

FISH OPERATIONS PLAN IMPLEMENTATION REPORT

July 2022

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

Introduction

The U.S. Army Corps of Engineers (Corps) developed this report in accordance with the 2022 Fish Operations Plan¹ (2022 FOP). The 2022 FOP describes the Corps' planned operations for juvenile fish passage at its four lower Snake River and four lower Columbia River dams during the 2022 spring and summer fish migration seasons, generally April 3 through August 31. The 2022 FOP is consistent with spill operations for juvenile 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) Columbia River System and U.S. Fish and Wildlife Service Biological Opinions (2020 BiOps)², the Extensions of the 2008 Columbia Basin Fish Accords (Accord Extensions)³, the Corps' requirements under the Endangered Species Act (ESA), and the ongoing consultation and communications with the relevant wildlife agencies to ensure consistency with the Act. The 2022 FOP also incorporates spill operations agreed to in the Term Sheet for Stay of Preliminary Injunction Motion and Summary Judgment Schedule (referred to as the 2022 Agreement) for the *NWF et al. v. NMFS et al.* (3:01-cv-00640-SI) litigation.⁴ Other project operations and water management actions not specifically addressed in this document will be consistent with other guiding operative documents, including the 2022 Water Management Plan (WMP), seasonal WMP updates, and the 2022 Fish Passage Plan (FPP).

This report describes the Corps' implementation of the 2022 FOP during the month of July. 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);

¹ The 2022 FOP was posted to the Technical Management Team (TMT) website on March 24, 2022 (<http://pweb.crohms.org/tmt/documents/fpp/2022/>).

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.

³ The 2020 Amendment to and 2018 Extension of the 2008 Columbia Basin Fish Accords are available at <https://www.salmonrecovery.gov/Partners/FishAccords.aspx>

⁴ 2022 Agreement: https://pweb.crohms.org/tmt/JointMotion_TermSheet_CourtOrder_OCT2021.pdf. Those operations were extended to August 31, 2023 as part of a recent motion to extend the litigation stay.

- 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 (see 2022 FOP, Section 4.1);
- actual spill: the hourly flow over the spillway; and,
- resultant 12-hour average 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 2022 FOP in July 2022.

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 July, with hourly spill, target spill, adjusted spill, generation, and total flows. The monthly graphs begin on July 1 and end on July 31 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 dotted blue line represents the summer spill target.
- The thick dark blue line represents the adjusted target 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 (2022 FOP section 4.1).

II. The average daily %TDG for the 12 highest hours for all projects is shown in the July 2022 Average Percent TDG Values Table (Table 4). Red numbers indicate that the project exceeded the %TDG cap 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 July 2022 Spill Variance Table (Table 2).⁵ 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

⁵ 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.

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 3).

"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 2022 FOP for Bonneville and The Dalles dams,⁶ which may range up to ± 3 kcfs) 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). 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.

July Operations

The month of July was characterized by below average precipitation and above average flows for the lower Snake and lower Columbia rivers. The July 2022 observed precipitation was 28% of average on the Snake River above Ice Harbor and 54% of average on the Columbia River above The Dalles⁷. The NOAA Northwest River Forecast Center runoff summary for July indicated that the adjusted runoff for the Snake River at Lower Granite was 102% of the 30-year average (1991-2020) with a volume of 2.2 MAF (Million acre-feet). The July 2022 adjusted runoff for the Columbia River at The Dalles was 142% of the 30-year average (1981-2010) with a volume of 20.2 MAF.⁸

⁶ As specified in the 2022 FOP Section 3.

⁷ Retrieved August 1, 2022: https://www.nwrfc.noaa.gov/water_supply/wy_summary/wy_summary.php?tab=5

⁸ Retrieved August 1, 2022: https://www.nwrfc.noaa.gov/runoff/runoff_summary.php

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 2022 at each project are defined in Table 1. At the Snake River Projects spill may range up to ± 1 kcfs during the summer spill operation from August 15 – August 31.

Table 1: Summary of 2022 summer target spill levels at lower Snake River and lower Columbia River projects.

PROJECT	SUMMER SPILL^A (June 21/16 – August 14) (24 hrs/day)	SUMMER SPILL^A (August 15 – August 31) (24 hrs/day)
Lower Granite ^B	18 kcfs	SW flow (as river flow allows)
Little Goose ^{B, C}	30%	SW flow or 9 kcfs spill
Lower Monumental ^{B, D}	17 kcfs	SW flow or 8 kcfs spill
Ice Harbor ^{B, E}	30%	SW flow or 9 kcfs spill
McNary	57%	20 kcfs
John Day	35%	20 kcfs
The Dalles	40%	30%
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 15-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 SW high-crest position and a forebay elevation of 635.5 feet, the mid-point of the forebay range from 633-638 feet.

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

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

In its implementation of the 2022 FOP in July, 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 4).⁹ 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).

⁹ See 2022 FOP, Section 2.2

Operational Adjustments

1. McNary Dam

McNary Dam's spillway weirs in bays 19 and 20 provide a surface passage route during spring spill for juvenile fish passage, April 10 through June 7, per the 2022 FOP section 8.5.1 and FPP section 2.3.2.6. Due to late spring high flows this year, the decision to keep both spillway weirs in service after June 7 until flows drop below 300 kcfs was coordinated with regional salmon managers via FPOM¹⁰. The intent of this operation was to avoid causing high TDG that would occur if spillbays 14–21 were closed for up to 5 days to remove the spillway weirs during high flows. The spillway weirs removal was completed on July 15.

