	12/5/17	247	46	0	1,507	1,800	0
12/3/17	0	80	150	60	12/5/17	0	11	12/6/17	0	290	11	1,529	1,830	0
12/4/17	0	80	152	60	12/6/17	26	0	12/7/17	0	292	26	1,692	2,010	0
12/5/17	0	63	150	60	12/7/17	0	18	12/8/17	0	273	18	1,839	2,130	0
12/6/17	265	56	150	60	12/8/17	0	60	12/9/17	266	0	60	1,684	2,010	0
12/7/17	282	74	150	60	12/9/17	0	71	12/10/17	284	0	71	1,605	1,960	0
12/8/17	140	79	150	60	12/10/17	0	0	12/11/17	140	149	0	1,571	1,860	0
12/9/17	35	79	152	60	12/11/17	25	18	12/12/17	35	256	43	1,486	1,820	0
12/10/17	101	80	152	60	12/12/17	0	0	12/13/17	101	191	0	1,448	1,740	0
12/11/17	136	80	152	60	12/13/17	27	284	12/14/17	136	156	311	1,387	1,990	0
12/12/17	299	80	161	60	12/14/17	0	390	12/15/17	301	0	390	1,469	2,160	0
12/13/17	407	80	266	60	12/15/17	0	124	12/16/17	406	0	124	1,190	1,720	0
12/14/17	487	80	343	60	12/16/17	0	35	12/17/17	483	0	35	1,562	2,080	0
12/15/17	470	80	331	60	12/17/17	0	0	12/18/17	471	0	0	1,699	2,170	0
12/16/17	470	80	331	60	12/18/17	0	7	12/19/17	471	0	7	1,742	2,220	0
12/17/17	580	80	439	60	12/19/17	0	18	12/20/17	579	0	18	1,713	2,310	0
12/18/17	407	80	263	60	12/20/17	0	7	12/21/17	403	0	7	1,690	2,100	0
12/19/17	240	76	136	56	12/21/17	0	64	12/22/17	240	28	64	1,658	1,990	0
12/20/17	210	74	136	56	12/22/17	0	35	12/23/17	210	56	35	1,679	1,980	0
12/21/17	0	74	136	56	12/23/17	0	0	12/24/17	0	266	0	2,854	3,120	0
12/22/17	0	74	136	56	12/24/17	0	0	12/25/17	0	266	0	3,924	4,190	0
12/23/17	0	74	136	56	12/25/17	0	18	12/26/17	0	266	18	2,946	3,230	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey					
Directed								Controlled releases					
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	IERQ bank releases
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
12/24/17	0	74	138	56	12/26/17	0	319	12/27/17	0	268	319	2,073	2,660	0
12/25/17	0	74	136	56	12/27/17	0	851	12/28/17	0	266	851	1,653	2,770	0
12/26/17	0	74	135	56	12/28/17	0	798	12/29/17	0	265	798	1,417	2,480	0
12/27/17	0	74	135	56	12/29/17	0	674	12/30/17	0	265	674	1,371	2,310	0
12/28/17	0	74	135	56	12/30/17	0	674	12/31/17	0	265	674	1,371	2,310	0
12/29/17	0	74	135	56	12/31/17	0	851	1/1/18	0	265	851	1,304	2,420	0
12/30/17	0	74	135	56	1/1/18	0	851	1/2/18	0	265	851	1,414	2,530	0
12/31/17	0	74	135	56	1/2/18	0	780	1/3/18	0	265	780	1,565	2,610	0
1/1/18	0	74	136	56	1/3/18	0	745	1/4/18	0	266	745	1,749	2,760	0
1/2/18	0	74	135	56	1/4/18	0	816	1/5/18	0	265	816	2,709	3,790	0
1/3/18	0	74	136	56	1/5/18	353	851	1/6/18	0	266	1,204	2,440	3,910	0
1/4/18	61	74	181	56	1/6/18	355	851	1/7/18	107	140	1,206	2,253	3,770	0
1/5/18	400	74	268	56	1/7/18	361	727	1/8/18	398	0	1,088	1,404	2,890	0
1/6/18	401	74	271	56	1/8/18	0	230	1/9/18	401	0	230	1,809	2,440	0
1/7/18	0	74	226	56	1/9/18	0	7	1/10/18	186	710	7	1,787	2,150	0
1/8/18	0	74	136	56	1/10/18	0	0	1/11/18	0	266	0	1,634	1,900	0
1/9/18	0	74	136	56	1/11/18	0	0	1/12/18	0	266	0	3,244	3,510	0
1/10/18	0	74	136	56	1/12/18	0	89	1/13/18	0	266	89	12,645	13,000	0
1/11/18	0	74	136	56	1/13/18	0	833	1/14/18	0	266	833	15,401	16,500	0
1/12/18	0	74	136	56	1/14/18	0	851	1/15/18	0	266	851	8,863	9,980	0
1/13/18	0	74	136	56	1/15/18	350	461	1/16/18	0	266	811	6,203	7,280	0
1/14/18	0	74	136	56	1/16/18	364	301	1/17/18	0	266	665	5,619	6,550	0
1/15/18	0	74	138	56	1/17/18	749	390	1/18/18	0	268	1,139	5,463	6,870	0
1/16/18	0	74	138	56	1/18/18	1,265	160	1/19/18	0	268	1,425	4,377	6,070	0
1/17/18	0	74	138	56	1/19/18	1,238	0	1/20/18	0	268	1,238	3,444	4,950	0
1/18/18	0	74	142	60	1/20/18	0	0	1/21/18	0	276	0	3,854	4,130	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey					
Directed								Controlled releases					
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	IERQ bank releases
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
1/19/18	0	79	153	60	1/21/18	0	0	1/22/18	0	292	0	3,818	4,110	0
1/20/18	0	80	153	60	1/22/18	250	124	1/23/18	0	293	374	5,553	6,220	0
1/21/18	0	80	152	60	1/23/18	243	426	1/24/18	0	292	669	20,039	21,000	0
1/22/18	0	80	150	60	1/24/18	245	230	1/25/18	0	290	475	13,735	14,500	0
1/23/18	0	80	152	74	1/25/18	555	106	1/26/18	0	306	661	9,233	10,200	0
1/24/18	0	80	152	110	1/26/18	641	0	1/27/18	0	342	641	6,947	7,930	0
1/25/18	0	84	167	110	1/27/18	0	71	1/28/18	0	361	71	6,358	6,790	0
1/26/18	0	99	178	110	1/28/18	0	53	1/29/18	0	387	53	5,880	6,320	0
1/27/18	0	99	167	110	1/29/18	471	0	1/30/18	0	376	471	5,183	6,030	0
1/28/18	0	101	189	110	1/30/18	789	89	1/31/18	0	400	878	4,402	5,680	0
1/29/18	0	101	178	110	1/31/18	782	195	2/1/18	0	389	977	3,504	4,870	0
1/30/18	0	101	176	110	2/1/18	464	301	2/2/18	0	387	765	3,528	4,680	0
1/31/18	0	101	176	110	2/2/18	592	479	2/3/18	0	387	1,071	2,932	4,390	0
2/1/18	0	101	181	110	2/3/18	252	142	2/4/18	0	392	394	2,374	3,160	0
2/2/18	0	101	178	110	2/4/18	0	71	2/5/18	0	389	71	2,870	3,330	0
2/3/18	0	101	179	110	2/5/18	596	124	2/6/18	0	390	720	2,780	3,890	0
2/4/18	0	101	178	110	2/6/18	590	160	2/7/18	0	389	750	2,591	3,730	0
2/5/18	0	99	178	110	2/7/18	627	53	2/8/18	0	387	680	2,883	3,950	0
2/6/18	0	101	172	110	2/8/18	676	213	2/9/18	0	383	889	3,458	4,730	0
2/7/18	0	101	173	110	2/9/18	700	337	2/10/18	0	384	1,037	3,009	4,430	0
2/8/18	0	101	175	110	2/10/18	0	319	2/11/18	0	386	319	3,005	3,710	0
2/9/18	0	101	175	110	2/11/18	0	355	2/12/18	0	386	355	5,299	6,040	0
2/10/18	0	99	175	110	2/12/18	849	426	2/13/18	0	384	1,275	6,111	7,770	0
2/11/18	0	101	176	110	2/13/18	1,074	532	2/14/18	0	387	1,606	5,537	7,530	0
2/12/18	0	101	175	110	2/14/18	1,135	550	2/15/18	0	386	1,685	5,539	7,610	0
2/13/18	0	101	170	110	2/15/18	1,657	550	2/16/18	0	381	2,207	7,912	10,500	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey						IERQ bank releases
Directed								Controlled releases						
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
2/14/18	0	101	173	110	2/16/18	1,488	550	2/17/18	0	384	2,038	12,278	14,700	0
2/15/18	0	101	176	110	2/17/18	1,631	550	2/18/18	0	387	2,181	9,732	12,300	0
2/16/18	0	101	176	110	2/18/18	1,632	727	2/19/18	0	387	2,359	7,654	10,400	0
2/17/18	0	101	176	110	2/19/18	1,630	745	2/20/18	0	387	2,375	9,138	11,900	0
2/18/18	0	101	176	110	2/20/18	1,629	745	2/21/18	0	387	2,374	14,339	17,100	0
2/19/18	0	101	179	127	2/21/18	1,452	851	2/22/18	0	407	2,303	15,790	18,500	0
2/20/18	0	101	179	190	2/22/18	1,421	851	2/23/18	0	470	2,272	14,958	17,700	0
2/21/18	0	101	178	189	2/23/18	1,446	851	2/24/18	0	468	2,297	13,835	16,600	0
2/22/18	0	101	261	190	2/24/18	1,447	851	2/25/18	0	552	2,298	20,650	23,500	0
2/23/18	0	234	674	190	2/25/18	1,470	851	2/26/18	0	1,098	2,321	26,381	29,800	0
2/24/18	0	405	1,052	190	2/26/18	1,567	851	2/27/18	0	1,647	2,418	17,635	21,700	0
2/25/18	0	602	1,355	190	2/27/18	1,630	851	2/28/18	0	2,147	2,481	12,772	17,400	0
2/26/18	0	699	1,497	190	2/28/18	1,632	851	3/1/18	0	2,386	2,483	10,231	15,100	0
2/27/18	0	696	1,499	190	3/1/18	1,264	851	3/2/18	0	2,385	2,115	12,800	17,300	0
2/28/18	0	699	1,502	190	3/2/18	492	851	3/3/18	0	2,391	1,343	14,466	18,200	0
3/1/18	0	699	1,501	190	3/3/18	500	851	3/4/18	0	2,390	1,351	11,159	14,900	0
3/2/18	0	699	1,491	190	3/4/18	501	851	3/5/18	0	2,380	1,352	9,268	13,000	0
3/3/18	0	699	1,493	190	3/5/18	500	851	3/6/18	0	2,382	1,351	7,867	11,600	0
3/4/18	0	699	1,493	189	3/6/18	500	851	3/7/18	0	2,381	1,351	7,568	11,300	0
3/5/18	0	699	1,496	189	3/7/18	495	762	3/8/18	0	2,384	1,257	7,659	11,300	0
3/6/18	0	699	1,496	190	3/8/18	1,106	301	3/9/18	0	2,385	1,407	6,308	10,100	0
3/7/18	0	699	1,496	190	3/9/18	594	0	3/10/18	0	2,385	594	5,281	8,260	0
3/8/18	0	699	1,496	190	3/10/18	0	0	3/11/18	0	2,385	0	5,175	7,560	0
3/9/18	0	699	1,491	167	3/11/18	0	319	3/12/18	0	2,357	319	5,394	8,070	0
3/10/18	0	670	1,298	190	3/12/18	882	479	3/13/18	0	2,158	1,361	4,761	8,280	0
3/11/18	0	664	947	110	3/13/18	1,161	426	3/14/18	0	1,721	1,587	3,992	7,300	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey					
Directed								Controlled releases					
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	IERQ bank releases
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
3/12/18	0	330	933	110	3/14/18	1,134	426	3/15/18	0	1,373	1,560	3,637	6,570	0
3/13/18	0	300	173	110	3/15/18	1,157	443	3/16/18	0	583	1,600	4,107	6,290	0
3/14/18	0	300	175	110	3/16/18	1,083	461	3/17/18	0	585	1,544	3,361	5,490	0
3/15/18	0	300	176	110	3/17/18	0	408	3/18/18	0	586	408	3,556	4,550	0
3/16/18	0	300	175	110	3/18/18	0	426	3/19/18	0	585	426	3,869	4,880	0
3/17/18	0	300	175	110	3/19/18	786	603	3/20/18	0	585	1,389	3,256	5,230	0
3/18/18	0	300	176	110	3/20/18	846	337	3/21/18	0	586	1,183	2,921	4,690	0
3/19/18	0	300	206	77	3/21/18	820	89	3/22/18	0	583	909	3,048	4,540	0
3/20/18	0	246	305	74	3/22/18	834	248	3/23/18	0	625	1,082	2,933	4,640	0
3/21/18	0	231	306	74	3/23/18	848	106	3/24/18	0	611	954	2,545	4,110	0
3/22/18	0	232	367	74	3/24/18	0	0	3/25/18	0	673	0	3,177	3,850	0
3/23/18	0	232	543	74	3/25/18	0	142	3/26/18	0	849	142	3,479	4,470	0
3/24/18	0	232	551	74	3/26/18	851	177	3/27/18	0	857	1,028	3,195	5,080	0
3/25/18	0	234	546	74	3/27/18	834	0	3/28/18	0	854	834	3,542	5,230	0
3/26/18	0	232	721	74	3/28/18	849	71	3/29/18	0	1,027	920	5,143	7,090	0
3/27/18	0	232	1,235	74	3/29/18	361	89	3/30/18	0	1,541	450	6,779	8,770	0
3/28/18	0	232	1,227	74	3/30/18	0	266	3/31/18	0	1,533	266	12,001	13,800	0
3/29/18	0	232	1,131	74	3/31/18	0	0	4/1/18	0	1,437	0	10,263	11,700	0
3/30/18	0	119	433	74	4/1/18	0	337	4/2/18	0	626	337	9,837	10,800	0
3/31/18	0	101	377	74	4/2/18	0	567	4/3/18	0	552	567	9,781	10,900	0
4/1/18	0	101	470	74	4/3/18	316	567	4/4/18	0	645	883	12,472	14,000	0
4/2/18	0	101	786	74	4/4/18	572	603	4/5/18	0	961	1,175	13,764	15,900	0
4/3/18	0	101	1,423	74	4/5/18	1,417	603	4/6/18	0	1,598	2,020	10,682	14,300	0
4/4/18	0	101	1,496	74	4/6/18	1,299	603	4/7/18	0	1,671	1,902	8,627	12,200	0
4/5/18	0	101	1,497	74	4/7/18	0	603	4/8/18	0	1,672	603	8,725	11,000	0
4/6/18	0	156	1,496	74	4/8/18	0	603	4/9/18	0	1,726	603	7,871	10,200	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey						IERQ bank releases
