

FISH OPERATIONS PLAN IMPLEMENTATION REPORT

June 2024

U.S. Army Corps of Engineers
Northwestern Division
Portland, OR.

Introduction

The 2024 Fish Operations Plan (2024 FOP) describes the U.S. Army Corps of Engineers' (Corps) planned operations for fish¹ passage at its four lower Snake River and four lower Columbia River dams during the 2024 surface spill operations in March through early April, spring, and summer fish migration seasons, generally April 3 through August 31, and surface spill operations September through mid-November. The 2024 FOP is consistent with spill operations for fish passage and the regional forum process for adaptive management and in-season management provisions outlined in the Record of Decision for the Columbia River System Operations Environmental Impact Statement (CRSO EIS ROD) dated September 28, 2020, CRSO Final EIS, 2020 National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) Columbia River System (CRS) Biological Opinions (2020 CRS BiOps)², the Extensions of the 2008 Columbia Basin Fish Accords (Accord Extensions), the Corps' requirements under the Endangered Species Act (ESA), and the ongoing communication with the relevant wildlife agencies to ensure consistency with the Act. The 2024 FOP also incorporates operations outlined in Appendix B of the "U.S. Government Commitments in Support of the Columbia Basin Restoration Initiative" (USG Commitments). The USG Commitments were agreed to as part of the 2023 Memorandum of Understanding (collectively named the "Resilient Columbia Basin Agreement"). Other project operations and water management actions not specifically addressed in this document will be consistent with other guiding operative documents, including the 2024 Water Management Plan (WMP), seasonal WMP updates, and the 2024 Fish Passage Plan (FPP).

The FOP Implementation Reports are produced to reflect implementation of the 2024 FOP for spring and summer fish passage spill. This report describes the Corps' implementation of the 2024 FOP during the month of June. Information in this report includes the following:

- total flow: the total hourly river flow rate;
- generation flow: the hourly flow through the powerhouse units;
- target spill: the spill target for that hour (Table 1 and Table 2);
- adjusted spill: the hourly spill level that can be achieved taking into consideration that spill may vary as a function of total river flow, forebay elevation and generator capacity, and is

¹ ESA-listed salmon and steelhead.

² The Corps, in coordination with the other Action Agencies, and NMFS, employs the Regional Implementation Oversight Group (RIOG) and technical teams including the Technical Management Team (TMT) and Fish Passage Operations & Maintenance (FPOM) coordination group, to coordinate with state, tribal and other federal experts for recommendations for implementing operations consistent with the 2020 BiOps.

subject to routine operational adjustments that limit the ability to spill to the target spill (see 2024 FOP, Section 4.1);

- actual spill: the hourly flow over the spillway; and,
- resultant 12-hour average total dissolved gas (TDG) for the tailwater at each project.

This report also provides information on issues and unanticipated or emergency situations that arose during implementation of the 2024 FOP in June 2024.

Data Reporting

I. For each project providing fish passage operations, this report contains a graph displaying the performance of the spring fish passage spill program for the month of June, with hourly spill, target spill, adjusted spill, generation, and total flows. The monthly graphs begin on June 1 and end on June 30 and reflect the following operations for the lower Snake River and the lower Columbia River projects:

- The black line represents the average hourly total river flow through the project in thousand cubic feet per second (kcfs).
- The orange line represents the average hourly generation flow through the powerhouse each hour in kcfs.
- The thin solid blue line represents the actual average hourly spill level through the spillway in kcfs.
- The dashed blue line represents the spill cap portion of the target spill estimated to reach the gas cap or target TDG.
- The thick light blue line represents the performance standard spill level portion of the target spill.
- The dotted blue line represents the summer target spill level.
- The thick dark blue line represents the adjusted spill: the hourly spill level that can be achieved taking into consideration that spill may vary as a function of total river flow, forebay elevation, and generator capacity, and is subject to routine operational adjustments that limit the ability to spill to the target spill (2024 FOP section 4.1).

II. The average daily %TDG for the 12 highest hourly TDG measurements in a calendar day for all projects is shown in the June 2024 Average Percent TDG Values Table (Table 4). Red numbers indicate that the project exceeded the %TDG cap - i.e. 125% (tailwater) on that day.

General Implementation Remarks

For all projects that spill for fish passage, the actual spill may vary from the adjusted spill due to various conditions as described below. When actual spill varied from adjusted spill levels during periods of voluntary spill, the change in spill level is described below in the June 2024 Spill Variance Table (Table 3).³ The Spill Variance Table includes average hourly data; but when spill varies from adjusted spill for a portion of an hour, it is characterized as a variance for a full hour. There are instances when the hourly adjusted spill levels are not achievable due to mechanical limitations in setting spill gates to implement the regionally coordinated spill pattern. The project operator sets the spill gate stops to most closely approximate the adjusted spill to the extent practicable. Other routine activities that changed spill levels, which were coordinated with regional partners, are identified in the monthly Pre-Coordinated Operations Table (Table 4).

"Low flow" operations at the lower Columbia and lower Snake projects are triggered when inflow is insufficient to provide both minimum generation and the target spill levels. For this report, the decrease in target spill is represented as adjusted spill. In these situations, the projects operate at minimum generation and pass the remainder of project inflow as spill and through other routes, such as fish ladders, sluiceways, and navigation locks. As flows transition from higher flows to low flows, there may be situations when flows recede at a higher rate than forecasted. In addition, inflows provided by nonfederal projects upstream are variable and uncertain.

The combination of these factors may result in instances when unanticipated changes to inflow result in forebay elevations dropping to the low end of the Minimum Operating Pool (MOP). Since these projects have limited operating flexibility, maintaining minimum generation, MOP elevation, and the target spill may not be possible throughout every hour.

Actual spill levels at Corps projects may vary up to ± 2 kcfs within the hour, except as otherwise noted in the 2024 FOP, as compared to a target spill. A number of factors influence actual spill, including hydraulic efficiency, exact gate opening calibration, spillway gate hoist cable stretch due to temperature changes, and forebay elevation (e.g., a higher forebay results in a greater level of spill since more water can pass under the spill gate or over a spillway weir crest). Transition periods between gas cap spill and performance standard spill hours may result in actual hourly spill levels that are slightly higher or lower than target spill levels. Occurrences requiring an adjustment in operations and/or regional coordination are described in greater detail in the "Operational Adjustments" section below.

³ Forced spill conditions shown in the graphs are not considered variances and are not reported in the Spill Variance Table. Forced spill conditions may result from lack of load, high river inflows that exceed available powerhouse capacity, scheduled or unscheduled turbine unit outages or transmission outages of various durations, passing debris, etc.