¹⁰ FPOM Memo of Coordination (MOC) 22MCN09:
https://pweb.crohms.org/tmt/documents/FPOM/2010/2022_FPOM_MEET/2022_JUN/22%20MCN%2009%20MOC%20Delay%20Removing%20TSWs.pdf

Table 2: Spill Variance Table – July 2022

Project	Parameter	Date	Time ¹¹	# of Hours	Type	Reason
McNary	Additional Spill	7/3	0700	1	Human Error	Hourly spill increased to 59% (greater than a djusted spill target of 57%) due to a delay in changing to the requested spill level.
John Day	Reduced Spill	7/8	1000	1	Human Error	Hourly spill decreased to 33% (less than a djusted spill target of 35%) due to a delay in changing to the requested spill level.

Table 3: Pre-Coordinated Operations – July 2022

Project	Parameter	Date	Time	# of Hours	Type	Reason
Little Goose	Reduced Spill	7/7	1600	1	Navigation	Hourly spill decreased to between 27 and 28% (less than adjusted spill target of 30%) for navigation. Regionally coordinated via 2022 FOP, Sections 4.1 and 4.6.
		7/8	1300, 2000	2		
		7/9	0300	1		
		7/12	0500, 2200	2		
		7/13	1000	1		
		7/20	0800	1		
		7/21	0100	1		
		7/22	2200	1		
		7/25	0100, 1000, 1400, 1800	4		
		7/28	2400	1		
7/30	0200, 2100	2				
Ice Harbor	Reduced Spill	7/13	0100, 0500, 0600	3	Navigation	Hourly spill decreased to 28% (less than a djusted spill target of 30%) for navigation. Regionally coordinated via 2022 FOP, Sections 4.1 and 4.6.
		7/14	2300	1		
		7/15	0300, 0500	2		
		7/21	0500	1		
		7/22	0400	1		
		7/23	0400, 0700, 1600, 1800, 2200	5		
		7/25	0200	1		
		7/26	0300, 0700, 0900	3		
		7/27	0500	1		
		7/28	1400	1		
		7/29	0500, 0800, 1300	3		
7/30	0600, 2000, 2200	3				
7/31	0200, 1300, 1900-2000	4				
McNary	Additional Spill	7/15	1400	1	Debris Spill	Hourly spill was increased to 59% (greater than the target spill of 57%) due to spill to pass debris. Regionally coordinated via 2022 FPP, page MCN 33, Section 5 and reported to FPAC via MFR 22 MCN 10. ¹²

¹¹ 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 Spill Variance and Pre-Coordinated Operations Tables as an hour.

¹²https://pweb.crohms.org/tmt/documents/FPOM/2010/NWW%20Memos%20of%20Coordination%20and%20Notification/MCN%20MOC%20and%20MFR/22%20MCN%2010%20MFR%20Emergency%20Debris%20Spill_.pdf