Directed								Controlled releases						
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
4/7/18	0	192	1,494	74	4/9/18	767	603	4/10/18	0	1,760	1,370	6,300	9,430	0
4/8/18	0	192	1,494	74	4/10/18	753	603	4/11/18	0	1,760	1,356	5,424	8,540	0
4/9/18	0	192	1,494	74	4/11/18	276	550	4/12/18	0	1,760	826	4,604	7,190	0
4/10/18	0	192	1,485	74	4/12/18	0	496	4/13/18	0	1,751	496	4,483	6,730	0
4/11/18	0	193	1,485	74	4/13/18	0	408	4/14/18	0	1,752	408	4,300	6,460	0
4/12/18	0	193	1,490	74	4/14/18	0	301	4/15/18	0	1,757	301	4,612	6,670	0
4/13/18	0	192	1,502	74	4/15/18	0	461	4/16/18	0	1,768	461	6,901	9,130	0
4/14/18	0	192	1,508	82	4/16/18	829	585	4/17/18	0	1,782	1,414	15,404	18,600	0
4/15/18	0	201	1,504	120	4/17/18	824	621	4/18/18	0	1,825	1,445	14,930	18,200	0
4/16/18	0	223	1,439	176	4/18/18	1,139	603	4/19/18	0	1,838	1,742	11,820	15,400	0
4/17/18	0	54	845	110	4/19/18	1,154	603	4/20/18	0	1,009	1,757	10,234	13,000	0
4/18/18	0	289	331	110	4/20/18	0	603	4/21/18	0	730	603	9,567	10,900	0
4/19/18	0	674	226	110	4/21/18	0	426	4/22/18	0	1,010	426	8,764	10,200	0
4/20/18	0	696	1,231	110	4/22/18	0	390	4/23/18	0	2,037	390	7,003	9,430	0
4/21/18	0	696	1,493	110	4/23/18	747	284	4/24/18	0	2,299	1,031	5,450	8,780	0
4/22/18	0	696	1,493	128	4/24/18	1,137	142	4/25/18	0	2,317	1,279	5,354	8,950	0
4/23/18	0	696	1,493	142	4/25/18	1,306	89	4/26/18	0	2,331	1,395	7,374	11,100	0
4/24/18	0	696	1,493	158	4/26/18	208	89	4/27/18	0	2,347	297	8,356	11,000	0
4/25/18	0	696	1,494	158	4/27/18	0	177	4/28/18	0	2,348	177	8,775	11,300	0
4/26/18	0	696	1,493	164	4/28/18	0	0	4/29/18	0	2,353	0	8,647	11,000	0
4/27/18	0	696	1,493	162	4/29/18	0	89	4/30/18	0	2,351	89	7,760	10,200	0
4/28/18	0	696	1,494	167	4/30/18	0	53	5/1/18	0	2,357	53	7,370	9,780	0
4/29/18	0	696	1,493	172	5/1/18	322	230	5/2/18	0	2,361	552	6,777	9,690	0
4/30/18	0	696	1,497	172	5/2/18	324	89	5/3/18	0	2,365	413	6,342	9,120	0
5/1/18	0	696	1,504	172	5/3/18	1,004	106	5/4/18	0	2,372	1,110	5,148	8,630	0
5/2/18	0	577	1,502	172	5/4/18	633	89	5/5/18	0	2,251	722	4,337	7,310	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey					
Directed								Controlled releases					
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	IERQ bank releases
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
5/3/18	0	541	1,504	166	5/5/18	0	0	5/6/18	0	2,211	0	4,609	6,820	0
5/4/18	0	541	1,502	108	5/6/18	0	18	5/7/18	0	2,151	18	5,281	7,450	0
5/5/18	0	541	1,502	102	5/7/18	0	142	5/8/18	0	2,145	142	5,333	7,620	0
5/6/18	0	541	1,502	99	5/8/18	0	35	5/9/18	0	2,142	35	4,483	6,660	0
5/7/18	0	285	1,392	101	5/9/18	622	106	5/10/18	0	1,778	728	4,094	6,600	0
5/8/18	0	265	1,098	101	5/10/18	698	106	5/11/18	0	1,464	804	4,162	6,430	0
5/9/18	0	300	1,032	99	5/11/18	347	106	5/12/18	0	1,431	453	4,226	6,110	0
5/10/18	0	300	1,032	101	5/12/18	0	142	5/13/18	0	1,433	142	4,785	6,360	0
5/11/18	0	300	1,032	101	5/13/18	0	177	5/14/18	0	1,433	177	5,360	6,970	0
5/12/18	0	300	1,032	101	5/14/18	830	248	5/15/18	0	1,433	1,078	5,699	8,210	0
5/13/18	0	300	1,032	101	5/15/18	1,416	390	5/16/18	0	1,433	1,806	7,161	10,400	0
5/14/18	0	300	869	101	5/16/18	874	35	5/17/18	0	1,270	909	8,221	10,400	0
5/15/18	0	300	730	101	5/17/18	694	0	5/18/18	0	1,131	694	6,755	8,580	0
5/16/18	0	300	730	101	5/18/18	432	0	5/19/18	0	1,131	432	7,467	9,030	0
5/17/18	0	300	730	101	5/19/18	1,326	284	5/20/18	0	1,131	1,610	16,159	18,900	0
5/18/18	0	300	730	102	5/20/18	2,035	851	5/21/18	0	1,132	2,886	13,082	17,100	0
5/19/18	0	300	777	122	5/21/18	1,765	780	5/22/18	0	1,199	2,545	9,156	12,900	0
5/20/18	0	300	832	190	5/22/18	834	426	5/23/18	0	1,322	1,260	12,918	15,500	0
5/21/18	0	393	834	190	5/23/18	834	426	5/24/18	0	1,417	1,260	11,623	14,300	0
5/22/18	0	391	834	190	5/24/18	833	426	5/25/18	0	1,415	1,259	8,426	11,100	0
5/23/18	0	300	834	124	5/25/18	833	426	5/26/18	0	1,258	1,259	6,773	9,290	0
5/24/18	0	300	834	121	5/26/18	838	426	5/27/18	0	1,255	1,264	5,621	8,140	0
5/25/18	0	299	764	121	5/27/18	834	426	5/28/18	0	1,184	1,260	5,006	7,450	0
5/26/18	0	209	674	116	5/28/18	591	319	5/29/18	0	999	910	4,271	6,180	0
5/27/18	0	156	523	101	5/29/18	274	284	5/30/18	0	780	558	4,072	5,410	0
5/28/18	0	139	449	101	5/30/18	353	230	5/31/18	0	689	583	3,548	4,820	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey						IERQ bank releases
Directed								Controlled releases						
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
5/29/18	0	139	449	101	5/31/18	353	195	6/1/18	0	689	548	3,253	4,490	0
5/30/18	0	139	438	108	6/1/18	331	213	6/2/18	0	685	544	3,691	4,920	0
5/31/18	0	139	461	110	6/2/18	54	195	6/3/18	0	710	249	4,471	5,430	0
6/1/18	0	138	461	110	6/3/18	205	177	6/4/18	0	709	382	3,499	4,590	0
6/2/18	0	139	458	110	6/4/18	352	160	6/5/18	0	707	512	3,301	4,520	0
6/3/18	0	139	458	110	6/5/18	425	160	6/6/18	0	707	585	3,038	4,330	0
6/4/18	0	139	459	110	6/6/18	506	177	6/7/18	0	708	683	2,689	4,080	0
6/5/18	0	139	459	110	6/7/18	508	106	6/8/18	0	708	614	2,358	3,680	0
6/6/18	0	139	459	110	6/8/18	409	18	6/9/18	0	708	427	2,005	3,140	0
6/7/18	0	139	459	110	6/9/18	0	124	6/10/18	0	708	124	1,938	2,770	0
6/8/18	0	139	461	110	6/10/18	0	0	6/11/18	0	710	0	1,900	2,610	0
6/9/18	0	139	464	110	6/11/18	261	9	6/12/18	0	713	270	1,737	2,720	0
6/10/18	0	139	449	110	6/12/18	246	71	6/13/18	0	698	317	1,635	2,650	0
6/11/18	0	139	458	110	6/13/18	234	18	6/14/18	0	707	252	1,651	2,610	0
6/12/18	0	139	461	110	6/14/18	261	53	6/15/18	0	710	314	1,436	2,460	0
6/13/18	0	139	461	108	6/15/18	231	35	6/16/18	0	708	266	1,466	2,440	0
6/14/18	227	139	433	101	6/16/18	100	18	6/17/18	227	446	118	1,259	2,050	0
6/15/18	0	135	415	99	6/17/18	316	18	6/18/18	0	649	334	1,317	2,300	0
6/16/18	145	133	518	101	6/18/18	387	35	6/19/18	145	607	422	1,296	2,470	191 (Th)
6/17/18	0	135	548	101	6/19/18	288	0	6/20/18	0	784	288	1,338	2,410	52 (Th)
6/18/18	89	135	412	101	6/20/18	220	0	6/21/18	89	559	220	1,282	2,150	0
6/19/18	290	135	412	101	6/21/18	213	35	6/22/18	290	358	248	1,154	2,050	0
6/20/18	259	136	412	101	6/22/18	148	71	6/23/18	259	390	219	1,132	2,000	0
6/21/18	338	135	412	101	6/23/18	45	0	6/24/18	338	310	45	1,157	1,850	0
6/22/18	275	135	410	101	6/24/18	0	18	6/25/18	275	371	18	1,436	2,100	0
6/23/18	208	135	410	101	6/25/18	78	35	6/26/18	208	438	113	1,651	2,410	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey					
Directed								Controlled releases					
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	IERQ bank releases
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
6/24/18	190	135	410	101	6/26/18	104	35	6/27/18	190	456	139	1,505	2,290	0
6/25/18	184	135	410	101	6/27/18	110	53	6/28/18	184	462	163	1,661	2,470	0
6/26/18	0	135	410	101	6/28/18	36	89	6/29/18	0	646	125	2,889	3,660	0
6/27/18	0	135	408	101	6/29/18	438	142	6/30/18	0	644	580	2,816	4,040	0
6/28/18	0	135	408	101	6/30/18	453	167	7/1/18	0	644	620	2,026	3,290	0
6/29/18	0	135	535	101	7/1/18	532	213	7/2/18	0	771	745	1,534	3,050	121 (Th)
6/30/18	0	135	718	121	7/2/18	545	301	7/3/18	0	974	846	1,240	3,060	323 (Th)
7/1/18	0	156	668	121	7/3/18	550	365	7/4/18	0	945	915	960	2,820	296 (Th)
7/2/18	0	159	616	121	7/4/18	486	122	7/5/18	0	896	608	1,236	2,740	248 (Th)
7/3/18	0	159	551	121	7/5/18	273	179	7/6/18	0	831	452	1,077	2,360	181 (Th)
7/4/18	0	159	415	102	7/6/18	386	106	7/7/18	0	676	492	1,082	2,250	26 (Th)
7/5/18	0	138	415	101	7/7/18	206	187	7/8/18	0	654	393	1,153	2,200	3 (Th)
7/6/18	355	133	415	101	7/8/18	133	189	7/9/18	355	294	322	899	1,870	0
7/7/18	465	133	415	101	7/9/18	191	33	7/10/18	465	184	224	957	1,830	0
7/8/18	420	133	413	101	7/10/18	184	54	7/11/18	420	227	238	985	1,870	0
7/9/18	447	135	413	101	7/11/18	188	165	7/12/18	447	202	353	868	1,870	0
7/10/18	491	135	413	101	7/12/18	172	268	7/13/18	491	158	440	831	1,920	0
7/11/18	185	135	412	101	7/13/18	411	334	7/14/18	185	463	745	787	2,180	0
7/12/18	224	135	412	101	7/14/18	308	309	7/15/18	224	424	617	875	2,140	0
7/13/18	0	135	412	101	7/15/18	455	338	7/16/18	0	648	793	719	2,160	0
7/14/18	0	135	472	101	7/16/18	384	358	7/17/18	0	708	742	770	2,220	57 (Th)
7/15/18	0	135	565	99	7/17/18	284	358	7/18/18	0	799	642	899	2,340	150 (Th)
7/16/18	0	133	381	94	7/18/18	228	305	7/19/18	0	608	533	739	1,880	0
7/17/18	335	125	362	94	7/19/18	249	206	7/20/18	335	246	455	594	1,630	0
7/18/18	264	125	362	94	7/20/18	370	255	7/21/18	264	317	625	514	1,720	0
7/19/18	537	125	362	94	7/21/18	219	46	7/22/18	537	44	265	624	1,470	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey						
Directed								Controlled releases						IERQ bank releases
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
7/20/18	0	125	362	94	7/22/18	189	67	7/23/18	0	581	256	1,633	2,470	0
7/21/18	0	125	360	94	7/23/18	205	209	7/24/18	0	579	414	4,507	5,500	0
7/22/18	70	125	360	94	7/24/18	1,021	550	7/25/18	70	509	1,571	8,650	10,800	0
7/23/18	0	125	360	94	7/25/18	1,598	411	7/26/18	0	579	2,009	14,312	16,900	0
7/24/18	0	125	360	94	7/26/18	1,603	493	7/27/18	0	579	2,096	13,625	16,300	0
7/25/18	0	111	362	139	7/27/18	795	454	7/28/18	0	612	1,249	7,539	9,400	0
7/26/18	0	125	430	190	7/28/18	605	206	7/29/18	0	745	811	5,234	6,790	0
7/27/18	0	153	526	190	7/29/18	737	106	7/30/18	0	869	843	3,678	5,390	0
7/28/18	0	167	549	190	7/30/18	666	283	7/31/18	0	906	949	2,705	4,560	0
7/29/18	0	170	549	189	7/31/18	650	840	8/1/18	0	908	1,490	2,172	4,570	0
7/30/18	0	170	549	190	8/1/18	840	213	8/2/18	0	909	1,053	5,278	7,240	0
7/31/18	0	170	549	190	8/2/18	839	246	8/3/18	0	909	1,085	6,066	8,060	0
8/1/18	0	170	549	190	8/3/18	803	197	8/4/18	0	909	1,000	19,191	21,100	0
8/2/18	0	170	549	190	8/4/18	838	262	8/5/18	0	909	1,100	17,891	19,900	0
8/3/18	0	196	551	190	8/5/18	843	298	8/6/18	0	937	1,141	10,322	12,400	0
8/4/18	0	692	554	190	8/6/18	840	440	8/7/18	0	1,436	1,280	6,994	9,710	0
8/5/18	0	699	664	190	8/7/18	835	394	8/8/18	0	1,553	1,229	6,308	9,090	0