June Operations

The month of June was characterized by below average precipitation and flows for the lower Snake and lower Columbia rivers. The observed precipitation was 62% of average on the Snake River above Ice Harbor and 74% of average on the Columbia River above The Dalles.⁴ The NOAA Northwest River Forecast Center runoff summary for June indicated that the adjusted runoff for the Snake River at Lower Granite was 75% of the 30-year average (1991-2020) with a volume of 4.3 MAF (Million acre-feet). The adjusted runoff for the Columbia River at The Dalles was 68% of the 30-year average (1991-2020) with a volume of 17.5 MAF.⁵

Spring spill operations occur April 3–June 20 at the four lower Snake River projects, and April 10–June 15 at the four lower Columbia River projects. Summer spill began at the lower Columbia projects on June 16 and at the lower Snake projects on June 21, and will continue through August 31. The Corps initiates spill at 0001 hours, or shortly after midnight, at each of the projects on the start date. Target spill levels for spring 2024 at each project are defined in Table 1 (Table 4 in the 2024 FOP). If deleterious impacts of the proposed spill operations are observed in-season, existing adaptive management processes may be employed to address the cause of the impacts. Spill may be temporarily reduced at any project to ensure navigation safety or transmission reliability, or in the event of adult salmonid migration delay (see 2024 FOP section 7.1). In order to operate consistently with state water quality standards, spill may also be reduced if observed gas bubble trauma (GBT) levels exceed those identified in state water quality standards (See [WASH. ADMIN. CODE § 173-201A-200\(l\)\(f\)\(ii\)](#) and [Order Approving a Modification to the Oregon's Water Quality Standard for Total Dissolved Gas in the Columbia River Mainstem](#), page 5).

Spill up to the 125% Gas Cap is spill to the maximum level that meets, but does not exceed, the TDG criteria allowed under state laws. This includes a criterion for not exceeding 126% TDG for the average of the two greatest hourly values within a day.

⁴ Retrieved July 3, 2024: https://www.nwrfc.noaa.gov/water_supply/wy_summary/wy_summary.php?tab=5

⁵ Retrieved July 3, 2024: https://www.nwrfc.noaa.gov/runoff/runoff_summary.php

Table 1: Summary of 2024 spring target spill levels at lower Snake River (April 3 – June 20) and lower Columbia River (April 10 – June 15) projects (Table 4 in the 2024 FOP).

PROJECT	SPRING SPILL DATES	SPRING SPILL OPERATION
Lower Granite ^{A, C}	April 3 - June 20	24 hours/day: 125% Gas Cap
Little Goose ^{B, C}	April 3 – June 20	125% Gas Cap 24 hours/day (until adult criteria met), <i>then</i> 16 hours/day: 125% Gas Cap 8 hours/day: 30% Performance Standard
Lower Monumental ^A	April 3 - June 20	24 hours/day: 125% Gas Cap
Ice Harbor	April 3 – June 20	24 hours/day: 125% Gas Cap
McNary	April 10 – June 15	24 hours/day: 125% Gas Cap
John Day ^D	April 10 – June 15	40% Daytime 125% Gas Cap Nighttime
The Dalles ^E	April 10 – June 15	24 hours/day: 40% Performance Standard
Bonneville ^F	April 10 – June 15	24 hours/day: 125% Gas Cap

A. Lower Granite and Lower Monumental Adult Delay Criteria – See Section 7.1 of the 2024 FOP

B. Little Goose Adult Criteria –Within 1 business day of when the earliest of the following conditions occurs: (1) a cumulative total of 25 adult spring Chinook salmon (not including jacks) pass Lower Monumental Dam; or (2) a cumulative total of 50 adult spring Chinook salmon (not including jacks) pass Ice Harbor Dam; or (3) April 24, 2024, the Corps will implement performance standard spill at Little Goose Dam for 8 consecutive AM hours (April 3–15 starting at 0500 hours; April 16–June 20 starting at 0400 hours) to target hours of peak adult passage. If lack of load conditions preclude the implementation of performance standard spill during the targeted periods, performance standard spill will begin as soon as practicable during AM hours and continue for up to 8 consecutive hours. If a second block is needed, it will start as soon as load conditions allow, continue for at least two consecutive hours, and conclude no later than 2000.

C. During periods of high river flow that exceeds powerhouse hydraulic capacity, implementing 8 consecutive hours of spill as described in Footnotes A and B may result in storing additional inflow in the forebay above MOP. If it is necessary to pond water to achieve the 8-hour block of spill during high inflow, water stored above MOP should be drafted out over the remaining hours by increasing spill to pass inflow from 1200-1600 hours, then increasing spill as necessary from 1600-0400 to draft the pool back to MOP. If it is forecasted that the drafting spill will result in exceeding 130% TDG in the tailrace, all 16 hours will be used to return the pool to MOP. In lack of load conditions performance standard spill blocks will be prioritized at Little Goose, Lower Monumental, and Lower Granite dams, in that order.

D. John Day Dam – Daytime hours are defined in FPP Chapter 4, Table JDA-5. Daytime hourly spill target of 40% river flows with ±5% flexibility in river flow for balancing reserves, consistent with current target spill level calculations.

E. The Dalles Dam –TDG in The Dalles tailrace may fluctuate up to 125% prior to reducing spill at upstream projects or reducing spill at The Dalles below 40%. Maintain 40% spill for 24 hours at The Dalles and reduce John Day spill below the 125% TDG spill cap as needed for TDG management. Spill above 40%, up to 125% TDG, may occur for TDG management or for carrying reserves.

F. Bonneville Dam – Spill for fish passage should not exceed 150 kcfs due to erosion concerns.

Summer spill operations occur June 21–August 31 at the four lower Snake River projects and June 16–August 31 at the four lower Columbia River projects. The Corps initiates spill at 0001 hours, or shortly after midnight, at each of the projects on the start date. Target spill levels for summer 2024 at each project are defined in Table 2. At the Snake River Projects spill may range up to ± 1 kcfs during the summer spill operation from August 15–August 31.

Table 2: Summary of 2024 summer target spill levels at lower Snake River and lower Columbia River projects.

PROJECT	SUMMER SPILL ^A (June 21/16 – July 31) (24 hrs/day)	SUMMER SPILL ^A (August 1 – August 31) (24 hrs/day)
Lower Granite ^B	18 kcfs	SW flow (as river flow allows)
Little Goose ^{B, C}	30%	SW flow or 7 kcfs
Lower Monumental ^{B, D}	17 kcfs	SW flow or 8 kcfs
Ice Harbor ^{B, E}	30%	SW flow or 9 kcfs
McNary ^F	57%	SW flow or 20 kcfs
John Day	35% ^G	SW flow ^H or 20 kcfs
The Dalles	40% ^G	30% ^G
Bonneville	95 kcfs	50 kcfs

A. Spill may be temporarily reduced below the FOP target summer spill level at any project if necessary to ensure navigation safety or transmission reliability, or to avoid exceeding State TDG standards.