Table 4: July 2022 Average Percent TDG Values

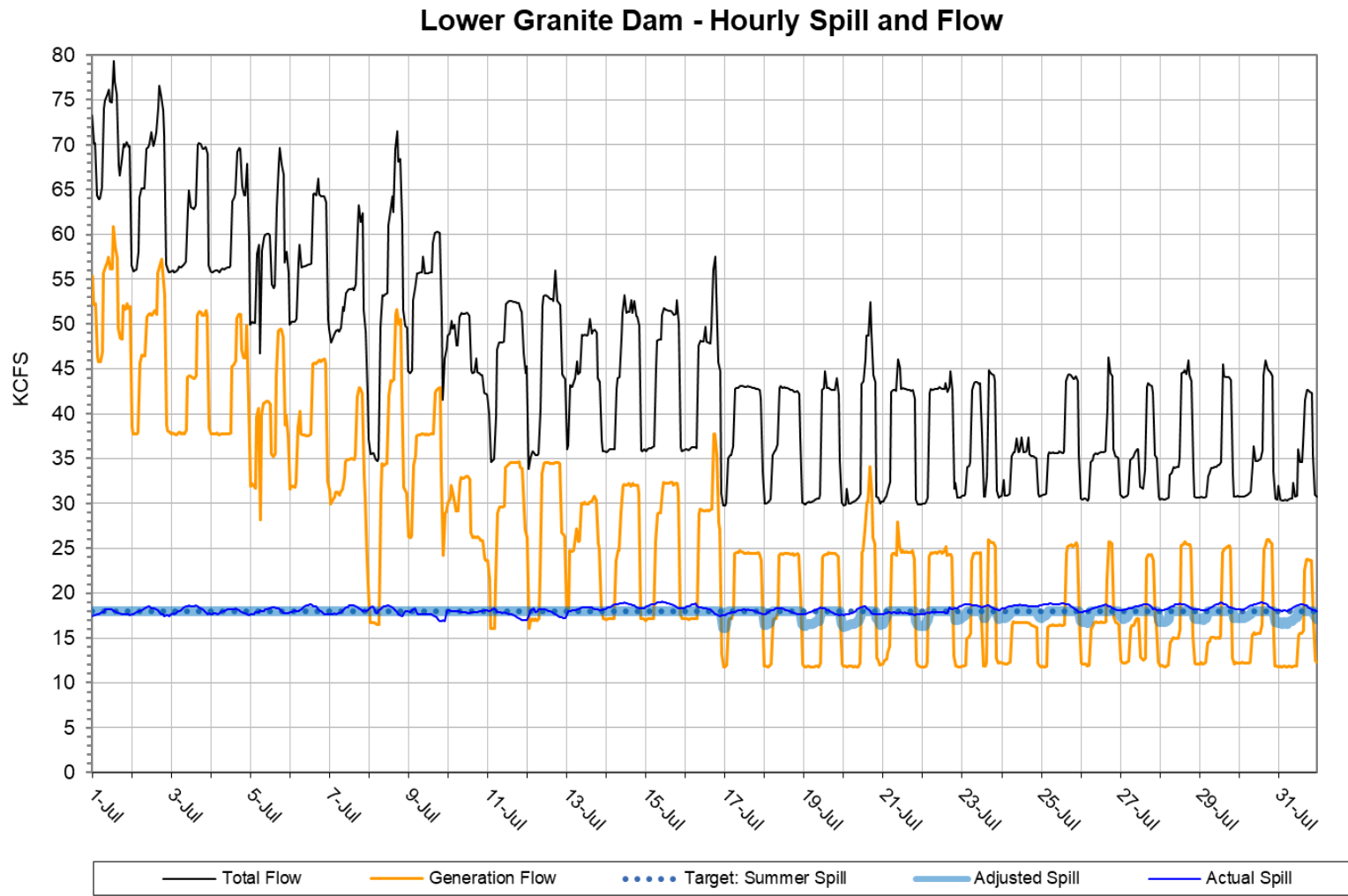
Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW	WRNO
Gas Cap %:	115	120	115	120	115	120	115	120	115	120	115	120	115	120	115	120	120
7/1/2022	103	109	110	112	114	118	116	116	120	122	116	119	116	120	118	120	118
7/2/2022	104	110	112	112	115	119	117	116	119	122	118	118	115	118	115	120	115
7/3/2022	104	111	111	112	114	118	116	115	117	121	118	117	113	118	112	119	113
7/4/2022	103	111	111	111	112	117	115	114	115	121	115	116	113	118	113	118	114
7/5/2022	103	111	111	112	112	117	114	115	114	119	115	118	114	118	115	119	115
7/6/2022	102	111	111	112	112	117	114	115	114	118	113	117	114	118	116	119	116
7/7/2022	102	111	110	112	112	117	114	114	115	118	112	117	112	117	115	118	116
7/8/2022	103	117	112	112	112	117	114	114	115	119	114	118	113	117	117	118	115
7/9/2022	103	116	111	113	111	118	114	115	114	119	114	118	113	117	117	118	115
7/10/2022	103	117	109	112	111	117	114	113	114	118	112	116	112	117	115	118	114
7/11/2022	104	117	112	113	112	118	114	113	115	120	113	117	114	118	115	118	• ¹³
7/12/2022	104	118	113	114	113	118	115	113	117	121	115	117	115	119	118	119	117
7/13/2022	103	118	113	114	113	117	115	114	117	121	114	116	112	116	114	118	115
7/14/2022	103	118	116	114	113	117	116	114	117	• ¹⁴	114	117	112	116	111	118	113
7/15/2022	104	118	115	114	113	117	115	115	115	•	114	117	112	117	111	• ¹⁵	114
7/16/2022	103	118	115	114	112	118	115	114	114	118	113	116	111	117	111	•	114
7/17/2022	103	117	115	113	113	117	114	114	113	118	112	116	111	116	110	•	114
7/18/2022	103	117	114	112	111	117	113	113	112	117	110	116	109	116	110	•	114
7/19/2022	104	118	113	112	111	117	112	113	113	118	111	115	112	118	113	117	115
7/20/2022	104	118	112	111	111	118	112	113	114	119	110	116	111	117	114	117	116
7/21/2022	103	118	112	110	112	117	112	113	115	120	110	115	111	117	113	117	116
7/22/2022	102	117	112	110	113	117	113	113	114	118	109	114	109	115	110	117	115
7/23/2022	102	115	112	109	112	117	114	114	112	118	109	114	108	114	108	117	113
7/24/2022	102	115	112	109	111	117	114	114	113	119	110	115	110	116	109	117	114
7/25/2022	102	115	112	111	111	117	115	114	112	117	111	116	113	118	114	117	117
7/26/2022	103	115	112	114	112	117	115	114	113	118	112	116	113	118	116	117	117
7/27/2022	103	115	112	114	112	117	115	114	113	117	113	115	112	117	115	117	117
7/28/2022	104	115	112	114	113	117	115	114	113	117	114	116	113	117	113	117	117
7/29/2022	105	115	113	114	113	117	116	114	114	117	116	115	114	118	113	117	116
7/30/2022	104	115	113	114	113	117	116	114	113	118	115	117	114	119	115	117	117
7/31/2022	104	115	112	114	113	117	116	114	113	117	115	116	114	118	115	117	117
Exceedances:			1				7		6	6	4		1		6		

¹³ The Warrendale gauge (WRNO) did not properly transmit 8 hours of data on July 11.

¹⁴ The McNary tailrace gauge (MCPW) failed due to a ruptured membrane.