8/6/18	0	696	931	190	8/8/18	688	365	8/9/18	0	1,817	1,053	11,030	13,900	0
8/7/18	0	701	1,032	190	8/9/18	380	362	8/10/18	0	1,923	742	12,435	15,100	0
8/8/18	0	699	1,327	190	8/10/18	472	255	8/11/18	0	2,216	727	7,957	10,900	0
8/9/18	0	699	1,494	190	8/11/18	522	130	8/12/18	0	2,383	652	9,365	12,400	0
8/10/18	0	699	1,501	190	8/12/18	424	281	8/13/18	0	2,390	705	8,405	11,500	0
8/11/18	0	699	1,502	190	8/13/18	607	323	8/14/18	0	2,391	930	9,979	13,300	0
8/12/18	0	699	1,504	190	8/14/18	841	372	8/15/18	0	2,393	1,213	16,194	19,800	0
8/13/18	0	640	1,505	190	8/15/18	840	401	8/16/18	0	2,335	1,241	13,824	17,400	0
8/14/18	0	87	1,507	189	8/16/18	835	400	8/17/18	0	1,783	1,235	10,282	13,300	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey					
Directed								Controlled releases					
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	IERQ bank releases
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
8/15/18	0	96	1,508	189	8/17/18	840	489	8/18/18	0	1,793	1,329	12,878	16,000	0
8/16/18	0	599	1,508	150	8/18/18	836	437	8/19/18	0	2,257	1,273	18,170	21,700	0
8/17/18	0	378	1,507	190	8/19/18	839	432	8/20/18	0	2,075	1,271	15,154	18,500	0
8/18/18	0	60	1,504	189	8/20/18	834	222	8/21/18	0	1,753	1,056	11,491	14,300	0
8/19/18	0	59	1,493	190	8/21/18	839	89	8/22/18	0	1,742	928	9,730	12,400	0
8/20/18	0	99	1,494	190	8/22/18	840	53	8/23/18	0	1,783	893	9,124	11,800	0
8/21/18	0	667	1,494	190	8/23/18	702	53	8/24/18	0	2,351	755	6,404	9,510	0
8/22/18	0	699	1,494	190	8/24/18	732	53	8/25/18	0	2,383	785	4,662	7,830	0
8/23/18	0	699	1,491	190	8/25/18	637	54	8/26/18	0	2,380	691	3,599	6,670	0
8/24/18	0	699	1,504	190	8/26/18	634	86	8/27/18	0	2,393	720	3,087	6,200	0
8/25/18	0	699	1,502	190	8/27/18	770	261	8/28/18	0	2,391	1,031	2,818	6,240	0
8/26/18	0	699	1,501	189	8/28/18	866	387	8/29/18	0	2,389	1,253	2,528	6,170	0
8/27/18	0	699	1,497	190	8/29/18	1,066	373	8/30/18	0	2,386	1,439	2,105	5,930	0
8/28/18	0	699	1,494	190	8/30/18	867	236	8/31/18	0	2,383	1,103	1,894	5,380	0
8/29/18	0	699	1,482	192	8/31/18	591	236	9/1/18	0	2,373	827	1,820	5,020	0
8/30/18	0	699	1,453	192	9/1/18	616	177	9/2/18	0	2,344	793	2,303	5,440	0
8/31/18	0	699	1,375	190	9/2/18	834	53	9/3/18	0	2,264	887	1,859	5,010	0
9/1/18	0	699	1,290	190	9/3/18	746	241	9/4/18	0	2,179	987	1,684	4,850	0
9/2/18	0	645	1,194	190	9/4/18	742	256	9/5/18	0	2,029	998	1,423	4,450	0
9/3/18	0	583	1,145	190	9/5/18	705	205	9/6/18	0	1,918	910	1,632	4,460	0
9/4/18	0	575	1,157	190	9/6/18	618	127	9/7/18	0	1,922	745	1,603	4,270	0
9/5/18	0	577	1,148	190	9/7/18	313	40	9/8/18	0	1,915	353	2,212	4,480	0
9/6/18	0	580	1,143	190	9/8/18	431	39	9/9/18	0	1,913	470	1,787	4,170	0
9/7/18	0	574	1,140	190	9/9/18	372	39	9/10/18	0	1,904	411	2,555	4,870	0
9/8/18	0	575	1,140	190	9/10/18	863	78	9/11/18	0	1,905	941	14,054	16,900	0
9/9/18	0	574	1,137	190	9/11/18	1,406	161	9/12/18	0	1,901	1,567	10,232	13,700	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey						IERQ bank releases
Directed								Controlled releases						
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
9/10/18	0	575	1,151	190	9/12/18	1,456	145	9/13/18	0	1,916	1,601	7,283	10,800	0
9/11/18	0	575	1,148	190	9/13/18	1,208	252	9/14/18	0	1,913	1,460	7,127	10,500	0
9/12/18	0	574	1,140	190	9/14/18	1,441	235	9/15/18	0	1,904	1,676	6,410	9,990	0
9/13/18	0	577	1,247	190	9/15/18	1,444	124	9/16/18	0	2,014	1,568	5,318	8,900	0
9/14/18	0	684	1,494	190	9/16/18	1,450	284	9/17/18	0	2,368	1,734	4,388	8,490	0
9/15/18	0	698	1,497	190	9/17/18	1,451	381	9/18/18	0	2,385	1,832	6,183	10,400	0
9/16/18	0	699	1,499	190	9/18/18	1,452	319	9/19/18	0	2,388	1,771	10,741	14,900	0
9/17/18	0	699	1,437	192	9/19/18	845	230	9/20/18	0	2,328	1,075	8,497	11,900	0
9/18/18	0	699	1,222	190	9/20/18	1,458	72	9/21/18	0	2,111	1,530	6,199	9,840	0
9/19/18	0	699	1,001	190	9/21/18	1,341	147	9/22/18	0	1,890	1,488	4,762	8,140	0
9/20/18	0	699	804	190	9/22/18	606	53	9/23/18	0	1,693	659	7,168	9,520	0
9/21/18	0	699	693	190	9/23/18	605	54	9/24/18	0	1,582	659	5,659	7,900	0
9/22/18	0	701	693	192	9/24/18	1,000	54	9/25/18	0	1,586	1,054	7,340	9,980	0
9/23/18	0	701	750	190	9/25/18	1,486	56	9/26/18	0	1,641	1,542	22,617	25,800	0
9/24/18	0	699	1,239	192	9/26/18	1,386	370	9/27/18	0	2,130	1,756	20,414	24,300	0
9/25/18	0	699	1,491	190	9/27/18	1,016	186	9/28/18	0	2,380	1,202	20,318	23,900	0
9/26/18	0	701	1,493	190	9/28/18	979	369	9/29/18	0	2,384	1,348	21,068	24,800	0
9/27/18	0	699	1,494	190	9/29/18	1,447	334	9/30/18	0	2,383	1,781	13,936	18,100	0
9/28/18	0	699	1,496	190	9/30/18	1,448	364	10/1/18	0	2,385	1,812	10,503	14,700	0
9/29/18	0	699	1,501	190	10/1/18	1,313	504	10/2/18	0	2,390	1,817	7,793	12,000	0
9/30/18	0	699	1,502	190	10/2/18	348	514	10/3/18	0	2,391	862	18,047	21,300	0
10/1/18	0	699	1,502	190	10/3/18	1,029	828	10/4/18	0	2,391	1,857	13,952	18,200	0
10/2/18	0	699	1,502	190	10/4/18	1,503	814	10/5/18	0	2,391	2,317	11,492	16,200	0
10/3/18	0	699	1,505	190	10/5/18	1,495	555	10/6/18	0	2,394	2,050	9,056	13,500	0
10/4/18	0	701	1,502	190	10/6/18	1,173	525	10/7/18	0	2,393	1,698	7,609	11,700	0
10/5/18	0	699	1,502	190	10/7/18	544	446	10/8/18	0	2,391	990	6,389	9,770	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey					
Directed								Controlled releases					
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	IERQ bank releases
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
10/6/18	0	699	1,497	190	10/8/18	0	555	10/9/18	0	2,386	555	5,969	8,910	0
10/7/18	0	699	1,499	190	10/9/18	0	471	10/10/18	0	2,388	471	5,291	8,150	0
10/8/18	0	699	1,497	190	10/10/18	0	530	10/11/18	0	2,386	530	6,614	9,530	0
10/9/18	0	699	1,497	190	10/11/18	0	817	10/12/18	0	2,386	817	17,497	20,700	0
10/10/18	0	699	1,499	190	10/12/18	0	826	10/13/18	0	2,388	826	12,486	15,700	0
10/11/18	0	699	1,499	190	10/13/18	0	830	10/14/18	0	2,388	830	10,082	13,300	0
10/12/18	0	699	1,496	190	10/14/18	0	830	10/15/18	0	2,385	830	8,185	11,400	0
10/13/18	0	699	1,497	190	10/15/18	0	826	10/16/18	0	2,386	826	7,588	10,800	0
10/14/18	0	699	1,494	190	10/16/18	0	879	10/17/18	0	2,383	879	6,838	10,100	0
10/15/18	0	699	1,502	190	10/17/18	0	874	10/18/18	0	2,391	874	5,835	9,100	0
10/16/18	0	698	1,508	190	10/18/18	4	604	10/19/18	0	2,396	608	5,046	8,050	0
10/17/18	0	698	1,508	190	10/19/18	4	462	10/20/18	0	2,396	466	4,538	7,400	0
10/18/18	0	698	1,502	190	10/20/18	0	356	10/21/18	0	2,390	356	4,374	7,120	0
10/19/18	0	698	1,497	192	10/21/18	0	425	10/22/18	0	2,387	425	4,248	7,060	0
10/20/18	0	699	1,497	190	10/22/18	0	500	10/23/18	0	2,386	500	3,664	6,550	0
10/21/18	0	701	1,497	190	10/23/18	0	379	10/24/18	0	2,388	379	3,473	6,240	0
10/22/18	0	699	1,496	190	10/24/18	0	449	10/25/18	0	2,385	449	3,356	6,190	0
10/23/18	0	699	1,496	190	10/25/18	0	390	10/26/18	0	2,385	390	3,095	5,870	0
10/24/18	0	699	1,493	190	10/26/18	20	474	10/27/18	0	2,382	494	3,374	6,250	0
10/25/18	0	699	1,491	190	10/27/18	0	498	10/28/18	0	2,380	498	8,022	10,900	0
10/26/18	0	699	1,491	190	10/28/18	4	494	10/29/18	0	2,380	498	8,522	11,400	0
10/27/18	0	699	1,497	190	10/29/18	605	489	10/30/18	0	2,386	1,094	8,120	11,600	0
10/28/18	0	699	1,501	190	10/30/18	754	802	10/31/18	0	2,390	1,556	6,754	10,700	0
10/29/18	0	699	1,499	190	10/31/18	756	479	11/1/18	0	2,388	1,235	5,857	9,480	0
10/30/18	0	699	1,501	190	11/1/18	745	631	11/2/18	0	2,390	1,376	6,194	9,960	0
10/31/18	0	699	1,499	190	11/2/18	769	674	11/3/18	0	2,388	1,443	18,469	22,300	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey						IERQ bank releases
Directed								Controlled releases						
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
11/1/18	0	699	1,497	190	11/3/18	776	907	11/4/18	0	2,386	1,683	19,331	23,400	0
11/2/18	0	701	1,501	198	11/4/18	751	881	11/5/18	0	2,400	1,632	13,468	17,500	0
11/3/18	0	729	1,566	190	11/5/18	1,285	883	11/6/18	0	2,485	2,168	14,547	19,200	0
11/4/18	0	699	1,504	190	11/6/18	1,599	889	11/7/18	0	2,393	2,488	18,319	23,200	0
11/5/18	0	699	1,501	190	11/7/18	1,598	891	11/8/18	0	2,390	2,489	13,821	18,700	0
11/6/18	0	699	1,501	190	11/8/18	1,599	898	11/9/18	0	2,390	2,497	11,013	15,900	0
11/7/18	0	699	1,502	190	11/9/18	1,088	895	11/10/18	0	2,391	1,983	16,126	20,500	0
11/8/18	0	699	1,504	190	11/10/18	600	851	11/11/18	0	2,393	1,451	15,756	19,600	0
11/9/18	0	699	1,507	190	11/11/18	566	851	11/12/18	0	2,396	1,417	11,987	15,800	0
11/10/18	0	699	1,508	190	11/12/18	573	887	11/13/18	0	2,397	1,460	12,643	16,500	0
11/11/18	0	699	1,508	190	11/13/18	1,218	885	11/14/18	0	2,397	2,103	15,200	19,700	0
11/12/18	0	699	1,505	190	11/14/18	1,582	788	11/15/18	0	2,394	2,370	11,636	16,400	0
11/13/18	0	699	1,501	190	11/15/18	1,585	883	11/16/18	0	2,390	2,468	10,242	15,100	0
11/14/18	0	699	1,501	190	11/16/18	1,141	688	11/17/18	0	2,390	1,829	10,281	14,500	0
11/15/18	0	699	1,501	190	11/17/18	1,604	657	11/18/18	0	2,390	2,261	8,749	13,400	0
11/16/18	0	699	1,502	190	11/18/18	1,599	847	11/19/18	0	2,391	2,446	8,063	12,900	0
11/17/18	0	699	1,501	190	11/19/18	1,448	716	11/20/18	0	2,390	2,164	8,646	13,200	0
11/18/18	0	699	1,501	190	11/20/18	1,025	847	11/21/18	0	2,390	1,872	10,038	14,300	0
11/19/18	0	699	1,501	190	11/21/18	1,279	883	11/22/18	0	2,390	2,162	8,148	12,700	0
11/20/18	0	699	1,501	190	11/22/18	1,281	883	11/23/18	0	2,390	2,164	6,446	11,000	0
11/21/18	0	701	1,499	190	11/23/18	1,269	882	11/24/18	0	2,390	2,151	5,759	10,300	0
11/22/18	0	701	1,497	190	11/24/18	1,269	880	11/25/18	0	2,388	2,149	11,763	16,300	0
11/23/18	0	701	1,496	190	11/25/18	1,420	851	11/26/18	0	2,387	2,271	15,742	20,400	0
11/24/18	0	699	1,496	190	11/26/18	1,582	888	11/27/18	0	2,385	2,470	26,845	31,700	0
11/25/18	0	699	1,497	190	11/27/18	1,580	887	11/28/18	0	2,386	2,467	24,047	28,900	0
11/26/18	0	699	1,501	190	11/28/18	1,580	961	11/29/18	0	2,390	2,541	16,969	21,900	0
11/27/18	0	699	1,502	190	11/29/18	1,587	887	11/30/18	0	2,391	2,474	13,335	18,200	0

