FISH OPERATIONS PLAN IMPLEMENTATION REPORT

August 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 Plan[1] (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 August. 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 August 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 August, with hourly spill, target spill, adjusted spill, generation, and total flows. The monthly graphs begin on August 1 and end on August 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 August 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 August 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.

August Operations

The August 2022 observed precipitation was 93% of average on the Snake River above Ice Harbor and 58% of average on the Columbia River above The Dalles[7]. The NOAA Northwest River Forecast Center runoff summary for August indicated that the adjusted runoff for the Snake River at Lower Granite was 88% of the 30-year average (1991-2020) with a volume of 1.0 MAF (Million acre-feet). The August 2022 adjusted runoff for the Columbia River at The Dalles was 116% of the 30-year average (1981-2010) with a volume of 8.4 MAF.[8]

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

[6] As specified in the 2022 FOP Section 3.
[7] Retrieved September 1, 2022: https://www.nwrfc.noaa.gov/water_supply/wy_summary/wy_summary.php?tab=5
[8] Retrieved September 1, 2022: https://www.nwrfc.noaa.gov/runoff/runoff_summary.php

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 August, 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

None.

Table 2: Spill Variance Table – August 2022

Project	Parameter	Date	Time[10]	# of Hours	Type	Reason
Little Goose	Additional Spill	8/3 8/4	1000-2000 1700	11 1	Human Error	Hourly spill was 11 kcfs (greater than adjusted spill target of 9 kcfs) due to a delay in changing to the appropriate target.[11]
Little Goose	Reduced Spill	8/3 8/4 8/14	2100-2400 0300-1100 0300	4 9 1	Human Error	Hourly spill was between 7 and 9 kcfs (less than adjusted spill target of between 9 and 11 kcfs) due to a delay in changing to the appropriate target.[12]
McNary	Additional Spill	8/15	0100-0600	6	Maintenance	Hourly spill was 26 kcfs (greater than adjusted spill target of 20 kcfs) due to spill pattern limitation caused by the fixed position of four gates.
McNary	Additional Spill	8/15 8/16 8/17 8/18 8/19 8/20	0700-2400 0100-2400 0100-2400 0100-2400 0100-2400 0100-2400	18 24 24 24 24 24	Maintenance	Hourly spill ranged from 27 to 62 kcfs (greater than adjusted spill target of 20 kcfs) due to multiple unit outages.
McNary	Additional Spill	8/30	1200-1300	2	Maintenance	Hourly spill increased to 23 kcfs (greater than adjusted spill target of 20 kcfs) while the temporary spillway weirs were tested prior to use for fall adult steelhead spill.
The Dalles	Reduced Spill	8/10	0200	1	Program Error	Hourly spill decreased to 38% (less than adjusted spill target of 40%) due to an error in the value reported by GDACS.

Table 3: Pre-Coordinated Operations – August 2022

Project	Parameter	Date	Time[13]	# of Hours	Type	Reason
Lower Granite	Additional Spill	8/8 8/9 8/10 8/11	0800-1800 0700-1900 0700-1900 0700-1900	12 13 13 13	Maintenance	Hourly spill increased to between 20 and 32 kcfs (greater than adjusted spill target of 18 kcfs) while generation was reduced when units were taken offline to perform transformer maintenance. Regionally coordinated via the 2022 FPP Appendix A.

[10] 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 Pre-Coordinated Operations Table as an hour.

[11] Based on the previous day's outflow, the spill target was 9 kcfs. See FOP section 8.2.3.

[12] Spill target was based on the previous day's outflow. See FOP section 8.2.3.

[13] 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 Pre-Coordinated Operations Table as an hour.