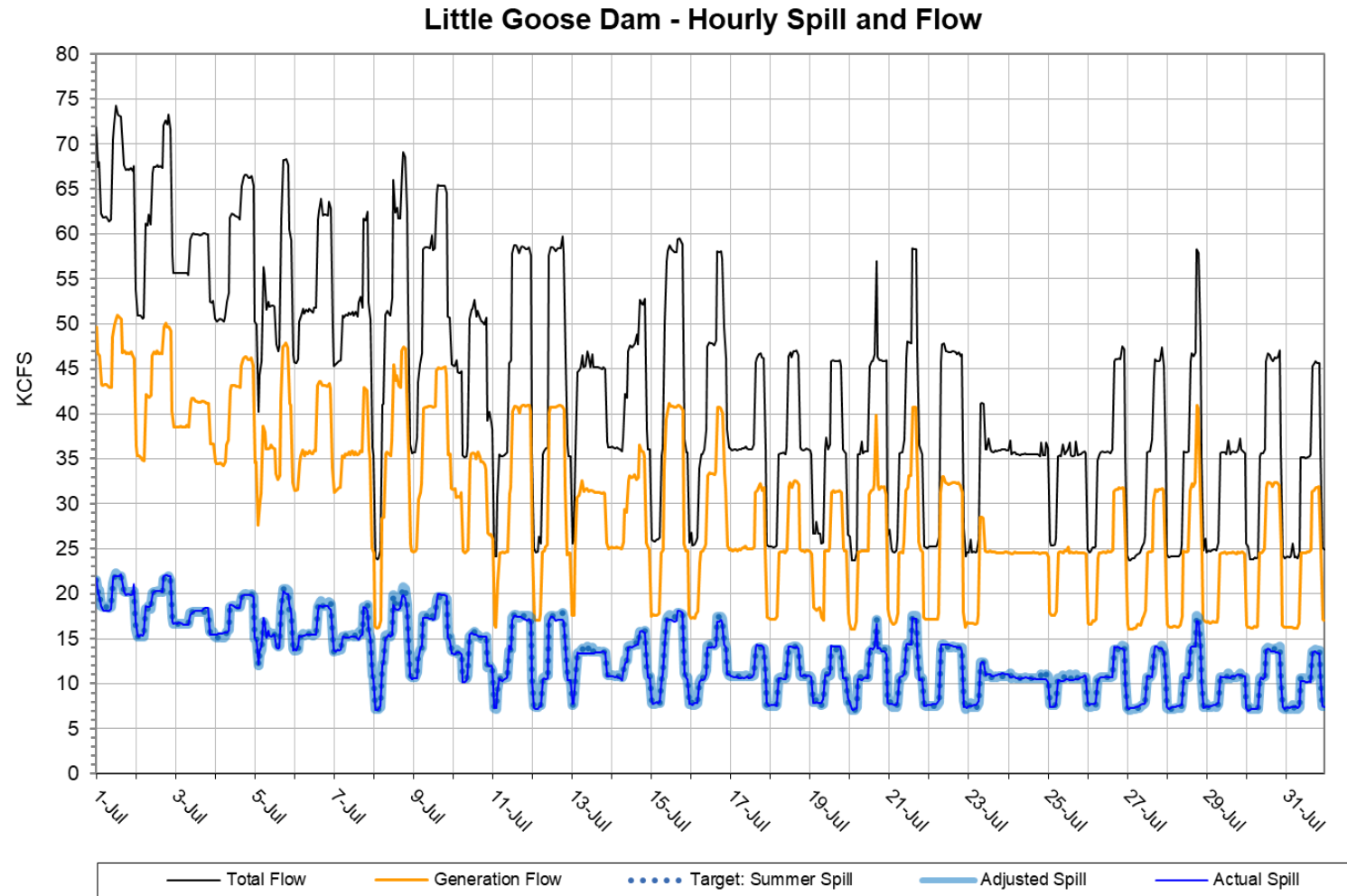
¹⁵ The Bonneville tailrace gauge (CCIW) failed due to a ruptured membrane.

Figure 1¹⁶



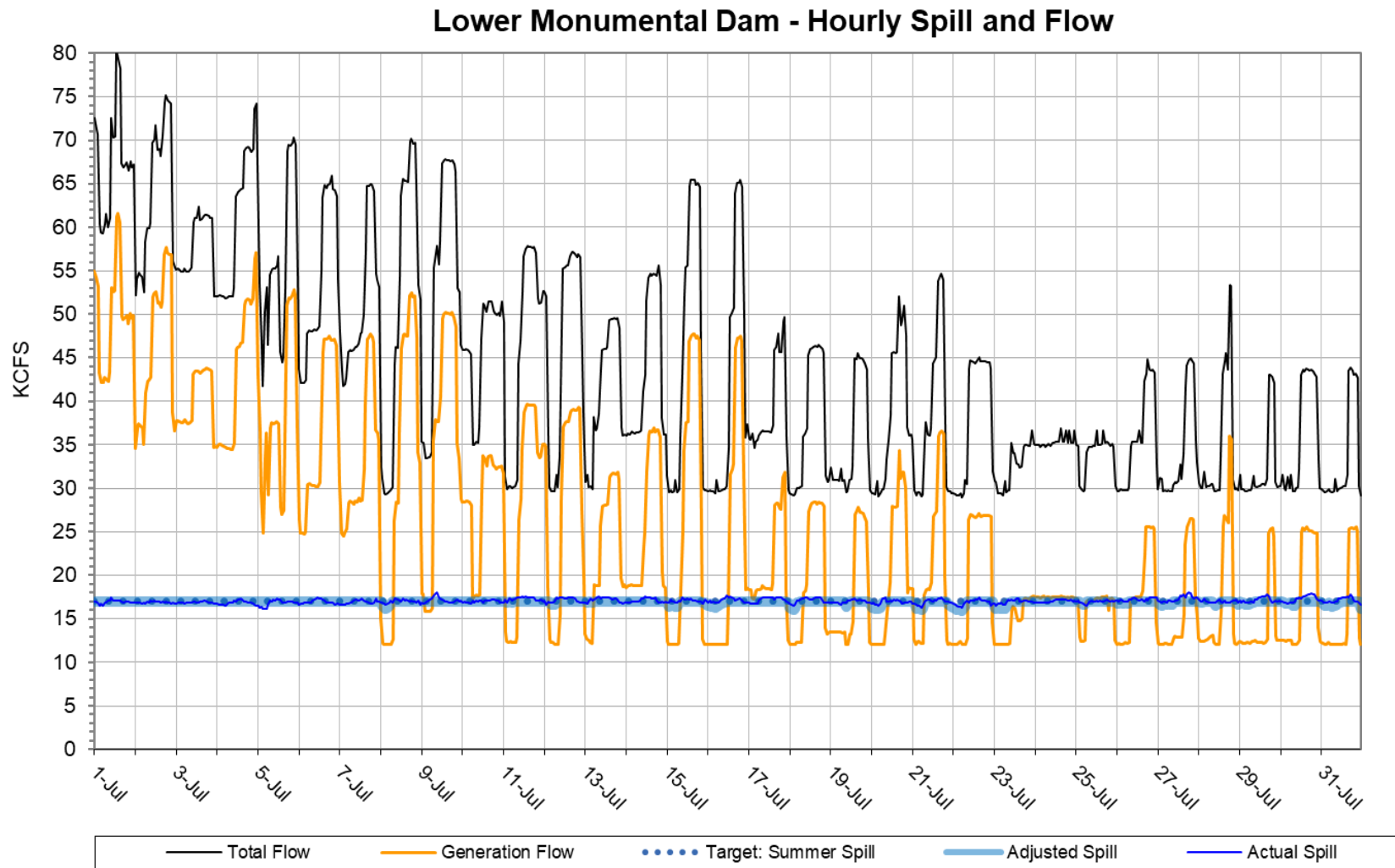
¹⁶ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 2¹⁷