Table 10. Controlled releases from reservoirs in the upper Delaware River Basin and segregation of flow of Delaware River at Montague, New Jersey, for the year ending November 30, 2018.—Continued

[Delaware River Master daily operations record. All provided measurements are the mean discharge in cubic feet per second (ft^3/s) for 24 hours. Column (col.) 1 = Office of the Delaware River Master directed release. Col. 2 = 24 hours beginning 1200 of date shown. Col. 3 = 24 hours ending 2400, 1 day later. Col. 4 = 24 hours beginning 1500, 1 day later. Col 5 = 24 hours beginning 0000 of date shown. Col. 6 = 24 hours beginning 1600 of the 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. Col. 12 = Interim Excess Release Quantity (IERQ) bank releases. Th, thermal IERQ bank; —, not applicable]

Controlled releases from New York City Reservoirs					Controlled releases from powerplant reservoirs			Segregation of flow, Delaware River at Montague, New Jersey					
Directed								Controlled releases					
Date	Amount	Pepacton	Cannonsville	Neversink	Date	Lake Wallenpaupack	Rio Reservoir	Date	New York City reservoirs		Powerplants	Computed uncontrolled	Total	IERQ bank releases
									Directed	Other				
	Col. 1	Col. 2	Col. 3	Col. 4		Col. 5	Col. 6		Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12
Monthly and annual totals														
Dec. 2017	5,326	2,373	5,616	1,820	—	78	4,582	—	5,323	4,486	4,660	54,151	68,620	0
Jan. 2018	862	2,416	4,815	2,044	—	8,229	10,893	—	1,092	8,183	19,122	170,393	198,790	0
Feb. 2018	0	3,762	7,570	3,576	—	28,437	14,081	—	0	14,908	42,518	238,494	295,920	0
Mar. 2018	0	14,252	28,186	4,068	—	20,030	12,536	—	0	46,506	32,566	182,478	261,550	0
Apr. 2018	0	9,660	37,089	3,024	—	12,744	12,609	—	0	49,773	25,353	258,084	333,210	0
May2018	0	11,862	32,294	3,917	—	19,546	7,376	—	0	48,073	26,922	208,265	283,260	0
Jun. 2018	2,205	4,116	13,335	3,159	—	6,859	2,260	—	2,205	18,405	9,119	61,961	91,690	243
Jul. 2018	3,793	4,209	13,804	3,452	—	14,626	7,637	—	3,793	17,672	22,263	83,252	126,980	1,405
Aug. 2018	0	14,907	37,808	5,845	—	23,399	9,004	—	0	58,560	32,403	277,337	368,300	0
Sept. 2018	0	19,556	36,297	5,710	—	30,308	5,317	—	0	61,563	35,625	228,592	325,780	0
Oct. 2018	0	21,669	46,463	5,892	—	10,244	18,310	—	0	74,024	28,554	237,812	340,390	0
Nov. 2018	0	21,008	45,100	5,708	—	36,754	24,930	—	0	71,816	61,684	389,440	522,940	0
Total	12,186	129,790	308,377	48,215	—	211,254	129,535	—	12,413	473,969	340,789	2,390,259	3,217,430	1,648

Table 13. Daily mean discharge of the Delaware River at Montague, New Jersey (U.S. Geological Survey site number 01438500), for report year ending November 30, 2018.

[Data from U.S. Geological Survey (2019d). All values, except for the year's total discharge volume, are in cubic feet per second (ft^3/s). The total discharge volume is given in cubic feet per second accumulated daily ([ft^3/s]-d). e, estimated; —, not applicable]

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.
1	1,950	2,540e	4,870	15,100	11,700	9,770	4,490	3,060	5,020	5,020	14,700	9,480
2	1,940	2,740e	4,560e	17,300	10,800	9,690	4,920	3,050	7,240	5,440	12,000	9,960
3	1,930	2,850e	3,920e	18,200	10,900	9,120	5,430	3,040	8,060	5,010	21,300	22,300
4	1,850	2,910e	3,090e	14,900	14,000	8,630	4,590	2,790	21,100	4,820	18,200	23,400
5	1,800	3,140e	3,330	13,000	15,900	7,310	4,520	2,690	19,900	4,450	16,200	17,500
6	1,830	3,500e	3,890	11,600	14,300	6,820	4,330	2,300	12,400	4,460	13,500	19,200
7	2,010	3,660e	3,730	11,300	12,200	7,450	4,080	2,170	9,710	4,270	11,700	23,200
8	2,130	3,530e	3,950	11,300	11,000	7,620	3,680	2,110	9,090	4,480	9,770	18,700
9	2,010	3,390e	4,570e	10,100	10,200	6,660	3,140	1,760	13,900	4,170	8,910	15,900
10	1,960	3,230e	4,430	8,260	9,430	6,600	2,770	1,710	15,100	4,870	8,150	20,500
11	1,860	3,050	3,710	7,560	8,540	6,430	2,610	1,730	10,900	16,900	9,530	19,600
12	1,820	3,800	6,040	8,070	7,190	6,110	2,720	1,720	12,400	13,700	20,700	15,800
13	1,730e	13,000	7,770	8,280	6,730	6,360	2,650	1,760	11,500	10,800	15,700	16,500
14	1,630e	16,500	7,530	7,300	6,460	6,970	2,610	2,000	13,300	10,500	13,300	19,700
15	1,570e	9,980	7,610	6,570	6,670	8,210	2,550	1,950	19,800	9,990	11,400	16,400
16	1,560e	7,280	10,500	6,290	9,130	10,400	2,530	2,160	17,400	8,900	10,800	15,100
17	2,080	6,390e	14,700	5,490	18,600	10,400	2,030	2,220	13,300	8,490	10,100	14,500
18	2,170	6,130e	12,300	4,550	18,200	8,580	2,260	2,340	16,000	10,400	9,100	13,400
19	2,220	5,620e	10,400	4,880	15,400	9,030	2,420	1,880	21,700	14,900	8,050	12,900
20	2,310	4,950	11,900	5,230	13,000	18,900	2,340	1,630	18,500	11,900	7,400	13,200
21	2,100	4,130	17,100	4,690	10,900	17,100	2,070	1,720	14,300	9,840	7,120	14,300
22	1,990	4,110	18,500	4,540	10,200	12,900	1,970	1,470	12,400	8,140	7,060	12,700
23	1,980	6,220	17,700	4,640	9,430	15,500	1,900	2,470	11,800	9,520	6,550	11,000
24	3,120	21,000	16,600	4,110	8,780	14,300	1,740	5,540	9,510	7,900	6,240	10,300
25	4,190	14,500	23,500	3,850	8,950	11,100	1,980	10,900	7,830	9,980	6,190	16,300
26	3,390e	10,200	29,800	4,470	11,100	9,290	2,260	16,900	6,670	25,800	5,870	20,400
27	2,820e	7,930	21,700	5,080	11,000	8,140	2,130	16,400	6,200	24,300	6,250	31,700
28	2,360e	6,790	17,400	5,230	11,300	7,450	2,300	9,760	6,240	23,900	10,900	28,900
29	2,260e	6,320	—	7,090	11,000	6,180	3,450	7,210	6,170	24,800	11,400	21,900
30	2,260e	5,930e	—	8,770	10,200	5,410	3,820	5,830	5,930	18,100	11,600	18,200
31	2,370e	5,550e	—	13,800	—	4,820	—	5,010	5,380	—	10,700	—
Total[1]	67,200	200,870	295,100	261,550	333,210	283,250	90,290	127,280	368,750	325,750	340,390	522,940
Mean[2]	2,168	6,480	10,539	8,437	11,107	9,137	3,010	4,106	11,895	10,858	10,980	17,431

[1]The year's total is 3,216,580 cubic feet per second accumulated daily.

[2]The combined mean is 8,813cubic feet per second.

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Glossary

The following definitions apply to various terms and procedures used in the operations documented in this report.

balancing adjustment An operating procedure used by the Office of the Delaware River Master to correct for inaccuracies inherent in the design of releases from New York City reservoirs to meet the flow objective at Montague, New Jersey. The balancing adjustment calls for more water to be released when previous directed releases (or lack of releases) were insufficient to meet the Montague flow objective. The balancing adjustment calls for less water to be released when previous directed releases were higher than required to meet the Montague flow objective. The balancing adjustment, based on provisional data, is computed as 10 percent of the difference between the cumulative forecasted directed release and the actual directed release required. 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. Beginning July 15, 2018, the cumulative values and the adjustment are computed only when directed releases are greater than New York City reservoir conservation releases.

capacity Total useable volume in a reservoir between the point of maximum depletion and the elevation of the lower crest of the spillway.

conservation releases Controlled releases from the Pepacton, Cannonsville, and Neversink Reservoirs designed to maintain specified minimum flows in stream channels immediately below the reservoirs (tailwaters). The following conservation rate zones are defined in the 2017 Flexible Flow Management Program as follows:

L1—Spill mitigation when New York City combined reservoir storage is in the spill mitigation (L1) storage zone.

L2—Conservation releases when New York City combined reservoir storage is in the normal (L2) storage zone.

L3—Conservation releases when New York City combined reservoir storage is in the drought watch (L3) storage zone.

L4—Conservation releases when New York City combined reservoir storage is in the drought warning (L4) storage zone.

L5—Conservation releases when New York City combined reservoir storage is in the drought (L5) storage zone (also referred to as "Drought Emergency").

contents Refer to "Storage."

controlled releases Controlled releases from reservoirs passed through outlet valves in the dams or turbines in powerplants. These releases do not include spillway overflow at the reservoirs.

directed releases Controlled releases from New York City reservoirs in the upper Delaware River Basin, designed by the Office of the Delaware River Master to meet the Montague flow objective.

diversions The out-of-basin transfer of water by New York City from the Pepacton, Cannonsville, and Neversink Reservoirs of New York State in the upper Delaware River Basin through the East Delaware, West Delaware, and Neversink Tunnels, respectively, to the New York City water-supply system. Also, the out-of-basin transfer of water by New Jersey from the Delaware River through the Delaware and Raritan Canal.

Excess Release Quantity As defined by the Decree, the excess release quantity of water is "equal to 83 per cent [sic] of the amount by which the estimated consumption during such year is less than the City's estimate of the continuous safe yield during such year of all its sources obtainable without pumping." The excess release quantity shall not exceed 70 billion gallons, and the seasonal period for release of the excess quantity begins on June 15 and concludes on the following March 15.

Flexible Flow Management Program (FFMP) 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 Decree and unanimously agreed to by the Decree Parties (Delaware, New Jersey, New York, New York City, and Pennsylvania).

Interim Excess Release Quantity An Interim Excess Release Quantity (IERQ) was defined in the 2017 Flexible Flow Management Program (Russell and others, 2024). 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 million gallons per day) and New York City's current estimate of continuous safe yield of the New York City water-supply system of 1,290 million gallons per day, obtainable without pumping. The IERQ resets to 10.0 billion gallons (15,468 cubic feet per second accumulated daily) on June 1st of each year of the Agreement or upon return to normal conditions after drought. The IERQ shall be used as defined below:

Trenton Equivalent Flow Objective:
6.09 billion gallons (9,423 cubic feet per second accumulated daily) of the IERQ, upon request by the Lower Basin States or the Delaware River Basin Commission, New York City shall release from the IERQ water in sufficient quantities to maintain a flow at Trenton of 3,000 cubic feet per second during basinwide normal conditions for the period commencing on June 1 and continuing through May 31. New York City shall make releases from the IERQ as provided above until the aggregate quantity of the IERQ is exhausted.

Thermal Mitigation:
1.62 billion gallons (2,500 cubic feet per second accumulated daily) of the IERQ will be banked and is available during basinwide normal conditions to support mitigation of thermal events that may adversely impact the cold-water fishery below the New York City Delaware River Basin Reservoirs. Use of the water for any single event will be informed by the current and forecasted basin conditions and the thermal mitigation guidance as developed by the Decree Parties. Releases for Thermal Mitigation shall be made at the direction of the New York State Department of Environmental Conservation and administered by the Office of the Delaware River Master (ODRM) and the New York City Department of Environmental Protection (NYCDEP) with notification made to all Decree Parties.

Rapid Flow Change Mitigation:
0.65 billion gallons (1,000 cubic feet per second accumulated daily) of the IERQ will be banked and is available during basinwide normal conditions to mitigate potentially ecologically harmful conditions caused by rapid reductions in the New York City Delaware River Basin reservoir directed releases because of the requirements of the Montague flow objective in Section 2.a. Use of the water for any single event will be informed by the current basin conditions and the guidance for its use as developed by the Decree Parties. Releases to mitigate rapid flow changes shall be made at the direction of the ODRM and NYCDEP, with notification to all Decree Parties.