B. Late summer spill August 1-August 31 will be through the SW or a constant spill rate through conventional spillbays using the appropriate FPP spill pattern. The SW spill rate is a function of forebay elevation (as pool elevation increases, more water is spilled over the SW), as defined in the FPP. The SWs will be operated per FPP criteria and closed when low flow criteria are met. When the SW is closed, the spill target will transition to a constant spill rate through conventional spillbays and will not vary with a fluctuating forebay elevation.

C. Flow corresponds to the Little Goose SW high crest elevation as adjusted relative to the forebay operating range (see FPP Chapter 8, section 2.3.2.7).

D. Flow corresponds to a Lower Monumental forebay elevation of 538.5 feet, the mid-point of the forebay range from 537-540 feet.

E. Flow corresponds to an Ice Harbor forebay elevation of 438.5 feet, the mid-point of the forebay range from 437-440 feet.

F. From June 16-July 31, McNary will adjust spill once a day to 57% of the previous day’s average project outflow. The intent is to reduce the frequency of spillgate changes while implementing a more uniform pattern to the extent it can be done safely (see FPP Chapter 5, section 2.2.1.1).

G. Hourly spill percentage target of river flow with $\pm 5\%$ flexibility of river flow for balancing reserves, consistent with current target spill level calculations.

H. John Day will also spill from bay 2 open 1 stop (approximately 1.6 kcfs) during daylight hours when spill is through the SWs only to maintain attraction flow to the north adult ladder, per FPP Chapter 4 (JDA), section 2.2.3.

In its implementation of the 2024 FOP in June, the Corps evaluated conditions every day to establish spill caps at a level that was estimated to meet, but not exceed, the gas cap or target

TDG in the tailrace (see Table 5).⁶ This evaluation considered: environmental conditions (e.g., river flow, wind, water temperature, barometric pressure, incoming TDG from upstream, and water travel time) and project operations (e.g., spill level, spill pattern, tailwater elevation, proportion of flow through the turbines, and project configuration).

Operational Adjustments

1. Lower Monumental

On May 31, the adult delay criteria specified in the 2024 FOP section 7.1 were met to reduce spill to performance standard levels at Lower Monumental for eight hours per day in the morning to target hours of peak adult fish passage. Following discussion at the May 29 RIOG meeting, the Corps did not immediately reduce spill levels and instead implemented a modified juvenile transportation operation. Adult delay continued through June 4, and on June 5, the Corps followed NMFS technical recommendation to implement 40% daytime spill operation for 8 hours per day with a targeted start time between 0400-0800. On June 9, the 24/7 125% Gas Cap operation was resumed per the FOP following three days without observed delay. This operation was coordinated during the June 5 TMT meeting.

⁶ See 2024 FOP, Section 2.2

Table 3: Spill Variance Table – June 2024 (6/1 to 6/30)

Project	Parameter	Date	Time ⁷	# of Hours	Type	Reason
Little Goose	Additional Spill	6/15 6/18	2100-2200 1300-2200	2 10	Maintenance	Hourly spill increased to between 45 and 60 kcfs (greater than adjusted spill target of between 34 and 47 kcfs) when Units 1-4 were removed from service due to arcing on T1.
Little Goose	Additional Spill	6/16 6/17 6/18	0500-1200 0500-1200 0500-1200	8 8 8	Maintenance	Hourly spill increased to between 68 and 87% (greater than adjusted spill target of 30%) while Units 1-4 were out of service due to arcing on T1.
Ice Harbor	Additional Spill	6/30	1100	1	Maintenance	Hourly spill increased to 32% (greater than adjusted spill target of 30%) when Unit 3 tripped off due to governor blade response.
The Dalles	Reduced Spill	6/27	1300-1400	2	Health and Human Safety	Hourly spill was reduced to between 19 and 34% (less than adjusted spill target of 40%) when the spillway was shut down to rescue a swimmer who was close to the spillway.

Table 4: Pre-Coordinated Operations – June 2024 (6/1 to 6/30)

Project	Parameter	Date	Time	# of Hours	Type	Reason
Little Goose	Reduced Spill	6/21 6/26	0200 2100-2300	1 3	Navigation	Hourly spill decreased to 28% (less than adjusted spill target of 30%) for navigation. Regionally coordinated via 2024 FOP, Sections 4.1 and 4.6.
Lower Monumental	Reduced Spill	6/1 6/5 6/9 6/13 6/17	1800-2000 1800-2000 1700-1800 1800-1900 1800-1900	3 3 2 2 2	Navigation	Hourly spill decreased to between 24 and 82 kcfs (less than adjusted spill target of between 29 and 88 kcfs) for navigation. Regionally coordinated via 2024 FOP, Sections 4.1 and 4.6.
Ice Harbor	Reduced Spill	6/26 6/27	1200 0700	1 1	Navigation	Hourly spill decreased to 28% (less than adjusted spill target of 30%) for navigation. Regionally coordinated via 2024 FOP, Sections 4.1 and 4.6.

⁷ Note: Data collected for reporting spill variances is reported using hourly-averaged data. Therefore, while spill may be increased or decreased for only a portion of an hour, it is represented in the table as an hour.