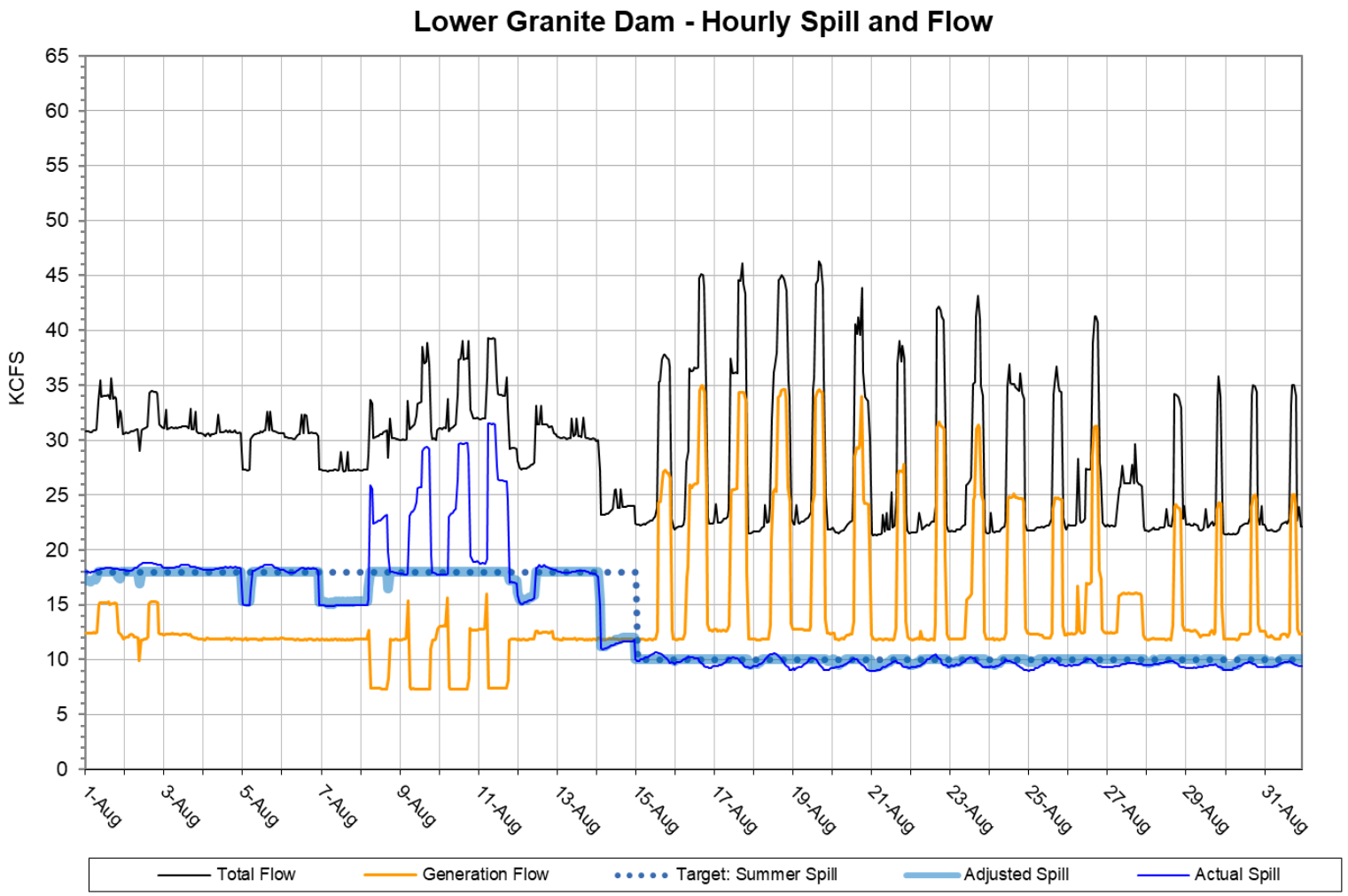
Little Goose	Additional Spill	8/1 8/2 8/3 8/4 8/5 8/6 8/7 8/8 8/9 8/10 8/11 8/12 8/13	1800-2400 0100-1000, 1800-2400 0100-1000 1800-2400 0100-1000, 1800-2400 0100-1000, 1800-2400 0100-1000 1800-2400 0100-1000 1800-2400 0100-1000 1800-2400 0100-1000 1800-2400 0100-1000	7 17 14 7 17 17 10 7 17 17 17 17 10	Maintenance	Hourly spill increased to between 11 and 27 kcfs (greater than adjusted spill target of between 7 and 11 kcfs) for powerhouse roof repair. Regionally coordinated via FPP Appendix A and MOC 22 LGS 06.
Lower Monumental	Additional Spill	8/22	0800-1300	6	Maintenance	Hourly spill increased to between 8 and 13 kcfs (greater than adjusted spill target of between 2 and 8 kcfs) for T-2 rehabilitation. Regionally coordinated via FPP Appendix A Section 7.4.1.
Ice Harbor	Reduced Spill	8/1 8/3 8/4 8/5 8/7 8/8 8/9 8/10 8/11 8/12 8/13 8/14	0500 2100 1200, 1600-1700 0300, 1200, 1400 0200, 0600-0700 0100 1600 0200, 0900, 1600 1700 0500, 2000 0600, 1700, 2200 0100, 1300	1 1 3 3 3 1 1 3 1 2 3 2	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.
The Dalles	Reduced Spill	8/1	2200	1	Transmission Reliability	Hourly spill decreased to 38% (less than adjusted spill target of 40%) due to an increase in generation to deploy reserves. Regionally coordinated via 2022 FOP, Section 4.4.1.
The Dalles	Reduced Spill	8/23	1900-2200	4	Transmission Reliability	Hourly spill decreased to 28% (less than adjusted spill target of 30%) due to an increase in generation to deploy reserves. Regionally coordinated via 2022 FOP, Section 4.4.1.