NJ Diversion Amelioration:
1.65 billion gallons (2,545 cubic feet per second accumulated daily) of the IERQ will be banked and reserved for use during drought conditions (basinwide or lower basin), to supply New Jersey's increased diversion when the New Jersey Diversion Offset Bank, as described below in Section 4.d., has been exhausted. Once the New York City reservoirs enter into drought watch, the combined storage of the city's Delaware River Basin reservoirs shall be computed as the actual storage volume minus the New Jersey Diversion Amelioration Bank and New Jersey Diversion Offset Bank volumes for determining storage zones.

Interim Excess Release Quantity Extraordinary Needs Bank: From section 3.d of the 2017 Flexible Flow Management Program (FFMP2017): "In addition to the hydrologic criteria described in Section 2.5.6.A. [sic] of the water code [Delaware River Basin Commission, 2013] and subject to other provisional uses of the Interim Excess Release Quantity (IERQ) as provided herein, the Decree Parties [Delaware, New Jersey, New York, New York City, and Pennsylvania], the DRBC and the 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 unanimous 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 quantity as may be so banked shall be deducted from the agreed upon IERQ. Any unused Extraordinary Needs Bank water shall be returned to IERQ" (Parties of the 1954 U.S. Supreme Court Decree, 2017).

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. Data from these stations are used year-round in Office of the Delaware River Master operations.

Montague flow objective In section 2a of the 2017 Flexible Flow Management Program (FFMP2017), "Except with respect to limitations provided herein in Section 5, releases from the City Delaware Basin Reservoirs shall be in quantities designed to maintain, during Normal storage conditions, a minimum basic rate of flow at the gaging station of the U.S. Geological Survey * * * at Montague, N. J. of 1,750 cubic feet per second (cfs), as directed by the River Master in accordance with Section VII. [sic] of the Decree. During Basinwide Drought Watch, Drought Warning, and Drought Emergency, in accordance with Section 5 of this Agreement and Section 2.5.3.B. [sic] and Tables 1 and 2 of the Delaware River Basin Water Code * * *, the Montague flow objective shall vary based upon the time of year and location of the salt front, and minimum compensating releases shall be made by the City of New York from its reservoirs in the upper Delaware Basin" (Parties of the 1954 U.S. Supreme Court Decree, 2017). The Delaware River Basin Water Code can be found in Delaware River Basin Commission (2013).

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

storage Usable volume of water in a reservoir. Unless otherwise indicated, volume is computed based on the level of the pool above the point of maximum depletion.

uncontrolled runoff Streamflow excluding controlled releases. In the context of this report, uncontrolled runoff excludes controlled releases from the Pepacton, Cannonsville, and Neversink Reservoirs; Lake Wallenpaupack; and Rio Reservoir, but include spillway overflow at these dams.

Appendix 1. Modification and Reissuance of Appendix A of the 2017 Agreement for a Flexible Flow Management Program

An agreement affecting the Amended Decree of the U.S. Supreme Court in *New Jersey* v. *New York*, 347 U.S. 995 (1954), for managing diversions and releases under the Decree, was consented to by all of the Decree Parties: the State of Delaware, the State of New Jersey, the State of New York, the Commonwealth of Pennsylvania, and the City of New York. The agreement is a 10-year, two-part program that was signed and went into effect October 23, 2017 (Parties of the 1954 U.S. Supreme Court Decree, 2017). A modification and reissuance of "Appendix A" (Operations Plan) of the FFMP2017 on July 16, 2018, added clarification to the text, tables, and graphics, with operations fundamentally unchanged (Parties of the 1954 U.S. Supreme Court Decree, 2018). A copy of the modification agreement and the associated operations plan are included as appendix 1 here, respectively; the original page numbers were removed to avoid confusion. The documents are available through the U.S. Geological Survey website (https://webapps.usgs.gov/odrm/documents/ffmp/Signed-AppA-Mod-20180716.pdf and https://webapps.usgs.gov/odrm/documents/ffmp/Appendix_A_FFMP-20180716-Final.pdf).

AGREEMENT

Effective July 16, 2018

Modification and Reissuance of Appendix A to the 2017 Agreement for a Flexible Flow Management Program

This Agreement to modify and reissue Appendix A to the Agreement for a Flexible Flow Management Program dated October 21, 2017 (FFMP2017), has been consented to by and among the State of Delaware (DE), the State of New Jersey (NJ), the State of New York (NY), the Commonwealth of Pennsylvania (PA), and the City of New York (NYC or City), (hereafter Decree Parties) who are Parties to the Amended Decree (Decree) of the U.S. Supreme Court in New Jersey v. New York, 347 U.S. 995 (1954).

AGREEMENT AND UNANIMOUS CONSENT

In accordance with Paragraph I of the FFMP2017, which provides that Appendix A may be modified by the unanimous consent of the Decree Parties, Appendix A is modified with the following clarifications and corrections:

1. Section 1.b.iii. A parenthetical is added to clarify that a calendar year is defined as January 1st through December 31st.
2. Section 2.a. The reference to Section (3) in this paragraph was a typo and has been changed to reference Section 4 to refer to drought management.
3. Section 3.c.iv. The calculation for the portion of actual storage volume that is available for two banks was clarified by adding the word "remaining" as shown below: "As of the date the NYC Reservoirs enter into drought watch, the combined storage of the City Delaware Reservoirs shall be computed as the actual storage volume minus the *remaining* NJ Diversion Amelioration Bank and NJ Diversion Offset Bank volumes for purposes of determining storage zones."
4. Figure 1. This figure has been updated to correct an error that was made in plotting the drought rule curves which define Storage Zones L3, L4 and L5. The curves should remain at a constant value for the entire month of June, as in previous iterations of the FFMP. All modeling was performed under the assumption that the drought rule curves,

defining Storage Zones L3, L4 and L5, were those of previous versions of the FFMP. Decisions about the FFMP 2017 were based on the results of the modeling.

5. Figure 2, Tables 4a through 4g, and Section 6.
    a. A footnote was also added to Figure 2 stating: *"L1-a releases are only in effect from June 15th to April 15th."*
    b. The time-period between April 16st and April 30th of each year when the L1-a release rates are not active has been distinguished in Tables 4a through 4g.
    c. The language in Section 6 was also clarified to read: *"For the period April 16 through June 15, discharge mitigation releases shall be made in accordance with standard practices for water supply reliability, toward achieving the CSSO, at rates up to but not exceeding L1-a release rates* ***applicable at other times of the year*** ~~*as*~~ *provided in Figure 2 and Tables 4a through 4g."*

The Decree Parties hereby agree to modify Appendix A with the above changes and reissue Appendix A on the River Master's Website.

State of Delaware Date

State of New Jersey Date

State of New York Date

Commonwealth of Pennsylvania Date

City of New York Date

FFMP2017 OPERATIONS PLAN

APPENDIX A

FLEXIBLE FLOW MANAGEMENT PROGRAM

This Flexible Flow Management Program (FFMP or FFMP2017) is the program referred to in the Agreement for a Flexible Flow Management Program and consented to by the Parties (the State of Delaware, the State of New Jersey, the State of New York, the Commonwealth of Pennsylvania, and the City of New York; hereafter Decree Parties or Parties) to the Amended Decree of the Supreme Court in New Jersey v. New York, 347 U.S. 995 (1954), (hereafter Decree). References herein to "Agreement" are to that document and modifications, if any, to this FFMP shall be pursuant to the provisions of the Agreement. On July 16, 2017 the Parties unanimously consented to modifications to this Appendix A included herein. Accordingly, the FFMP shall be implemented as follows:

1. DIVERSIONS

a. New York City

In accordance with Section III.A. of the Decree, and subject to the limitations provided herein, at no time during any twelve-month period, commencing June 1st, shall the aggregate total quantity of water diverted by the City, divided by the number of days elapsed since the preceding May 31st, exceed 800 million gallons per day (mgd). The City shall be subject to the conditions and obligations in connection with the diversions, and releases to maintain the Montague flow objective, set forth in Section III.B. of the Decree, and to the limitations provided herein in Section 4. For the term of the Agreement, the City shall make releases from its Delaware Basin Reservoirs in accordance with the releases schedules incorporated herein.

b. New Jersey

In accordance with Section V. of the Decree, except with respect to limitations provided herein in Section 4, the State of New Jersey may divert outside the Delaware River watershed, from the Delaware River or its tributaries in New Jersey, without compensating releases, the equivalent of 100 mgd under the supervision of the Delaware River Master (River Master) established by the Decree and shall be subject to the following conditions and obligations:

i. The State of New Jersey may divert not to exceed 100 mgd as a monthly average, with the diversion on any day not to exceed 120 million gallons.

ii. Pursuant to Section V.2. of the Decree, if and when the State of New Jersey has built and is utilizing one or more reservoirs to store waters of the Delaware River or its tributaries for the purpose of diversion to another watershed, it may withdraw water from the Delaware River or its tributaries into such impounding reservoirs without limitation except during the months of July, August, September and October of any year, when not more than 100 mgd as a monthly average and not more than 120 million gallons in any day shall be withdrawn. This restriction may be modified upon unanimous consent of the Decree Parties should the State of New Jersey purchase or lease reallocated water or new storage from an existing or new facility.

iii. Regardless of whether the State of New Jersey builds and utilizes storage

reservoirs for diversion, its total diversion for use outside of the Delaware River watershed without compensating releases shall not exceed an average of 100 mgd during any calendar year (January 1 through December 31).

2. FLOW OBJECTIVES

a. Montague Flow Objective

Except with respect to limitations provided herein in Section 4, releases from the City Delaware Basin Reservoirs shall be in quantities designed to maintain, during Normal storage conditions, a minimum basic rate of flow at the gaging station of the United States Geological Survey (USGS) at Montague, N.J. of 1,750 cubic feet per second (cfs), as directed by the River Master in accordance with Section VII. of the Decree.

During Basinwide Drought Watch, Drought Warning, and Drought Emergency, in accordance with Section 4 of this FFMP and Section 2.5.3.B. and Tables 1 and 2 of the Delaware River Basin Water Code (Water Code), the Montague flow objective shall vary based upon the time of year and location of the salt front, and minimum compensating releases shall be made by the City of New York from its reservoirs in the upper Delaware Basin.

The Decree Parties, with the guidance of the Operations Support Tool described herein in Section 5 shall seek to maximize the frequency of the minimum basic rate of 1,750 cfs flows at the USGS gaging station at Montague, N.J. without adversely impacting basin water supplies and other objectives of the FFMP.

b. Trenton Equivalent Flow Objective

Section 2.5.3 of the Water Code establishes a set of equivalent flow objectives at Trenton, N.J. to control salinity intrusion in the Delaware Estuary. One means to manage salinity is through releases from Beltzville and Blue Marsh Reservoirs. Blue Marsh Reservoir is located on the Schuylkill River and is downstream of the USGS gaging station at Trenton, N.J. Releases from Blue Marsh Reservoir, as well as bypass flows from Yardley and the Point Pleasant Pumping station, are considered to be as effective at repelling salinity as water entering the estuary from the main stem Delaware River at Trenton. The Trenton Equivalent Flow is computed as the sum of flows at the USGS Trenton gaging station, releases in excess of conservation releases from Blue Marsh Reservoir, and an amount of water, determined by the Delaware River Basin Commission (DRBC), to account for bypass flows via Yardley and the Point Pleasant Pumping Station. This value is compared to the Trenton Equivalent Flow Objective to determine if the flow objective was satisfied.

During Basinwide Drought Watch, Drought Warning, and Drought Emergency, in accordance with Section 4 of this Agreement and Section 2.5.3.B. and Tables 1 and 2 of the Water Code, the Trenton Equivalent Flow Objective shall vary based upon the time of year and location of the salt front.

3. RELEASES

a. Conservation Releases from the City Delaware Basin Reservoirs

Conservation releases designed for protection of the ecology in the stream reaches below the City Delaware Basin Reservoirs, including water quality, fisheries, and aquatic habitat needs, shall be made at the rates described in the Habitat Protection Program in Section 5 below.

FFMP2017 OPERATIONS PLAN

b. Excess Release Quantity

Section III.B.1.(c) of the Decree defines an excess amount of water, known herein as the Excess Release Quantity (ERQ). For the period of the current program, the Decree Parties agree to use the Excess Release Quantity in support of an Interim Excess Release Quantity (IERQ) as defined in Paragraph c. below.

c. Interim Excess Release Quantity

An IERQ of 10.0 billion gallons (15,468 cfs-days) shall be provided (determined as in the original FFMP) and based upon 83 percent of the difference between 1,257 mgd (the highest year's consumption of the NYC water supply system between 2002 and 2006 inclusive) and 1,290 mgd (NYC's estimate of continuous safe yield of the NYC water supply system at that time, obtainable without pumping). The IERQ shall reset to 10.0 BG (15,468 cfs-days) on June 1st of each year of the Agreement or upon return to normal conditions after drought if the basin is in a drought condition on June 1st.