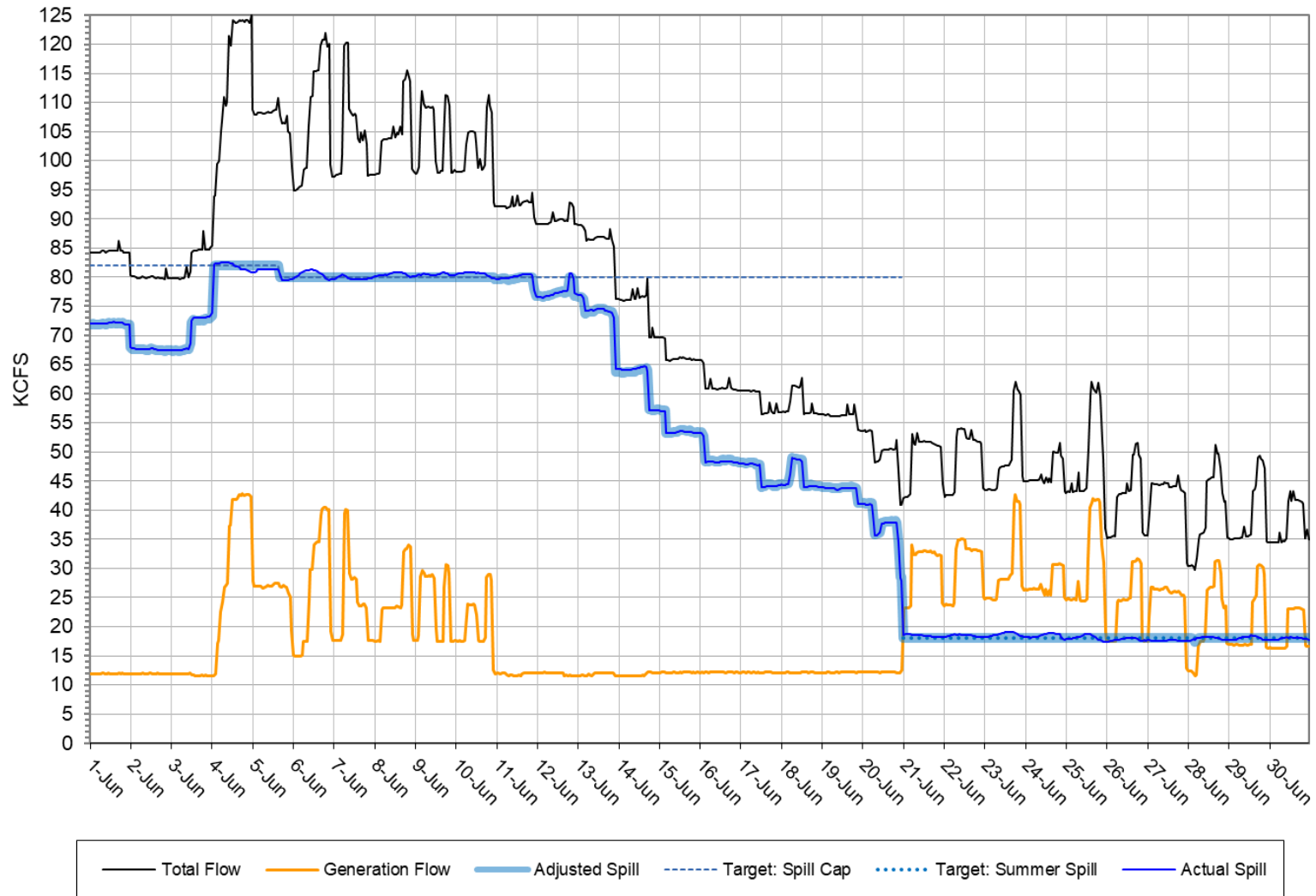
Table 5: June 2024 Average Percent TDG Values Table

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
Gas Cap %:		125		125		125		125		125		125		125		125
6/1/2024	105	123	121	123	125	120	122	117	114	121	111	117	117	120	117	121
6/2/2024	106	123	122	123	124	119	122	117	114	118	111	116	116	119	116	120
6/3/2024	105	123	120	122	122	120	120	116	113	118	111	116	115	119	114	120
6/4/2024	103	126	116	125	117	123	115	124	109	122	111	117	112	117	111	121
6/5/2024	102	125	115	125	119	122	117	123	107	122	112	118	115	119	113	121
6/6/2024	104	125	120	125	124	122	121	122	114	122	112	120	120	122	116	121
6/7/2024	105	125	124	125	126	121	123	121	116	123	111	120	122	123	118	122
6/8/2024	105	125	125	125	127	122	123	119	116	122	113	118	119	121	120	121
6/9/2024	105	125	125	124	126	123	122	122	116	122	118	118	116	120	117	121
6/10/2024	104	125	122	124	125	123	122	118	113	122	119	117	115	119	112	120
6/11/2024	104	124	121	124	125	122	123	118	114	122	119	117	115	119	113	121
6/12/2024	103	123	119	123	122	121	120	118	111	122	116	117	115	119	112	121
6/13/2024	104	123	119	123	123	121	120	117	111	122	114	118	118	120	114	121
6/14/2024	103	123	118	122	122	118	120	117	111	122	112	117	113	118	113	120
6/15/2024	103	119	116	121	120	117	119	116	110	119	111	115	111	116	112	120
6/16/2024	102	119	114	118	117	116	115	115	107	117 ⁸	110	114	111	116	112	117
6/17/2024	102	119	113	118	116	117	114	115	107	117	109	114	110	116	111	117
6/18/2024	101	118	112	120	115	117	113	114	107	117	108	114	109	115	110	117
6/19/2024	101	117	112	118	116	116	114	114	108	117	108	114	112	118	113	117
6/20/2024	101	117	114	117	117	115	114	114	109	117	108	114	112	117	115	117
6/21/2024	103	111	115	114	119	119	115	114	111	117	108	114	112	117	117	117
6/22/2024	104	111	116	115	119	119	116	114	112	117	109	114	111	116	115	117
6/23/2024	104	111	117	114	118	118	116	113	111	116	109	114	109	115	111	116
6/24/2024	103	111	116	114	115	117	115	114	110	117	109	115	109	116	109	117
6/25/2024	103	111	116	113	114	118	115	115	110	117	112	115	112	118	112	117
6/26/2024	103	111	114	113	113	117	115	114	110	116	112	116	113	117	113	117
6/27/2024	102	111	110	112	113	117	114	113	108	116	109	116	109	115	110	116
6/28/2024	102	112	110	113	112	117	113	113	107	117	108	115	109	116	110	117
6/29/2024	102	111	110	113	111	117	112	112	107	117	108	116	111	117	111	117
6/30/2024	100	111	109	112	110	117	111	112	108	117	107	116	109	115	110	117
Exceedances:		1	4		3		2								1	

⁸ Blue shading indicates the summer WQS.