Table 4: August 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
8/1/2022	104	115	112	114	113	117	115	113	113	118	114	115	112	116	112	117	115
8/2/2022	103	115	112	115	112	116	115	113	111	117	112	115	110	115	110	117	114
8/3/2022	104	115	111	115	112	117	115	114	110	117	111	115	111	116	109	117	117
8/4/2022	103	115	111	112	111	116	114	112	108	117	108	115	110	114	108	117	115
8/5/2022	103	115	110	113	110	115	112	108	108	117	106	115	109	115	108	117	116
8/6/2022	103	115	109	114	110	115	111	108	108	117	106	114	110	116	111	117	116
8/7/2022	103	116	109	114	110	113	111	108	108	117	106	115	110	116	112	117	116
8/8/2022	102	119	109	112	109	115	111	108	111	117	107	115	111	116	114	117	118
8/9/2022	101	119	109	114	110	114	111	108	111	117	108	115	110	115	111	117	116
8/10/2022	100	119	109	115	110	115	111	108	110	117	108	115	109	115	108	117	116
8/11/2022	101	•[14]	109	114	110	114	111	108	109	117	109	114	109	115	109	117	116
8/12/2022	103	117	111	114	109	113	111	108	109	117	109	115	109	115	108	117	115
8/13/2022	103	115	111	114	108	114	110	107	108	116	108	115	108	113	107	116	115
8/14/2022	101	115	110	110	109	113	110	108	108	117	107	114	108	114	107	116	115
8/15/2022	101	115	110	110	110	110	110	108	107	114	107	113	109	113	109	113	114
8/16/2022	102	113	112	111	110	110	110	108	109	113	108	113	108	112	110	114	113
8/17/2022	102	113	112	111	110	111	109	108	111	115	109	114	108	113	110	115	113
8/18/2022	101	113	112	111	110	111	111	108	110	114	110	114	109	113	111	115	114
8/19/2022	101	112	112	111	109	110	112	108	111	114	110	115	109	112	110	114	113
8/20/2022	103	114	112	111	108	110	110	108	110	113	110	115	108	112	107	114	112
8/21/2022	102	114	111	111	108	110	109	107	109	112	109	113	108	112	106	113	112
8/22/2022	102	114	110	111	108	112	108	107	108	111	107	113	108	112	107	113	113
8/23/2022	102	114	110	111	108	110	108	107	109	111	106	113	106	111	107	114	113
8/24/2022	102	114	110	110	108	110	107	107	109	112	107	113	107	112	108	114	114
8/25/2022	102	113	109	110	108	110	106	107	108	112	107	113	108	•[15]	109	114	114
8/26/2022	101	113	109	110	108	110	107	107	109	111	106	113	108	112	108	114	113
8/27/2022	101	113	108	109	107	110	108	107	107	110	105	112	105	110	105	113	112
8/28/2022	100	114	108	110	106	110	107	107	105	110	105	113	104	110	105	113	115
8/29/2022	100	113	108	110	106	110	106	107	104	109	105	113	108	112	105	113	113
8/30/2022	100	113	106	110	105	110	105	107	104	109	104	112	109	112	106	113	116
8/31/2022	104	114	107	109	105	110	105	107	104	109	104	112	108	112	108	113	117
Exceedances:																	