For each year beginning June 1st of the current program, the IERQ shall be used as defined below:

i. Trenton Equivalent Flow Objective: 6.09 billion gallons (9,423 cfs-days) of the IERQ, upon request by the Lower Basin States or the DRBC, NYC shall release from the IERQ water in sufficient quantities to maintain a flow at Trenton of 3,000 cfs during basin wide normal conditions for the period commencing on June 1 and continuing through May 31. NYC shall make releases from the IERQ as provided above until the aggregate quantity of the IERQ is exhausted.

ii. Thermal Mitigation: 1.62 billion gallons (2,500 cfs-days) of the IERQ will be banked and is available during basinwide normal conditions to support mitigation of thermal events which may adversely impact the cold-water fishery below the NYC Delaware Reservoirs. Use of the water for any single event will be informed by the current and forecasted basin conditions and the thermal mitigation guidance as developed by the Decree Parties. Releases for Thermal Mitigation shall be made at the direction of the New York State Department of Environmental Conservation ("NYSDEC") and administered by the River Master and the New York City Department of Environmental Protection ("NYCDEP") with notification made to all Decree Parties.

iii. Rapid Flow Change Mitigation: 0.65 billion gallons (1,000 cfs-days) of the IERQ will be banked and is available during basinwide normal conditions to mitigate potentially ecologically harmful conditions caused by rapid reductions in the NYC Delaware Reservoir directed releases because of the requirements of the Montague Flow Objective in Section 2.a. Use of the water for any single event will be informed by the current basin conditions and the guidance for its use as developed by the Decree Parties. Releases to mitigate rapid flow changes shall be made at the direction of the River Master and NYCDEP, with notification to all Decree Parties.

iv. NJ Diversion Amelioration: 1.65 billion gallons (2,545 cfs-days) of the IERQ will be banked and reserved for use during drought conditions (basinwide and/or lower basin), to supply NJ's increased diversion when the NJ Diversion Offset Bank, as described below in Section 4.d., has been exhausted. As of the date the NYC Reservoirs enter into drought watch, the combined storage of the City Delaware Reservoirs shall be computed as the actual storage volume minus the remaining NJ Diversion Amelioration Bank and NJ Diversion Offset Bank volumes for purposes of determining storage zones.

d. Interim Excess Release Quantity Extraordinary Needs Bank

In addition to the hydrologic criteria described in Section 2.5.6.A. of the Water Code and subject to other provisional uses of the IERQ as provided herein, the Decree Parties, the DRBC and the 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 unanimous agreement, the Decree Parties may reallocate all or a portion of the IERQ uses identified in section 3.c 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 quantity as may be reallocated shall be deducted from the agreed upon IERQ source as defined above. Any unused Extraordinary Needs Bank water shall be returned to IERQ.

4. DROUGHT MANAGEMENT

Figure 1 defines five zones of combined reservoir usable storage relative to the three drought management rule curves (Drought Watch, Drought Warning, and Drought Emergency creating Zones L3, L4, and L5, respectively) and one additional curve that subdivides the Normal storage zone into two zones (L1 – discharge mitigation and L2- normal). The three drought management zones are described below. The two normal conditions storage zones are described in Section 5.

During the effective period of this Agreement, the following drought stage definitions and procedures will be in effect:

a. Drought Watch (L3)

The seasonally segmented line (shown as dashes) dividing the current Drought Warning in Figure 1 of DRBC Resolution No. 83-13 and DRBC Docket No. D-77-20 CP (Revised) is raised by four (4) billion gallons during the entire year. In addition, the upper half of the Drought Warning zone, previously referred to as DW1 in DRBC Resolution No. 83-13, is hereby designated Drought Watch, with diversions and flow objectives as shown in Table 1.

b. Drought Warning (L4)

The lower half of the Drought Warning zone (DW2), based upon the rule curves included in DRBC Resolution No. 83-13 and as modified by Paragraph a. above, is hereby designated Drought Warning, with diversions and flow objectives as shown in Table 1.

New Jersey's maximum average monthly diversion from the Delaware River Basin via the Delaware and Raritan Canal shall be in accordance with Table 1, when said diversion shall not exceed a daily running average of 90 mgd commencing on the day such Drought Emergency becomes effective. Under all City Delaware Basin Reservoir combined storage conditions, New Jersey's diversion on any day shall not exceed 120 million gallons.

c. Drought Emergency (L5)

The operation level named "Drought" in the rule curves included in DRBC Resolution No. 83-13 and Docket D-77-20 CP (Revised) is hereby designated Drought Emergency. During Drought Emergency, diversions shall be limited as shown in Table 1. The Montague and Trenton Equivalent Flow Objectives are shown in Tables 1 and 2.

New York City's diversions from the Delaware River Basin shall be in accordance with Table 1 (Interstate Operation Formula for Diversions and Flow Objectives). Minimum releases from the New York City Delaware Basin Reservoirs shall be in accordance with Table 3 (Schedule of Releases during Drought Operations).

New Jersey's maximum average monthly diversion from the Delaware River Basin via the Delaware and Raritan Canal shall be in accordance with Table 1, when said diversion shall not exceed a daily running average of 80 mgd commencing on the day such Drought Emergency becomes effective. Under all City Delaware Basin Reservoir combined storage conditions, New Jersey's diversion on any day shall not exceed 120 million gallons.

d. New Jersey Diversion Offset Bank

There is hereby established a NJ Diversion Offset Bank, not to exceed 1.49 billion gallons (2,300 cfs-days) of water in the City Delaware Basin Reservoirs, for the purpose of offsetting the increased diversions by New Jersey as provided in Table 1 of this FFMP, during drought conditions (basinwide and/or lower basin). The increases are in increments, not to be exceeded on any day, as follows: 0 mgd during Normal conditions; up to 15 mgd during Drought Watch; up to 20 mgd during Drought Warning; and up to 15 mgd during Drought Emergency. The differences in New Jersey's diversion, computed on the basis of Table 1 of the Good Faith Agreement, and the corresponding rates in Table 1 of this FFMP, establish the additional increments for New Jersey's diversion as incorporated herein.

This Diversion Offset Bank shall be created by use of Forecast Available Water from June 1 to August 31 as described in Section 5 of this Appendix and reserved for New Jersey to offset the increased diversion during drought periods (basinwide and/or lower basin). Water shall be accumulated in the Diversion Offset Bank (up to 25 cfs per day) and shall be excluded from the Forecast Available Water calculation. Once the NYC Reservoirs enter into drought watch, the combined storage of the City Delaware Reservoirs shall be computed as the actual storage volume minus the NJ Amelioration Bank and NJ Diversion Offset Bank volumes for purposes of determining storage zones.

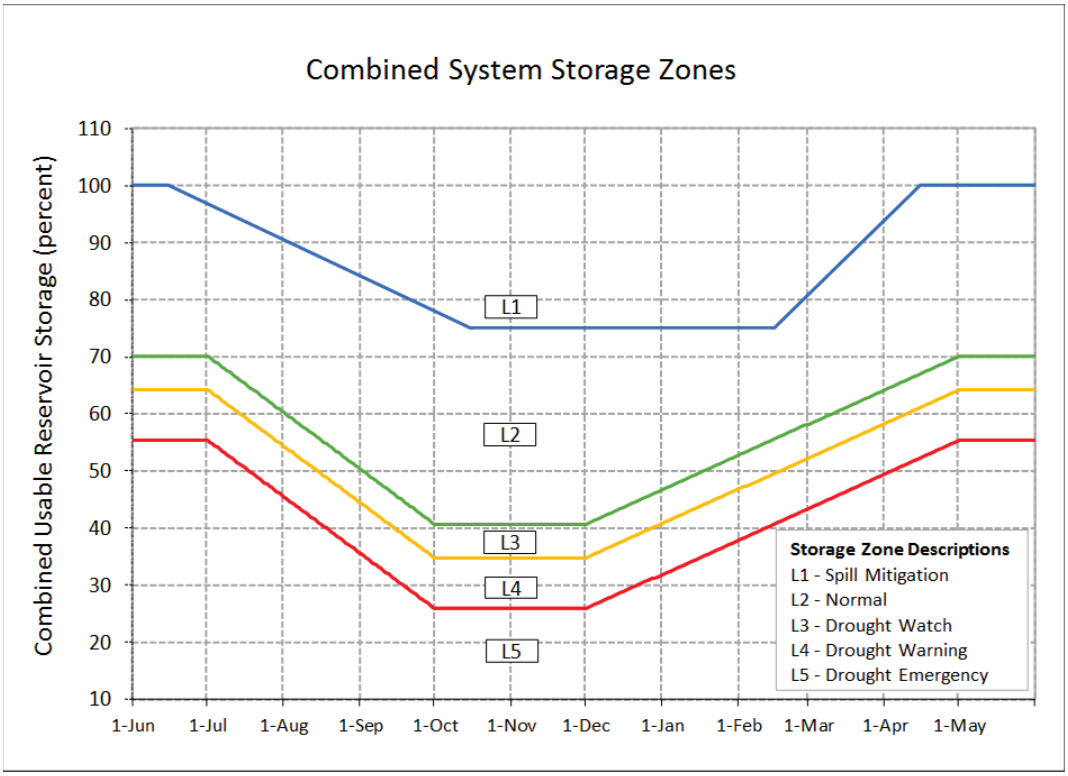
If the accumulated incremental increased diversions by New Jersey, at any time, exceed the available water in the Diversion Offset Bank, the IERQ water dedicated to the NJ diversion amelioration will be used in the same manner. If the accumulated incremental increased diversions by New Jersey exceed both the combined NJ Diversion Offset Bank and the IERQ water dedicated to NJ diversion amelioration, the Lower Basin Reservoirs in Pennsylvania will provide the additional water to offset New Jersey's increased diversions.

Releases from the NJ Diversion Offset Bank and the IERQ dedicated to the NJ diversion amelioration shall be at the direction of DRBC with prior notification to New Jersey, and will be implemented by the River Master. Releases from the Lower Basin Reservoirs for New Jersey's diversion, if necessary, shall be at the direction of DRBC, in consultation with and at the request of New Jersey.

Releases from the NJ Diversion Offset Bank, the IERQ dedicated to the NJ diversion amelioration, or the Lower Basin Reservoirs in Pennsylvania to offset New Jersey's incremental increases in out-of-basin diversions, measured at Port Mercer, NJ shall be in accordance with timing procedures agreed upon by DRBC, New Jersey, and the River Master. No offsetting or accounting for offsetting is required for New Jersey's increased diversions on any day when DRBC determines that no water is required to meet the current Trenton flow objective.

The River Master will maintain the ongoing accounting for releases made from this bank and the Diversion Amelioration Bank. At no time during the year commencing June 1st shall releases from the NJ Diversion Offset Bank exceed the balance of the bank. The bank will reset under normal conditions on June 1st and begin accumulating water as defined in this section. If under basin wide drought conditions on May 31st the balance of the NJ Diversion Offset Bank shall remain available for use until normal conditions resume. Upon return to normal conditions, the NJ Diversion Offset Bank will reset and begin accumulating water as described in this and Section 5.

Figure 1
New York City Delaware System Usable Combined Storage
(Cannonsville, Pepacton, and Neversink Reservoirs)



FFMP2017 OPERATIONS PLAN

Table 1
Interstate Operation Formula for Diversions and Flow Objectives

NYC Storage Condition	*NYC Diversion (mgd)*	*NJ Diversion (mgd)*	*Montague Flow Objective (cfs)*	*Trenton Flow Objective (cfs)*
Normal (L1, L2)	800	100	1,750	3,000
Drought Watch (L3)	680	100	1,650	2,700
Drought Warning (L4)	560	90	1,550	2,700
Drought Emergency (L5)	520	80	1,100-1,650*	2,500-2,900*
Severe Drought	(to be negotiated depending upon conditions)			

* Varies with time of year and location of salt front, in accordance with Table 2.

Table 2

Interstate Operation Formula for Adjusting Montague and Trenton Flow Objectives during Drought Emergency (L5) Operations

	Flow objective, cubic feet per second at:					
	Montague, NJ			Trenton, NJ***		
7-day average location of Salt Front*, River Mile**	Dec-Apr.	May-Aug.	Sept-Nov.	Dec-Apr.	May-Aug.	Sept-Nov.
Upstream of R.M. 92.5	1,600	1,650	1,650	2,700	2,900	2,900
Between R.M. 87.0 and R.M. 92.5	1,350	1,600	1,500	2,700	2,700	2,700
Between R.M. 82.9 and R.M. 87.0	1,350	1,600	1,500	2,500	2,500	2,500
Downstream of R.M. 82.9	1,100	1,100	1,100	2,500	2,500	2,500

* Defined as the 250 milligrams per liter isochlor in the Delaware Estuary.

**Measured in statute miles along the navigation channel from the mouth of Delaware Bay.

*** The Trenton Equivalent Flow Objective is achieved if the sum of flows observed at the USGS Trenton gaging station, releases in excess of conservation releases from Blue Marsh Reservoir, and an amount to account for water withdrawn above Trenton and returned below the gage is greater than the Trenton Flow Objective listed above.

FFMP2017 OPERATIONS PLAN

Table 3
Schedule of Releases (cfs) during Drought Operations

	Summer			Fall			Winter		Spring	
Cannonsville	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	30-Apr	20-May	31-May
L3	135	135	135	85	85	55	55	55	85	85
L4	100	100	100	50	50	50	50	50	60	60
L5	90	90	90	40	40	40	40	40	40	40

	Summer			Fall			Winter		Spring	
Pepacton	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	30-Apr	20-May	31-May
L3	75	75	75	45	45	45	45	45	60	60
L4	65	65	65	40	40	40	40	40	50	50
L5	60	60	60	35	35	35	35	35	35	35

	Summer			Fall			Winter		Spring	
Neversink	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	30-Apr	20-May	31-May
L3	55	55	55	30	30	30	30	30	40	40
L4	45	45	45	25	25	25	25	25	30	30
L5	40	40	40	20	20	20	20	20	20	20

e. Entry and Exit Criteria

Criteria for entry into and exit from the various stages of drought operations shall be in accordance with Section 2.5.3.E. of the Water Code. Normal (L2 or higher) level releases will be restored when combined storage in the City Delaware Basin Reservoirs reaches 25 billion gallons above the L3 curve in Figure 1 and remains at or above that level for 15 consecutive days.

FFMP2017 OPERATIONS PLAN

f. Balancing Adjustment

In order to conserve water, the River Master is requested to utilize a balancing adjustment, based upon procedures agreed upon by the Decree Parties, when calculating the releases to be directed to meet the Montague flow objectives in Tables 1 and 2.

5. HABITAT PROTECTION PROGRAM

a. Applicability and Management Objectives

The overall management goal of the Habitat Protection Program (HPP) is to protect the cold-water fishery while maintaining aquatic community diversity, structure, and function through improved ecological flow releases. A series of four categorical protection levels for describing cold water ecosystem management objectives for waters downstream of the City Delaware Basin Reservoirs was developed by New York and Pennsylvania fishery managers and is shown on Plate 1. These protection levels apply in non-drought years and are defined as follows:

Excellent: Excellent year-round cold-water aquatic habitat protection. Summer water temperatures are routinely 68ºF or less and only very rarely exceed a daily maximum of 75ºF. Excellent protection level applies to the West Branch Delaware River from Cannonsville Reservoir to the junction with the East Branch Delaware River, the East Branch Delaware River from Pepacton Reservoir to the hamlet of East Branch, N.Y., and Neversink River from Neversink Reservoir to Bridgeville, N.Y.