Figure 1⁹

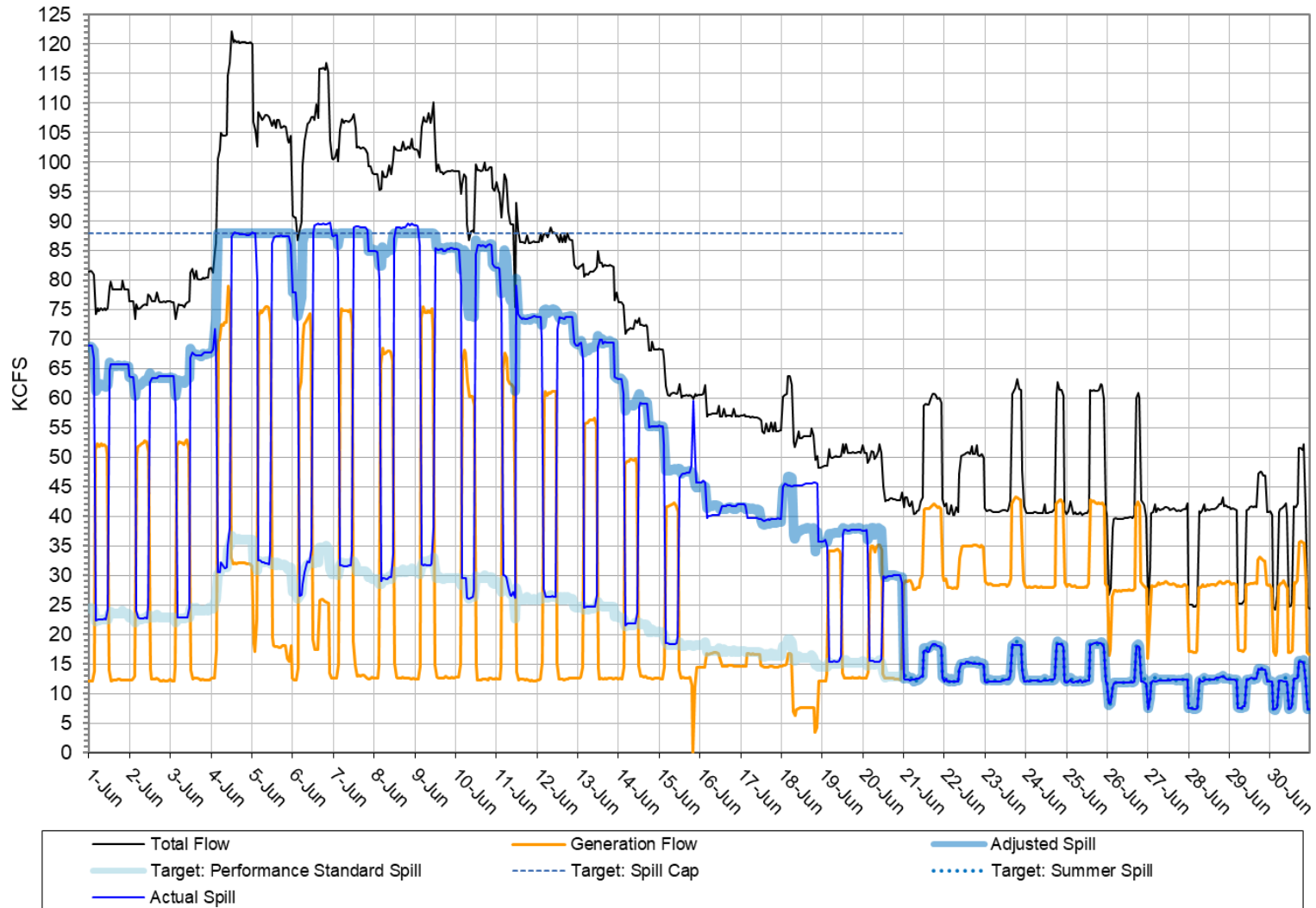
Lower Granite Dam - Hourly Spill and Flow



⁹ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 3 and 4 for spill variances and pre-coordinated operations.