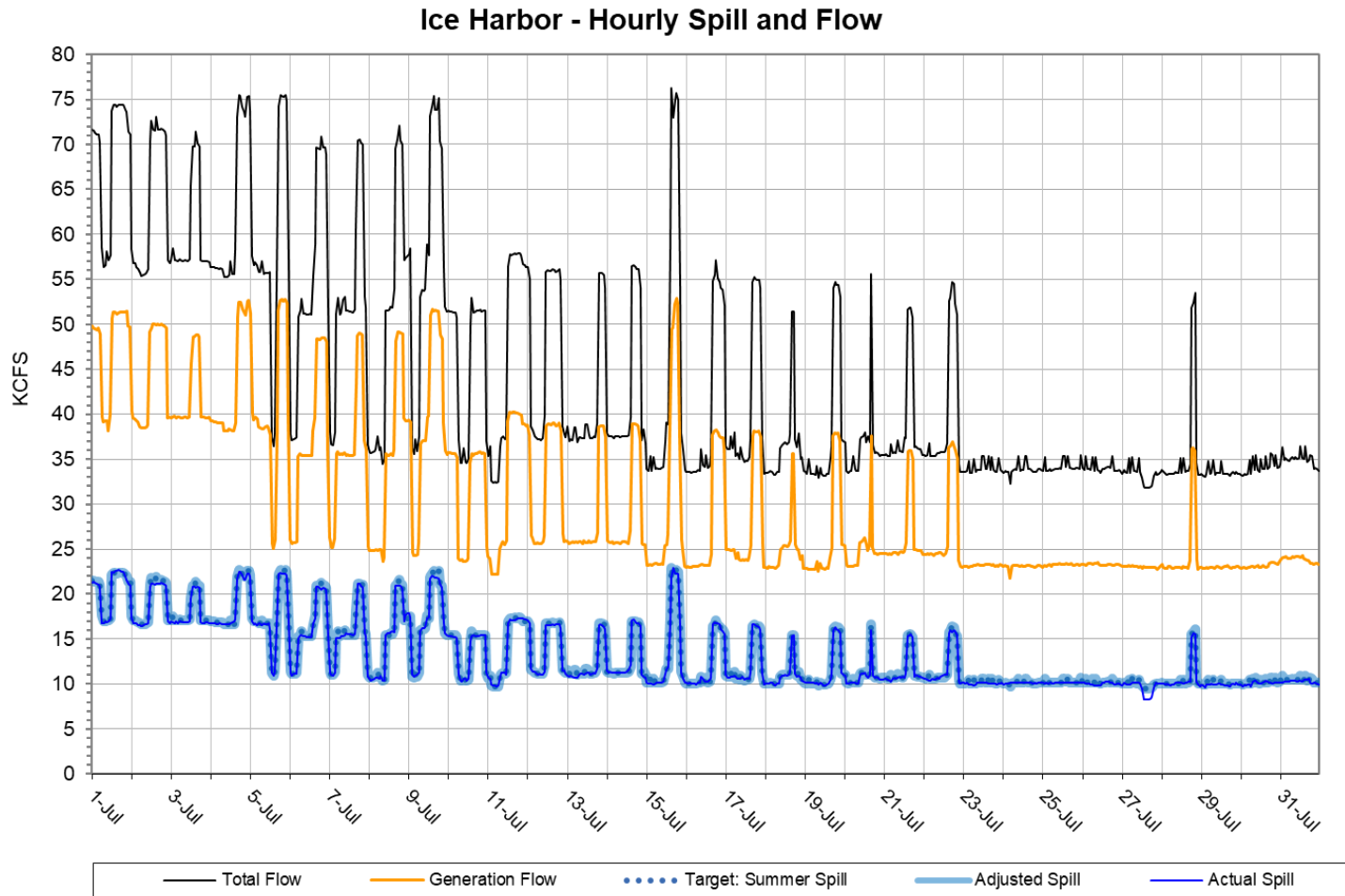
¹⁷ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 3¹⁸