Good: River section provides cold water aquatic habitat and thermal protection and maintains opportunities for a cold-water fishery. Summer water temperatures will occasionally exceed a daily maximum of 75ºF for short periods and water temperatures greater than 68ºF occur more frequently than with the Excellent protection level. Elevated temperatures will occasionally be an issue. Good protection level applies to the Delaware River main stem from the junction of the West and East Branches to Lordville, N.Y. and the Neversink River from Bridgeville, N.Y. to the mouth of Eden Brook near Oakland Valley, N.Y.

Moderate: River sections will experience adequate flow and some thermal protection for cold water species. Seasonal opportunities for a cold-water fishery will occur, but thermal benefits will diminish. Moderate protection level applies to the East Branch Delaware River from East Branch, N.Y. to the mouth of Corn Creek near Peas Eddy, N.Y., the Neversink River from the mouth of Eden Brook near Oakland Valley, N.Y. to the Sullivan/Orange County, N.Y. boundary, and the Delaware River main stem from Lordville, N.Y. to Hankins, N.Y.

Minimal: River sections with this designation will experience adequate flow, but only limited thermal protection. The quality of the fishery will be generally seasonal and will vary from year to year. Flows should be adequate to allow trout to reach cold water refugia and to protect dwarf wedgemussel populations in the vicinity of

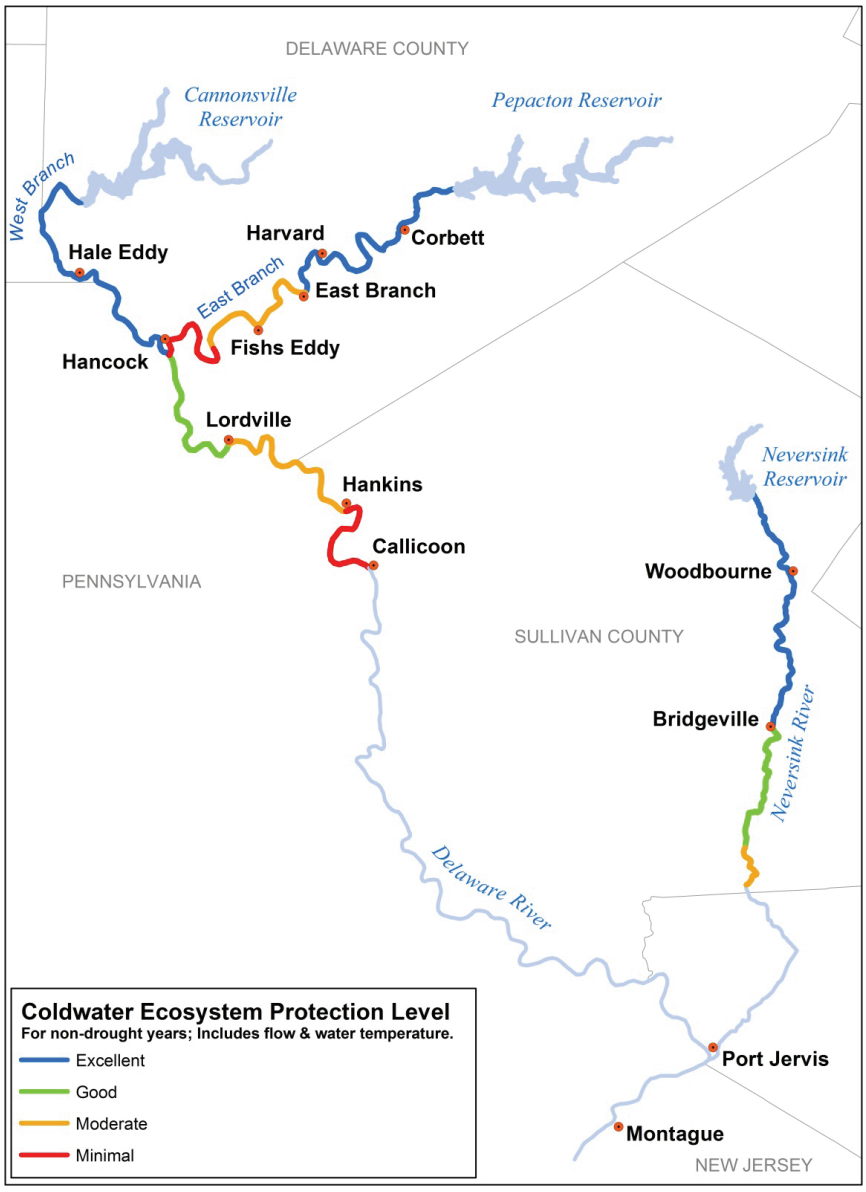
Callicoon, N.Y. Minimal protection level applies to the East Branch Delaware River from the mouth of Corn Creek near Peas Eddy, N.Y. to the junction with the West Branch Delaware River, and the Delaware River main stem from Hankins, N.Y. to Callicoon, N.Y.

The Decree Parties recognize that the degree of protection in waters downstream of the City Delaware Basin Reservoirs will vary according to annual fluctuations in precipitation and temperature, reservoir releases rates, distance from the locations of reservoir releases, and tributary influences. Requirements for protection of the federally endangered dwarf wedgemussel are currently under study and are poorly defined.

FFMP2017 OPERATIONS PLAN

Plate 1

Extent and Protection Level of the Cold-Water Ecosystem



b. Controlled Releases for Habitat Protection Program

There is hereby established a Habitat Protection Program (HPP), which consists of conservation releases designed for the protection of the cold-water fishery below the City Delaware Basin Reservoirs.

The HPP is designed to make enhanced releases, above the base releases given in Table 4a, when an assessment by New York City, using its Operations Support Tool (OST) as guidance, determines that additional water is available for releases and that any risk to the City's water supply is at an acceptable level. The Base Releases table is designed for drought neutral minimum releases, i.e., no additional drought risk relative to DRBC Docket D-77-20 CP Revised (Rev. 1), which can be maintained under Normal conditions, independent of inflow or the City's demand.

The City is using OST, a state-of-the-art forecast-driven analysis and decision support tool that provides the City with probabilistic predictions of future system status. In addition to its principal objective of improving operational decision making in providing a reliable supply of high quality drinking water for 9 million people, OST also provides assurance that the actions taken to support downstream objectives, such as fish habitat, stream ecosystems, and better discharge mitigation, will not adversely impact water supply reliability. It allows the City to compare different sets of operating scenarios using real-time system information (e.g., reservoir levels, water quality, streamflows) and forecasts (e.g., streamflows, meteorological drivers) to evaluate the impacts on water supply reliability so that objective risk-based decisions can be made quickly and efficiently.

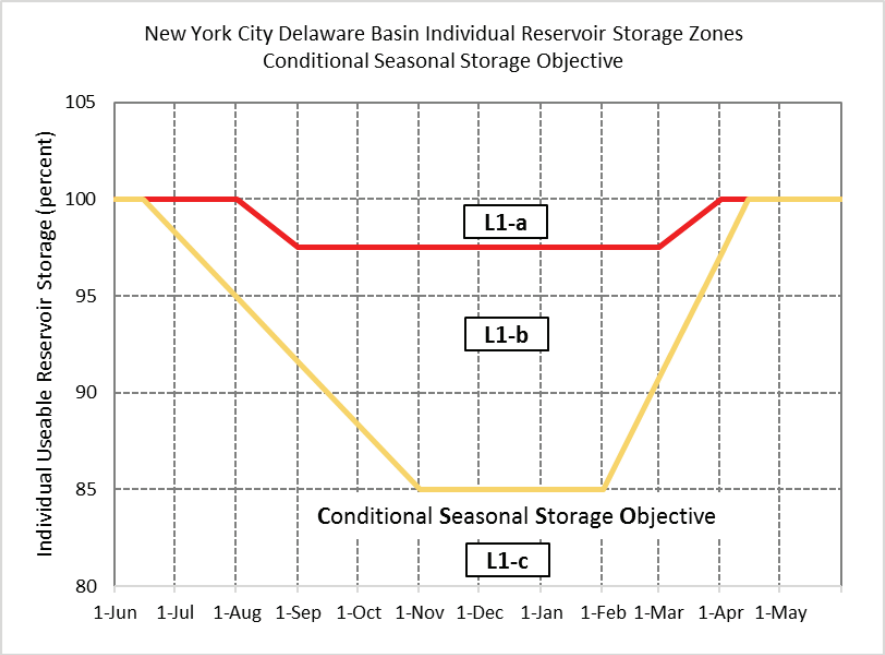
Under this agreement the City will voluntarily make enhanced releases using the Forecast-based Available Water (FAW) as determined by an OST assessment and in accordance with Figures 1 and 2 and the appropriate FAW or the base releases shown in Table 4a. During periods when Table 4g is in effect, a 25 cfs credit towards the New Jersey Diversion offset Bank shall be included with the total NYC Reservoir releases. During periods when Table 4f is in effect, a 10 cfs credit towards the New Jersey Diversion offset Bank shall be included with the total NYC Reservoir releases. When the assessment indicates that no additional water is available, the City shall make releases in accordance with the currently sustainable base releases shown in Table 4a. The City is under no obligation to make enhanced releases beyond the base releases, when the risk to water supply, as determined by the City using its OST assessment, is unacceptable.

The City will make available to the Decree Parties the inputs to the OST model, the outputs from the model, and the releases table selection guidelines, including the forecasted probabilistic inflows, the status of the City Delaware Reservoirs, and the operational assumptions applicable to OST-based decisions. OST assessments shall be performed as frequently as necessary to confirm confidence in the selected FAW table but generally not less than monthly. Prior to making a releases table change, the City will provide notification, along with a general description of the rationale of such change to the Decree Parties, the River Master, and DRBC. The City shall provide the OST Summary Data, described above through the River Master's website.

As shown in Tables 4a through 4g, each reservoir has a schedule of seasonal releases based on the quantity of combined reservoir usable storage, and the quantity of water available for the HPP.

FFMP2017 OPERATIONS PLAN

Figure 2
New York City Delaware System Usable Individual Storage
(Cannonsville, Pepacton, and Neversink Reservoirs) *



** L1-a releases are only in effect from June 15th to April 15th.*

FFMP2017 OPERATIONS PLAN

Table 4a

Schedule of Releases (cfs) during Normal Conditions
Base Releases with no Forecast based Available Water (FAW)

	Summer			Fall			Winter			Spring	
Cannonsville	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	1500	1500	1500	1500	1500	1500	1500	*	*	*
L1-b	600	600	600	600	600	600	600	600	600	600	600
L1-c	215	215	215	200	105	85	85	85	85	185	185
L2	190	190	190	180	85	60	60	60	60	160	160

	Summer			Fall			Winter			Spring	
Pepacton	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	700	700	700	700	700	700	700	*	*	*
L1-b	300	300	300	300	300	300	300	300	300	300	300
L1-c	120	120	120	110	80	70	70	70	70	100	100
L2	100	100	100	90	60	50	50	50	50	80	80

	Summer			Fall			Winter			Spring	
Neversink	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	190	190	190	190	190	190	190	*	*	*
L1-b	150	150	150	150	110	110	110	110	110	110	110
L1-c	90	90	90	85	65	50	50	50	50	75	75
L2	75	75	75	70	50	35	35	35	35	60	60

* Indicates storage zone not present at this time period; release is entry in cell below.

FFMP2017 OPERATIONS PLAN

Table 4b

Schedule of Releases (cfs) during Normal Conditions

	Summer			Fall			Winter			Spring	
Cannonsville	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	1500	1500	1500	1500	1500	1500	1500	*	*	*
L1-b	600	600	600	600	600	600	600	600	600	600	600
L1-c	300	300	300	250	200	110	110	165	165	245	265
L2	245	245	245	225	140	75	75	110	110	200	210

	Summer			Fall			Winter			Spring	
Pepacton	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	700	700	700	700	700	700	700	*	*	*
L1-b	300	300	300	300	300	300	300	300	300	300	300
L1-c	135	135	135	125	95	80	80	80	80	95	110
L2	110	110	110	100	70	55	55	55	55	90	90

	Summer			Fall			Winter			Spring	
Neversink	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	190	190	190	190	190	190	190	*	*	*
L1-b	150	150	150	150	110	110	110	110	110	110	110
L1-c	100	100	100	85	75	55	55	55	55	85	85
L2	80	80	80	75	55	40	40	40	40	65	65

* Indicates storage zone not present at this time period; release is entry in cell below.

FFMP2017 OPERATIONS PLAN

Table 4c

Schedule of Releases (cfs) during Normal Conditions

	Summer			Fall			Winter			Spring	
Cannonsville	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	1500	1500	1500	1500	1500	1500	1500	*	*	*
L1-b	600	600	600	600	600	600	600	600	600	600	600
L1-c	350	350	350	300	225	110	110	175	175	275	275
L2	300	300	300	270	190	90	90	155	155	240	255

	Summer			Fall			Winter			Spring	
Pepacton	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	700	700	700	700	700	700	700	*	*	*
L1-b	300	300	300	300	300	300	300	300	300	300	300
L1-c	140	140	140	125	105	80	80	80	80	100	120
L2	115	115	115	105	80	60	60	60	60	95	100

	Summer			Fall			Winter			Spring	
Neversink	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	190	190	190	190	190	190	190	*	*	*
L1-b	150	150	150	150	110	110	110	110	110	110	110
L1-c	105	105	105	95	75	60	60	60	60	85	90
L2	90	90	90	80	65	45	45	45	45	70	75

* Indicates storage zone not present at this time period; release is entry in cell below.

FFMP2017 OPERATIONS PLAN

Table 4d

Schedule of Releases (cfs) during Normal Conditions

	Summer			Fall			Winter			Spring	
Cannonsville	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	1500	1500	1500	1500	1500	1500	1500	*	*	*
L1-b	600	600	600	600	600	600	600	600	600	600	600
L1-c	400	400	400	325	275	140	140	245	245	305	345
L2	360	360	360	315	245	105	105	205	205	280	305

	Summer			Fall			Winter			Spring	
Pepacton	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	700	700	700	700	700	700	700	*	*	*
L1-b	300	300	300	300	300	300	300	300	300	300	300
L1-c	150	150	150	125	115	85	85	85	85	120	130
L2	125	125	125	115	95	65	65	65	65	105	110

	Summer			Fall			Winter			Spring	
Neversink	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	190	190	190	190	190	190	190	*	*	*
L1-b	150	150	150	150	110	110	110	110	110	110	110
L1-c	110	110	110	95	85	60	60	60	60	90	95
L2	95	95	95	85	70	50	50	50	50	75	80

* Indicates storage zone not present at this time period; release is entry in cell below.