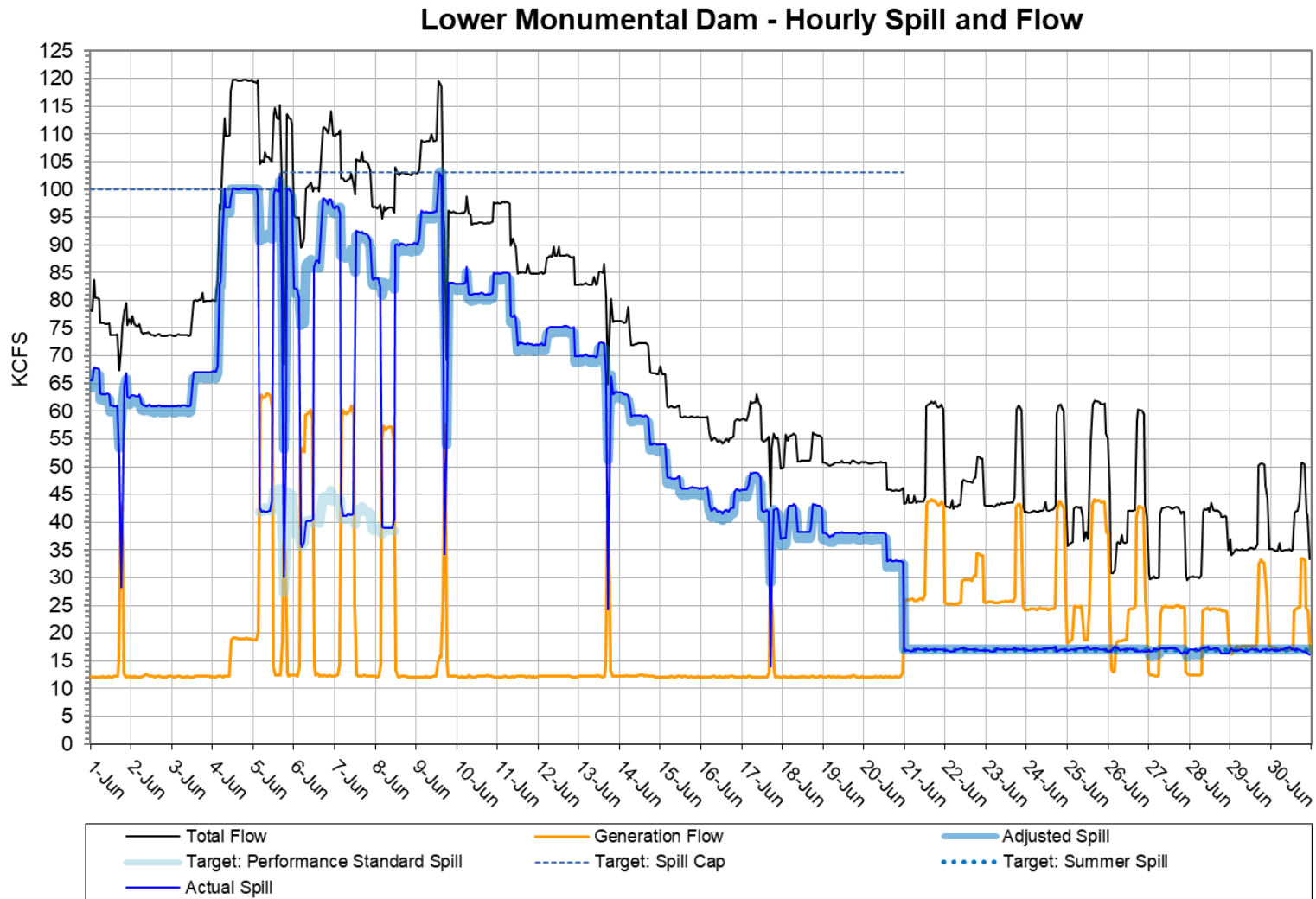
Figure 2¹⁰

Little Goose Dam - Hourly Spill and Flow



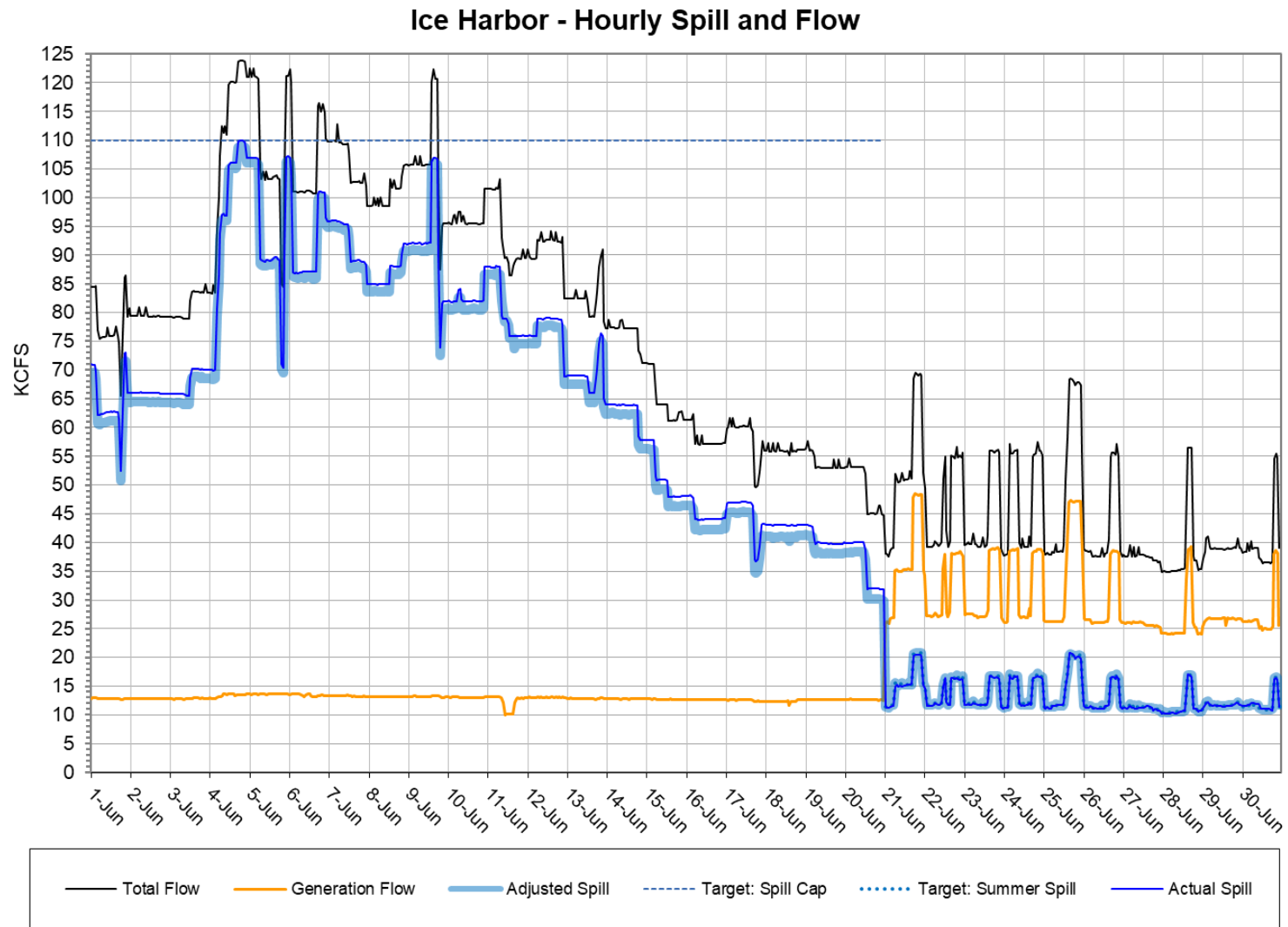
¹⁰ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 3 and 4 for spill variances and pre-coordinated operations.

Figure 3¹¹



¹¹ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 3 and 4 for spill variances and pre-coordinated operations.