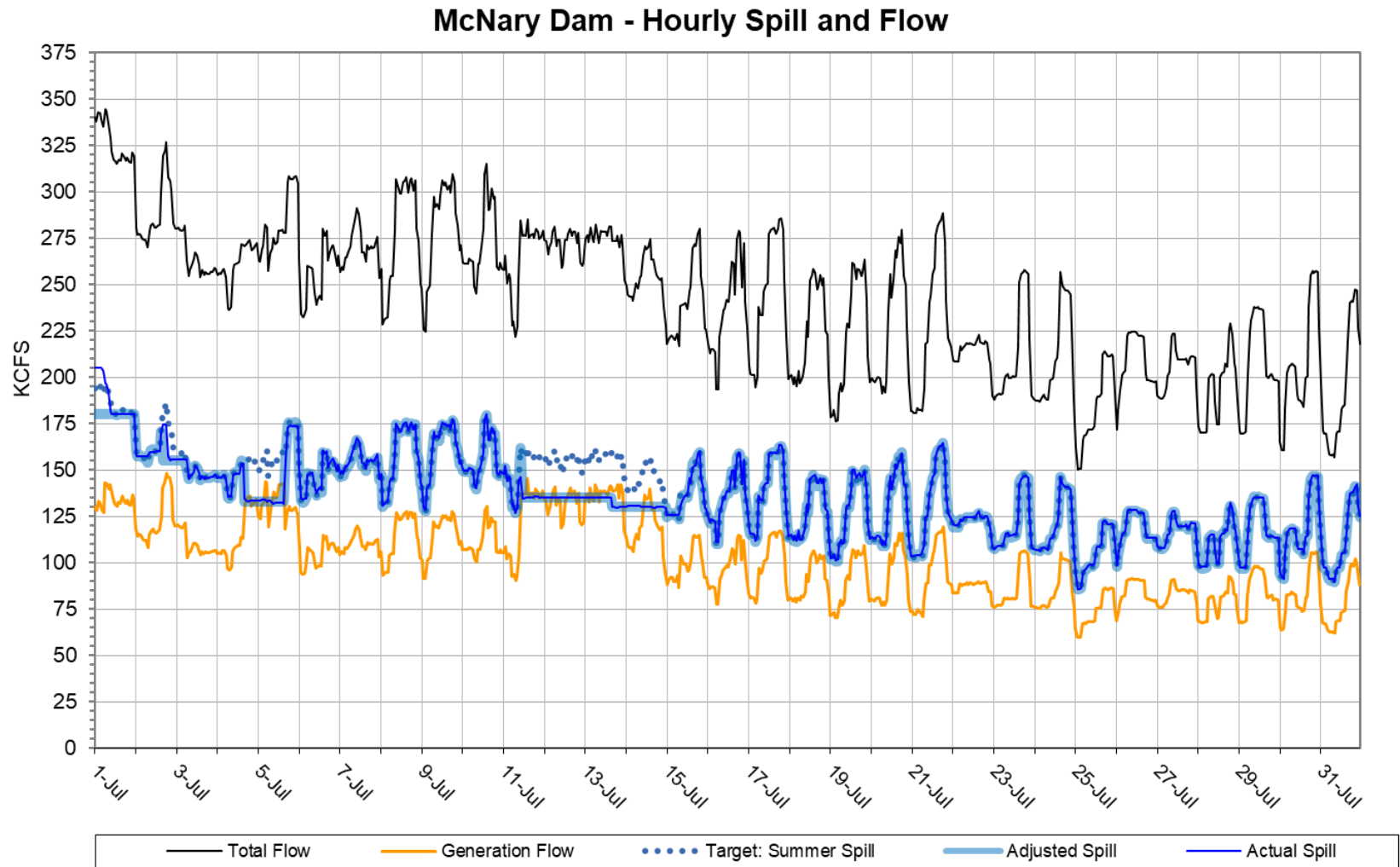
¹⁸ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 4¹⁹