FFMP2017 OPERATIONS PLAN

Table 4e

Schedule of Releases (cfs) during Normal Conditions

	Summer			Fall			Winter			Spring	
Cannonsville	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	1500	1500	1500	1500	1500	1500	1500	*	*	*
L1-b	600	600	600	600	600	600	600	600	600	600	600
L1-c	450	450	450	375	335	150	150	285	285	350	385
L2	415	415	415	360	295	120	120	255	255	320	355

	Summer			Fall			Winter			Spring	
Pepacton	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	700	700	700	700	700	700	700	*	*	*
L1-b	300	300	300	300	300	300	300	300	300	300	300
L1-c	155	155	155	140	125	90	90	90	90	120	140
L2	135	135	135	125	105	70	70	70	70	110	120

	Summer			Fall			Winter			Spring	
Neversink	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	190	190	190	190	190	190	190	*	*	*
L1-b	150	150	150	150	110	110	110	110	110	110	110
L1-c	115	115	115	105	90	65	65	65	65	95	100
L2	100	100	100	90	75	50	50	50	50	80	85

* Indicates storage zone not present at this time period; release is entry in cell below.

FFMP2017 OPERATIONS PLAN

Table 4f

Schedule of Releases (cfs) during Normal Conditions

	Summer			Fall			Winter			Spring	
Cannonsville	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	1500	1500	1500	1500	1500	1500	1500	*	*	*
L1-b	600	600	600	600	600	600	600	600	600	600	600
L1-c	500	500	500	425	400	175	160	325	325	375	425
L2	460	460	460	405	350	135	135	300	300	360	400

	Summer			Fall			Winter			Spring	
Pepacton	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	700	700	700	700	700	700	700	*	*	*
L1-b	300	300	300	300	300	300	300	300	300	300	300
L1-c	160	160	160	145	135	95	95	95	95	130	150
L2	140	140	140	130	115	75	75	75	75	120	130

	Summer			Fall			Winter			Spring	
Neversink	Jun 1 -	Jun 16 -	Jul 1 -	Sep 1 -	Sep 16 -	Oct 1 -	Dec 1 -	Apr 1 -	Apr 16 -	May 1 -	May 21 -
Storage Zone	15-Jun	30-Jun	31-Aug	15-Sep	30-Sep	30-Nov	31-Mar	15-Apr	30-Apr	20-May	31-May
L1-a	*	190	190	190	190	190	190	190	*	*	*
L1-b	150	150	150	150	110	110	110	110	110	110	110
L1-c	120	120	120	105	95	65	65	65	65	100	105
L2	110	110	110	95	85	55	55	55	55	85	95

* Indicates storage zone not present at this time period; release is entry in cell below.

FFMP2017 OPERATIONS PLAN

Table 4g

Schedule of Releases (cfs) during Normal Conditions

	Summer			Fall			Winter			Spring	
Cannonsville Storage Zone	Jun 1 - 15-Jun	Jun 16 - 30-Jun	Jul 1 - 31-Aug	Sep 1 - 15-Sep	Sep 16 - 30-Sep	Oct 1 - 30-Nov	Dec 1 - 31-Mar	Apr 1 - 15-Apr	Apr 16 - 30-Apr	May 1 - 20-May	May 21 - 31-May
L1-a	*	1500	1500	1500	1500	1500	1500	1500	*	*	*
L1-b	600	600	600	600	600	600	600	600	600	600	600
L1-c	550	550	550	475	425	175	175	375	375	425	475
L2	500	500	500	450	400	150	150	350	350	400	450

	Summer			Fall			Winter			Spring	
Pepacton Storage Zone	Jun 1 - 15-Jun	Jun 16 - 30-Jun	Jul 1 - 31-Aug	Sep 1 - 15-Sep	Sep 16 - 30-Sep	Oct 1 - 30-Nov	Dec 1 - 31-Mar	Apr 1 - 15-Apr	Apr 16 - 30-Apr	May 1 - 20-May	May 21 - 31-May
L1-a	*	700	700	700	700	700	700	700	*	*	*
L1-b	300	300	300	300	300	300	300	300	300	300	300
L1-c	170	170	170	160	145	100	100	100	100	145	160
L2	150	150	150	140	125	80	80	80	80	125	140

	Summer			Fall			Winter			Spring	
Neversink Storage Zone	Jun 1 - 15-Jun	Jun 16 - 30-Jun	Jul 1 - 31-Aug	Sep 1 - 15-Sep	Sep 16 - 30-Sep	Oct 1 - 30-Nov	Dec 1 - 31-Mar	Apr 1 - 15-Apr	Apr 16 - 30-Apr	May 1 - 20-May	May 21 - 31-May
L1-a	*	190	190	190	190	190	190	190	*	*	*
L1-b	150	150	150	150	110	110	110	110	110	110	120
L1-c	125	125	125	115	100	75	75	75	75	100	115
L2	115	115	115	100	90	60	60	60	60	90	100

* Indicates storage zone not present at this time period; release is entry in cell below.

FFMP2017 OPERATIONS PLAN

6. DISCHARGE MITIGATION PROGRAM

To enhance flood mitigation provided by the City Delaware Basin Reservoirs, a Conditional Seasonal Storage Objective (CSSO) rule curve in Figure 2 will be established. Consistent with good practices for water supply reservoirs, and in order to ensure that sufficient resources are available during an extended dry period to support both lower basin and NYC needs, it is essential to ensure that the City Delaware Basin Reservoirs are filled on or around June 1st every year. To accomplish this, the CSSO (boundary between the L1-b and L1-c storage zones in Figure 2) must be limited and ramped. NYC shall endeavor, to the maximum extent possible without impacting water supply reliability, to maintain reservoir levels at the CSSO, thus creating a high probability of maintaining fifteen (15) percent void spaces each year between November 1 through the following February 1to help mitigate flooding events. In determining the releases needed to maintain the CSSO, the following parameters are considered in the OST evaluation: forecasted inflows over the next seven (7) days, FAW table releases in effect over the next seven (7) days, anticipated diversions over the next seven (7) days, including inflow from the snow water equivalent (snowmelt) as forecast by the National Weather Service's (NWS) Hydrological Ensemble Forecasting System (HEFS), and the current usable reservoir storage. Based on any projected seven (7) day storage surplus, the City will calculate new release volumes, above the FAW table releases in effect, to progress toward the CSSO and allocate those volumes over the upcoming 7-day period, within the limitations of the release works for each reservoir.

Discharge Mitigation Program releases are designed to help mitigate the effects of flooding immediately below the City Delaware Basin Reservoirs. When the combined reservoir usable storage in Figure 1 is in Zone L1, the spill mitigation zone, Figure 2 defines three zones of reservoir-specific storage (L1-a, L1-b and L1-c) relative to two rule curves for each reservoir. Tables 4a through 4g further define spill mitigation releases based on reservoir-specific storage when combined storage is in Zone L1. When combined usable reservoir storage is below Zone L1, reservoir-specific storage zones as defined in Figure 2 are not applicable, and the releases to be made, as set forth in the tables, are for conservation purposes only.

The City shall make discharge mitigation releases from the City Delaware Basin Reservoirs in accordance with the following:

i. If combined reservoir usable storage is in Zone L1 in accordance with Figure 1, discharge mitigation releases shall be made based upon individual reservoir usable storage in accordance with Zones L1-a, L1-b and L1-c as provided in Figure 2 and Tables 4a through 4g. HEFS will explicitly model the amount and timing of snowmelt in reservoir inflow forecasts. By incorporating the most recent City snowpack survey data, as well as the City's automated snowpack sensor network data and the NWS's meteorological forecasts into a runoff model, HEFS will determine an up to date prediction of reservoir inflows from rainfall and snowmelt.

ii. For the period April 16 through June 15, discharge mitigation releases shall be made in accordance with standard practices for water supply reliability, toward achieving the CSSO, at rates up to but not exceeding L1-a release rates applicable at other times of the year provided in Figure 2 and Tables 4a through 4g.

iii. NYCDEP and the NYSDEC reservoir releases managers, upon mutual agreement, may transfer spills to bottom releases to the extent possible at any reservoir.

iv. The current National Weather Service (NWS) flood stage for the West Branch Delaware River at Hale Eddy is 11 feet. Accordingly, Zone L1 discharge mitigation releases will not be made from Cannonsville Reservoir when the river stage for the

West Branch Delaware River at Hale Eddy is above 9 feet, or is forecasted to be above 9 feet within 48 hours of planned discharge mitigation releases, and releases shall be made in accordance with Zone L2 through L5 as provided in Tables 4a through 4g. This guidance may be modified at any time upon unanimous consent by the Decree Parties, if additional information demonstrates that a different cautionary stage should be used to limit the discharge mitigation releases.

v. The current NWS flood stage for the East Branch Delaware River at Fishs Eddy is 13 feet. Accordingly, Zone L1 discharge mitigation releases will not be made from Pepacton Reservoir when the river stage for the East Branch Delaware River at Fishs Eddy is above 11 feet or is forecast to be above 11 feet within 48 hours of planned discharge mitigation releases, and releases shall be made in accordance with Zone L2 through L5 as provided in Tables 4a through 4g. This guidance may be modified at any time upon unanimous consent by the Decree Parties, if additional information demonstrates that a different cautionary stage should be used to limit the discharge mitigation releases.

vi. The current NWS flood stage for the Neversink River at Bridgeville is 13 feet. Accordingly, Zone L1 discharge mitigation releases will not be made from Neversink Reservoir when the river stage for the Neversink River at Bridgeville is above 12 feet, or is forecast to be above 12 feet within 48 hours of planned discharge mitigation releases, and releases shall be made in accordance with Zone L2 through L5 as provided in Tables 4a through 4g. This guidance may be modified at any time upon unanimous consent by the Decree Parties, if additional information demonstrates that a different cautionary stage should be used to limit the discharge mitigation releases.

vii. Discharge mitigation releases may be suspended from the respective reservoir if NYCDEP and NYSDEC, in consultation with the NWS, determine that ice conditions threaten flood prone areas of the West Branch Delaware River below Cannonsville Reservoir, East Branch Delaware River below Pepacton Reservoir, or Neversink River below Neversink Reservoir.

viii. Discharge mitigation releases will be designed so that the combined discharge from each reservoir's controlled release works and spillway does not exceed the maximum rate given in Table 5 below. Respective controlled releases will be reduced to L5 in Table 3.

ix. To more naturally effect downward or upward transitions between discharge mitigation releases rates identified in Tables 4a through 4g, discharge mitigation releases rates may be ramped, in cooperation with NYSDEC, generally over a period of three days at Cannonsville and Pepacton Reservoirs, and two days at Neversink Reservoir.

x. Modifications to the program necessary to accommodate emergencies, maintenance and repair operations or short-term needs shall be undertaken pursuant to Section V of the Agreement.

FFMP2017 OPERATIONS PLAN

Table 5
Maximum Combined Discharge Rates

Reservoir	*Maximum Combined Discharge Rate (cfs)*
Neversink	3,400
Pepacton	2,400
Cannonsville	4,200

7. SALINITY REPULSION

New York City will provide releases to protect the lower basin water supply from salt water movement up the Delaware River in accordance with Table 2 of the Interstate Water Management Recommendations of the Parties to the U.S. Supreme Court Decree of 1954 to the Delaware River Basin Commission pursuant to Delaware River Basin Commission Resolution 78-20 (Good Faith Agreement). As stipulated in the Good Faith Agreement and in accordance with Table 2, herein (Interstate Operation Formula for Adjusting Montague And Trenton Flow Objectives During Drought Emergency (L5) Operations), the City shall make releases to meet the Montague flow objectives according to the location of the salt front.

8. TEMPERATURE MONITORING AND REPORTING

During the term of the current Agreement, NYSDEC shall monitor water temperatures within the stream reaches defined and categorized in Section 5. Monitoring will be conducted at a sufficient number of locations (to be determined by NYSDEC) to adequately characterize temperatures. At the end of the current Agreement, NYSDEC shall provide a compilation of the monitoring data with a brief statement of the findings to the Decree Parties.

9. TEMPORARY SUSPENSION OR MODIFICATION OF FFMP

From time to time, the Decree Parties and DRBC may agree that upgrades to facilities, emergencies, maintenance and repair operations, short-term needs, or unanticipated effects of the FFMP may require temporary suspension or modification of one or more of the provisions herein. In considering such temporary suspensions or modifications, the Decree Parties and DRBC may estimate probabilities and risks associated with such temporary suspensions or modifications. Any resultant action taken, other than the temporary suspension or modification to the releases as provided below, shall require the unanimous approval of the Decree Parties.

New York City shall provide reasonable advance notification to the Decree Parties, River Master and DRBC of any planned extended tunnel shutdowns from New York City's Delaware System reservoirs and/or changes in releases due to emergencies, maintenance and repair operations, upgrades to existing facilities or the construction and integration of new infrastructure. New York City shall establish the scope of work and the schedule for the work and shall inform the Decree Parties and DRBC of such plans as early as practicable. For work involving a temporary suspension or modification due to new infrastructure or an upgrade to an existing facility, New York City shall provide the Decree Parties and DRBC with the releases modification strategy and project design materials at the sixty (60) percent design point to allow for review, comment and discussion. The Decree Parties shall make their best effort to reach unanimous approval for a modified release schedule as may be required for purposes of performing the work. In the absence of unanimous approval, New York City, acting in cooperation with the New York State Department of

Environmental Conservation (NYSDEC), will make releases to the best of its ability for the duration of the work, provided, however, that releases shall be sufficient to meet the Montague flow objective in effect at the time.

Modifications to releases not to exceed seven (7) consecutive days for purposes 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 the NYSDEC, provided, however, that releases shall be sufficient to meet the Montague flow objective in effect at the time.

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