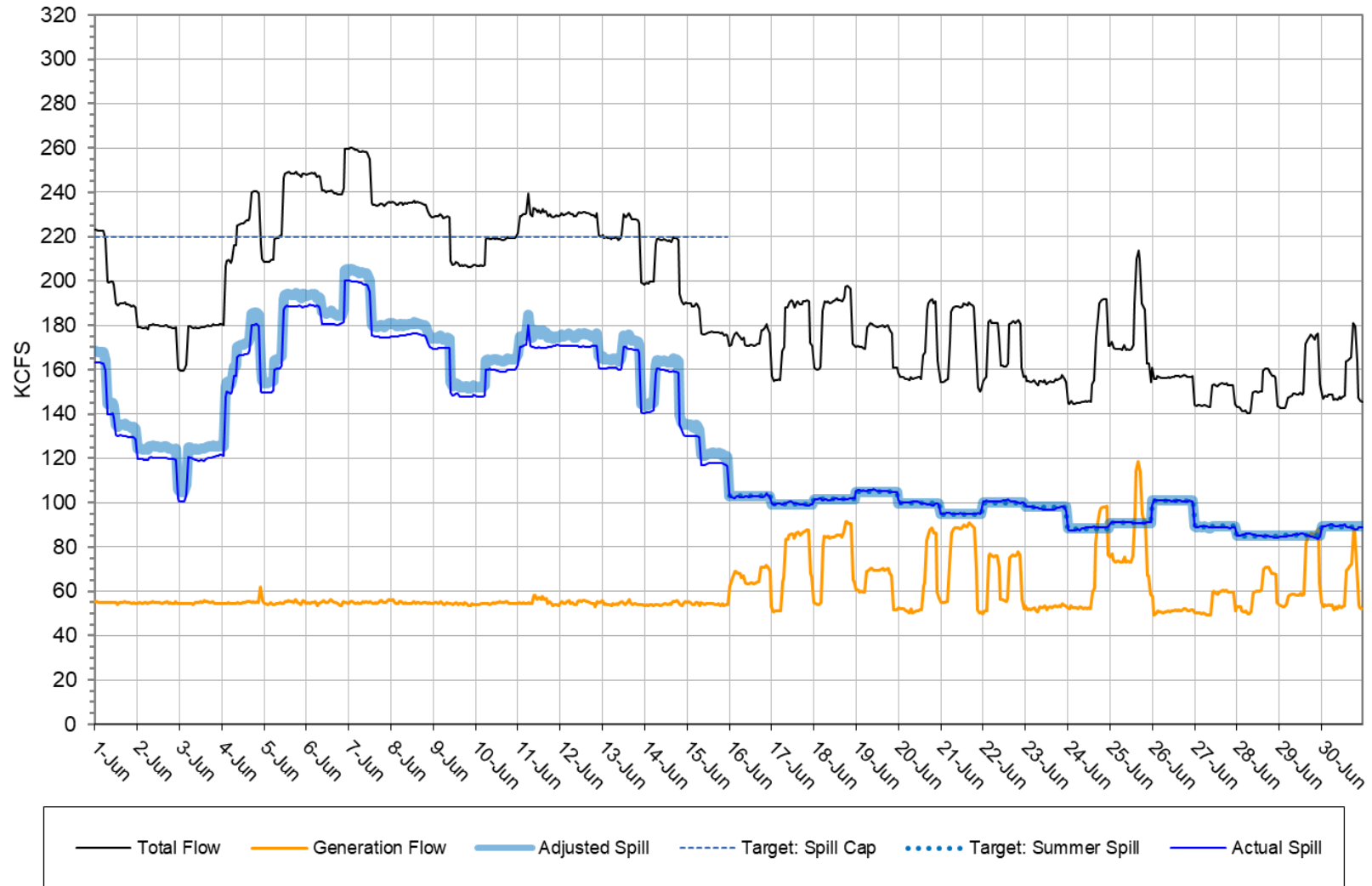
Figure 4¹²



¹² The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 3 and 4 for spill variances and pre-coordinated operations.

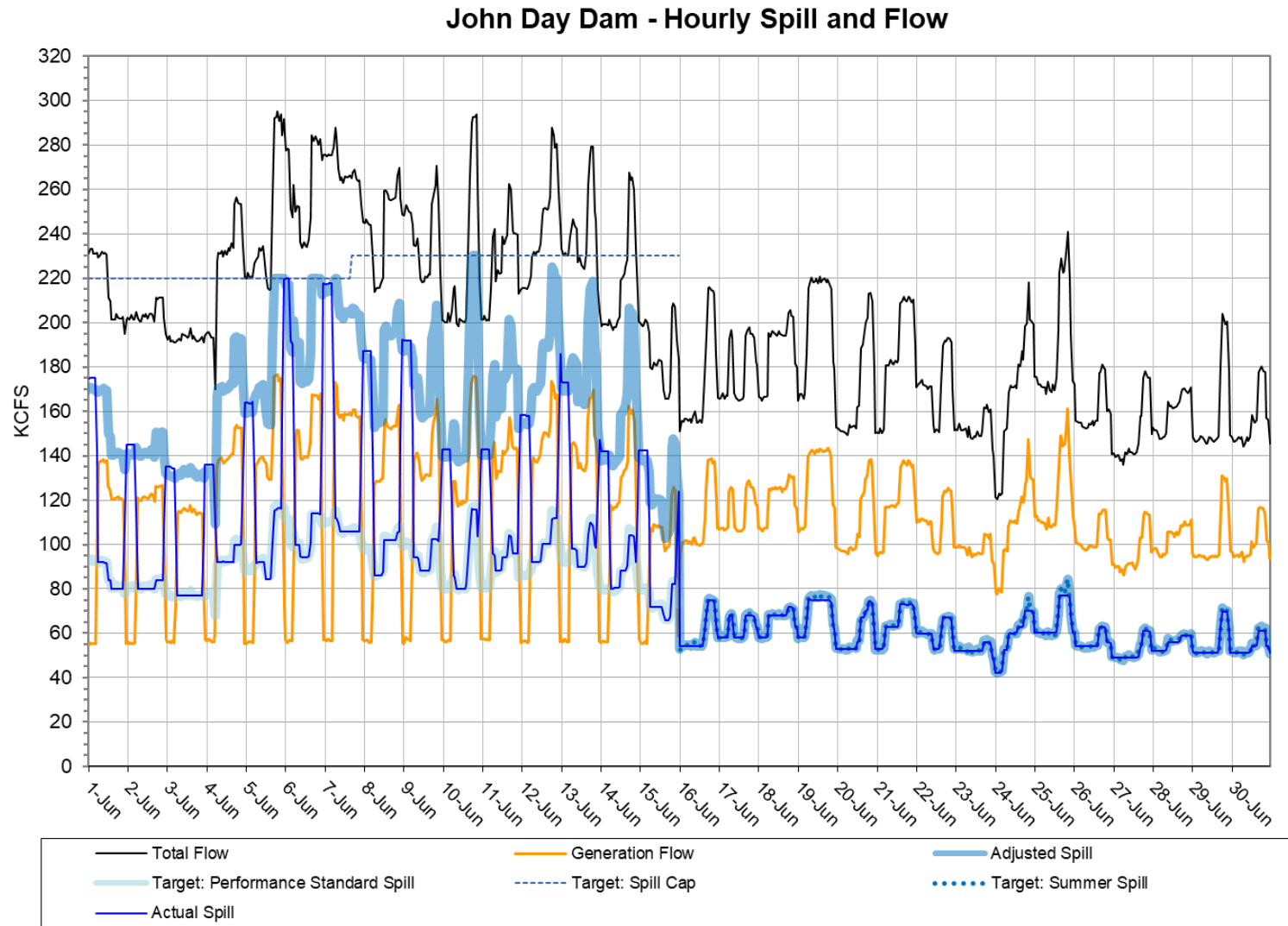
Figure 5¹³

McNary Dam - Hourly Spill and Flow



¹³ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 3 and 4 for spill variances and pre-coordinated operations.