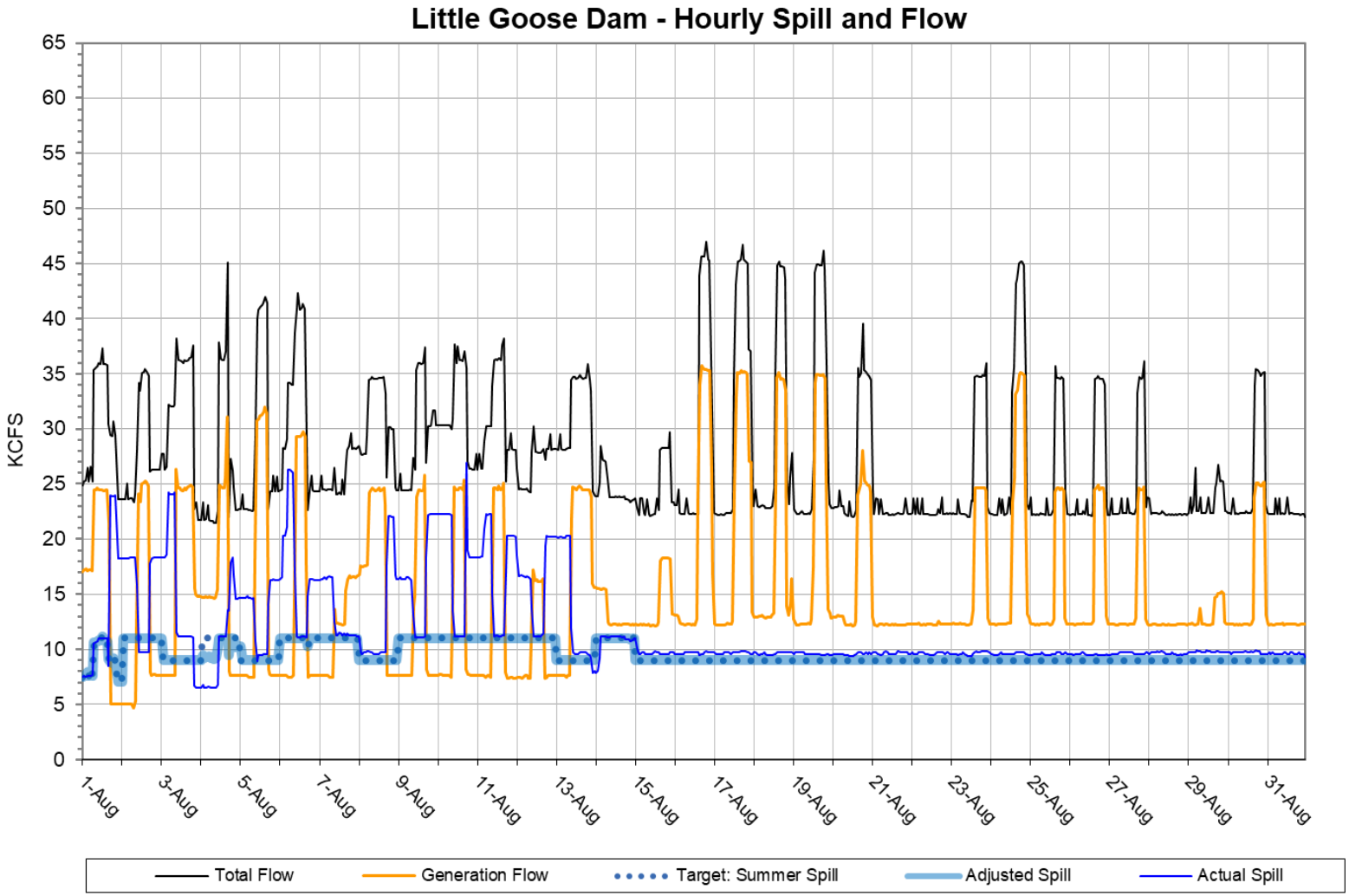
[14] The Lower Granite tailrace gauge (LGNW) reported bad data for a period of 10 hours.
[15] The Dalles tailrace gauge (TDDO) failed due to a ruptured membrane.