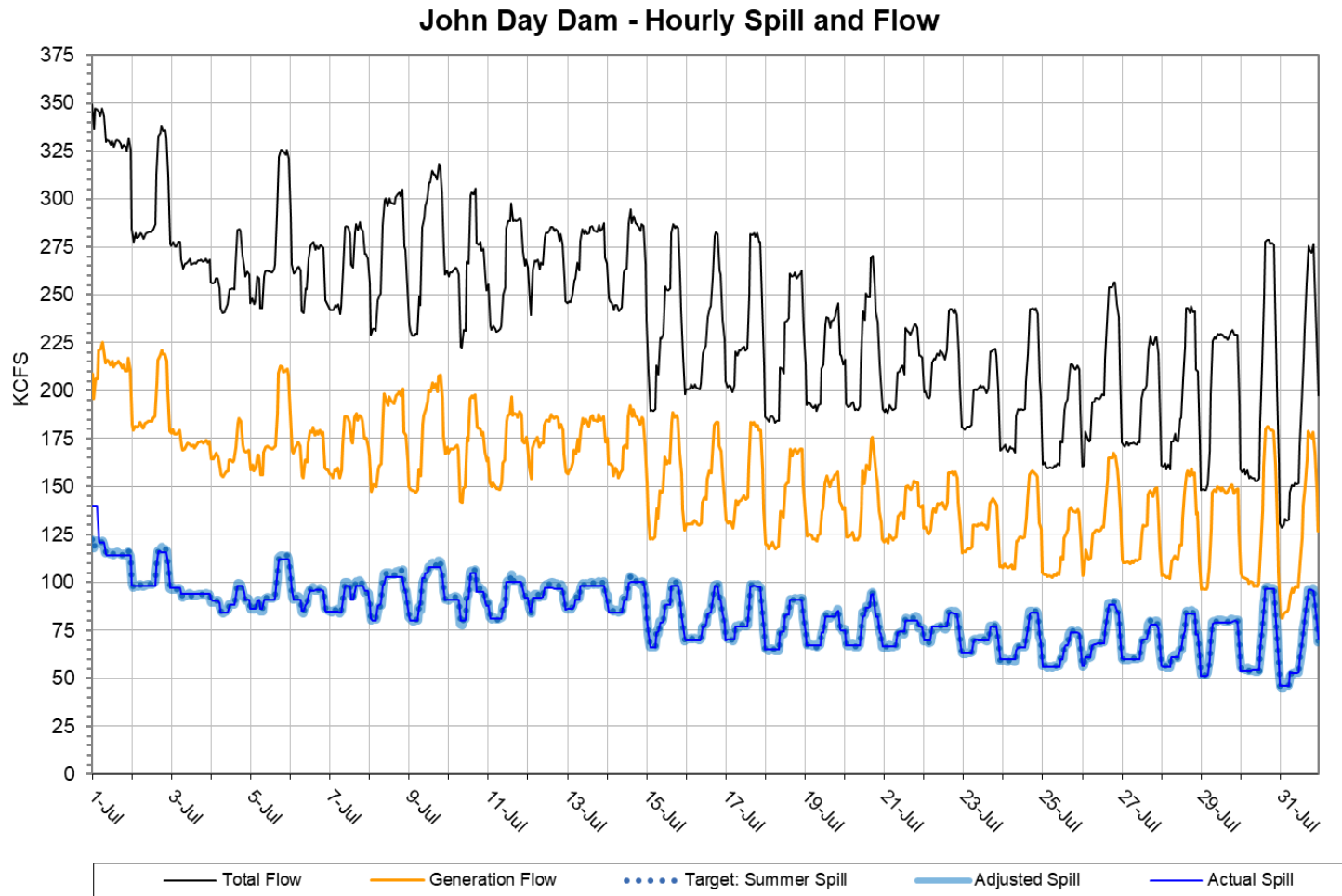
¹⁹ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations. On July 27, hourly spill was reduced to between 26 and 27% (less than a djusted spill target of 30%) due to low flows and fixed-blade unit deadbands. Per section 8.4.3 of the 2022 FOP, all but one of the available units at Ice Harbor have runner blades that are locked at a set angle (non-adjustable) and a smaller operating range (also referred to as “fixed-blade” units). As a result, turbine outflow cannot achieve some flow ranges, referred to as deadbands. When targeting spill as a percent of outflow, these deadbands will result in a spill percentage that is above or below the target percentage.

Figure 5²⁰



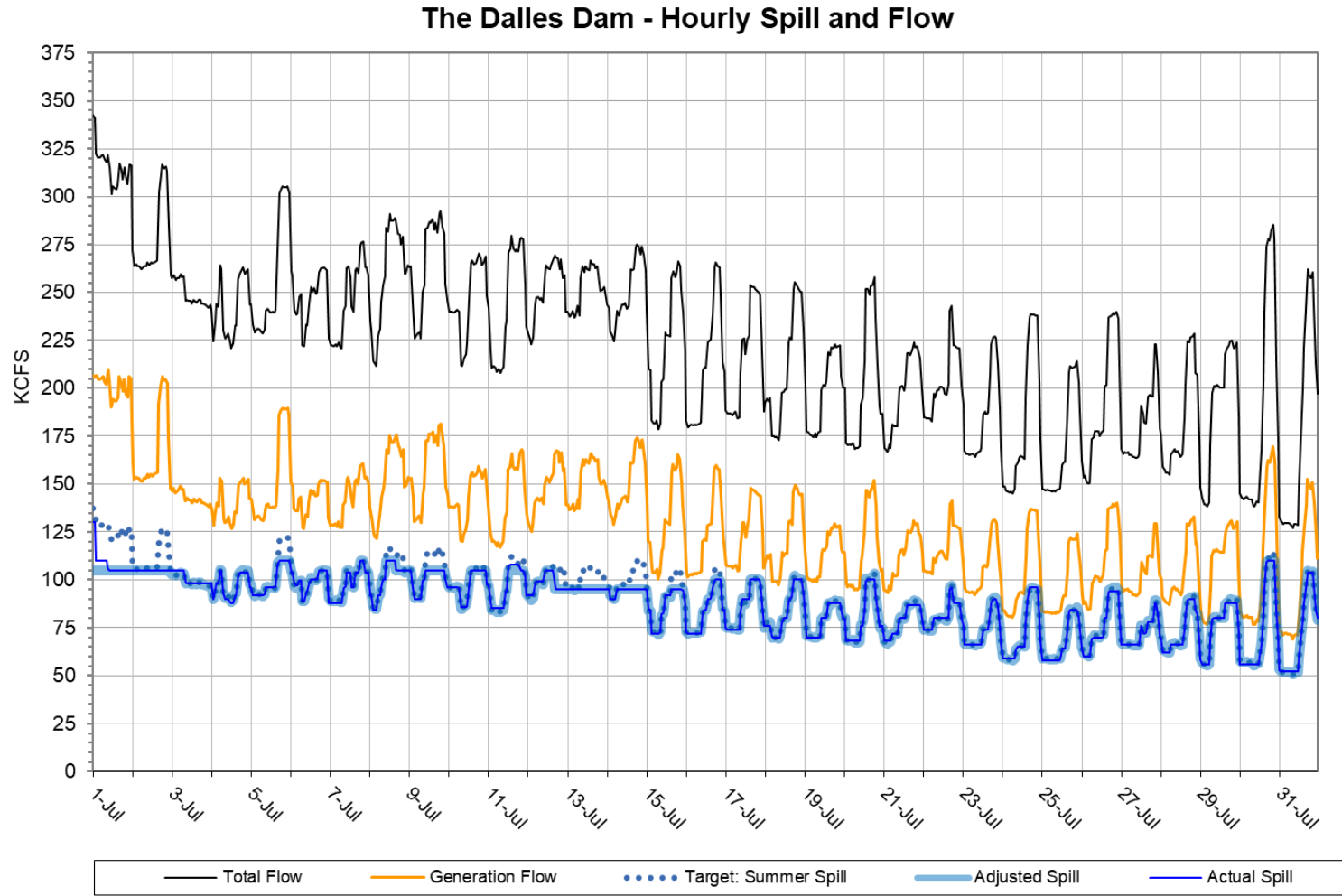
²⁰ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 6²¹