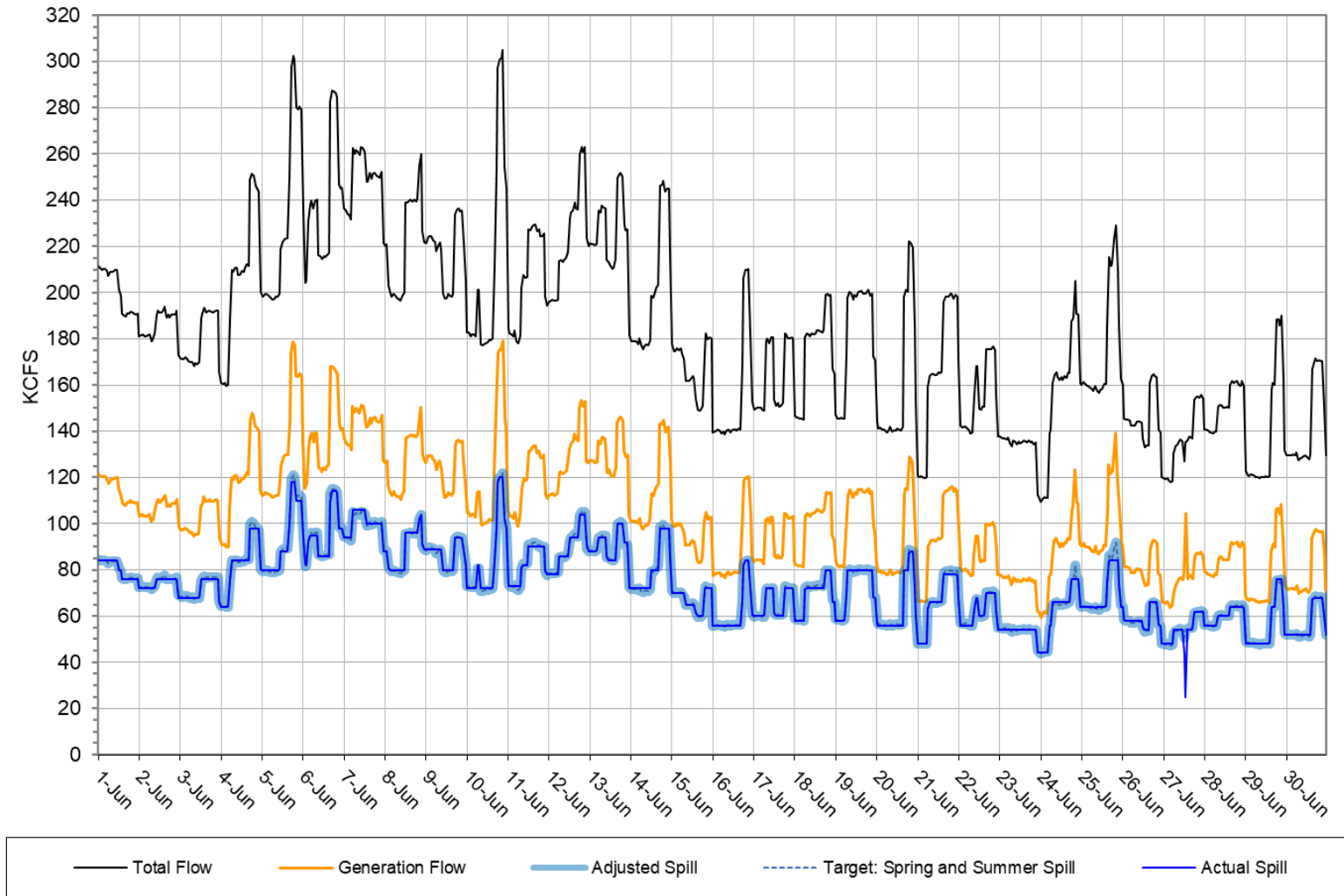
Figure 6¹⁴



¹⁴ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 3 and 4 for spill variances and pre-coordinated operations.

Figure 7¹⁵

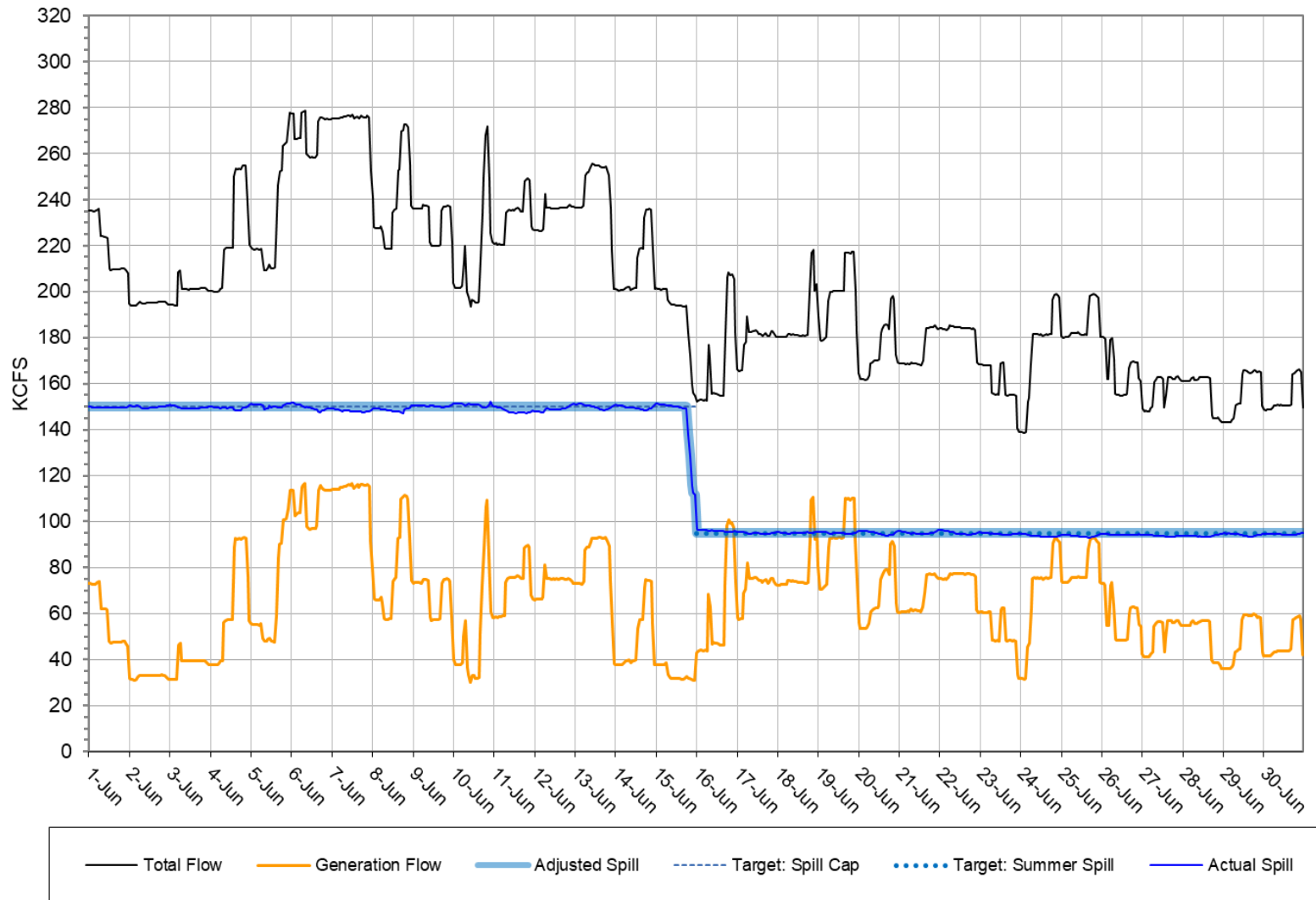
The Dalles Dam - Hourly Spill and Flow



¹⁵ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 3 and 4 for spill variances and pre-coordinated operations.

Figure 8¹⁶

Bonneville Dam - Hourly Spill and Flow



¹⁶ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 3 and 4 for spill variances and pre-coordinated operations.