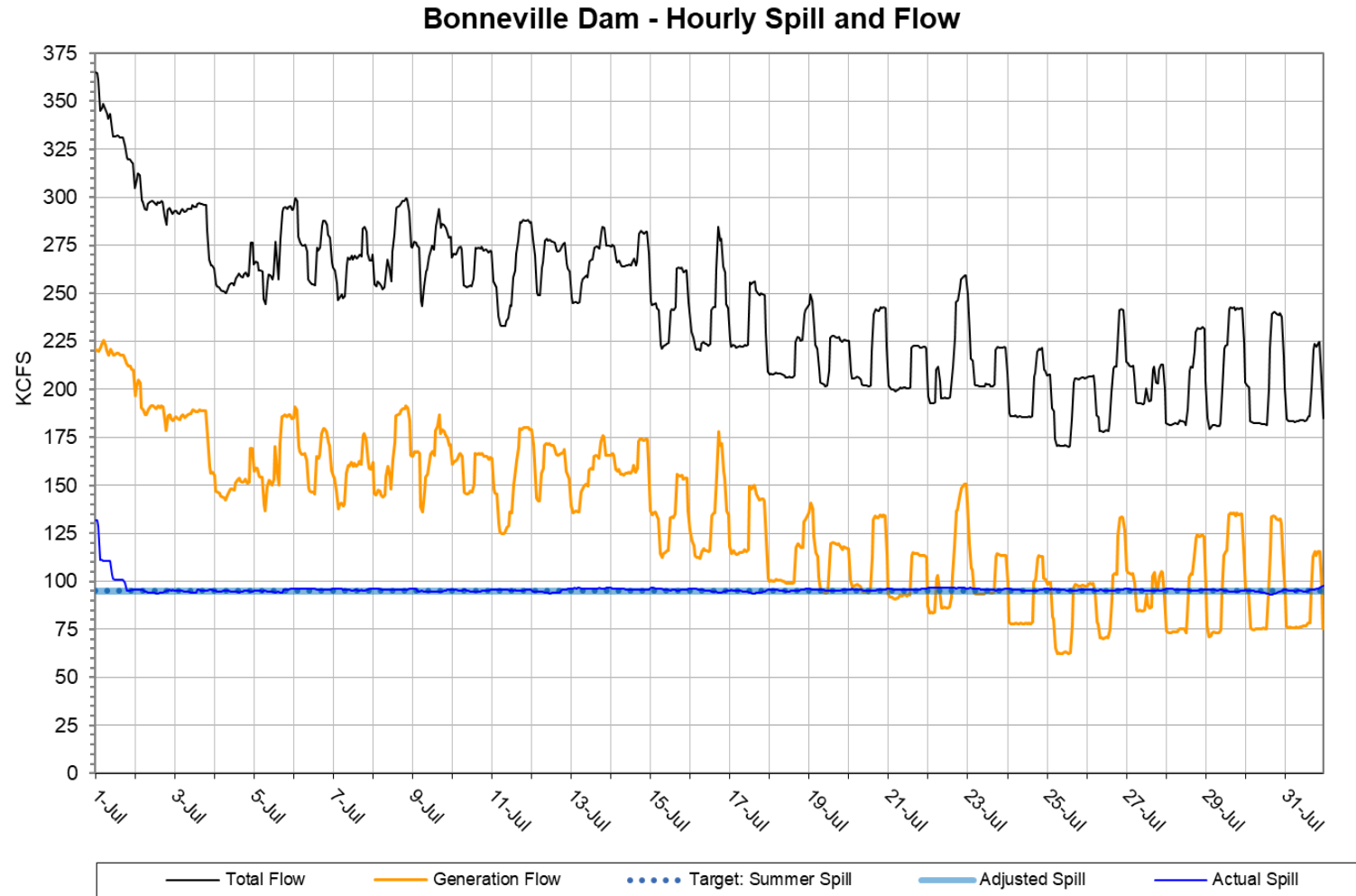
²¹ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 7²²



²² The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 8²³



²³ The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.