Figure 1[16]



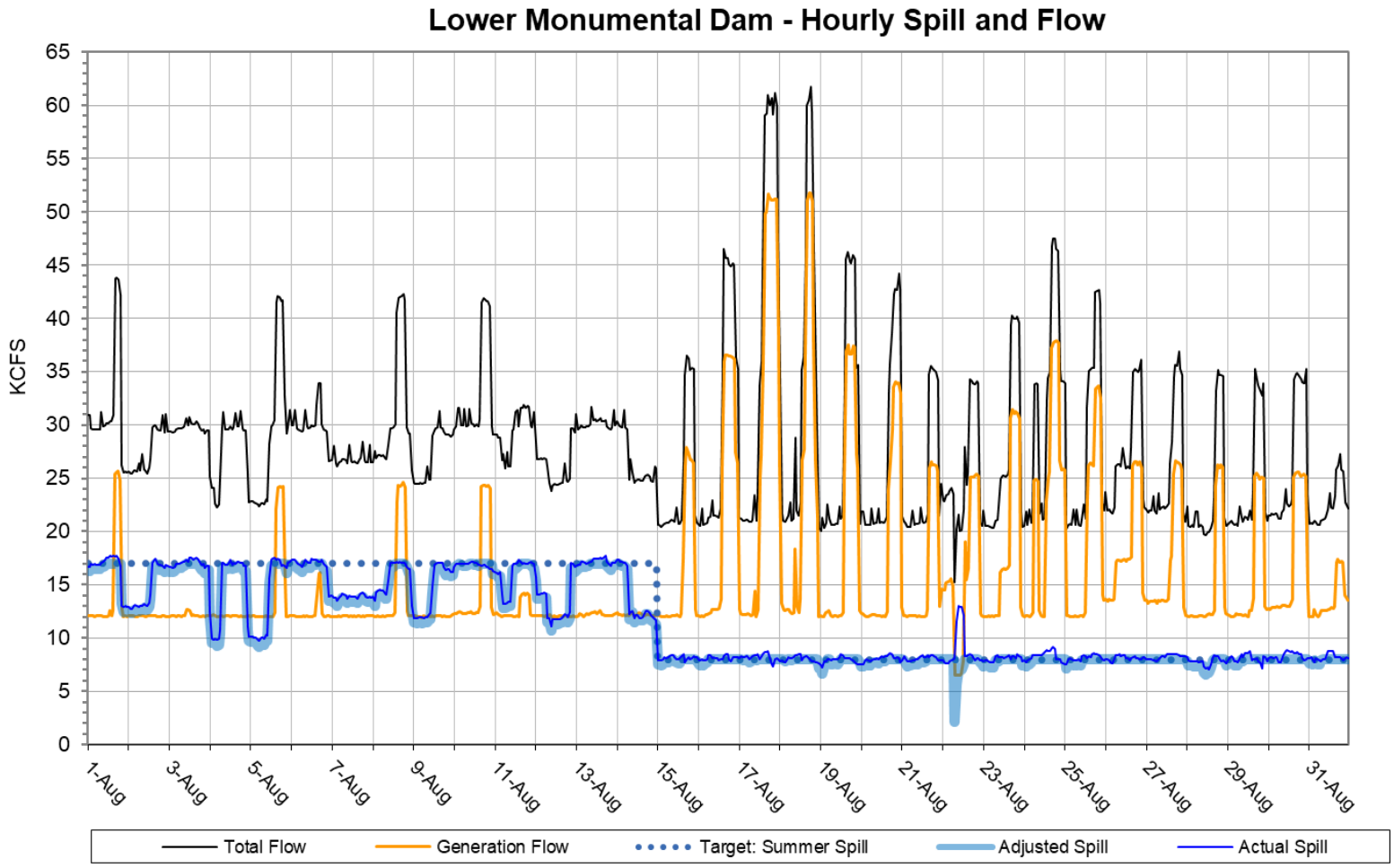
[16] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 2[17]



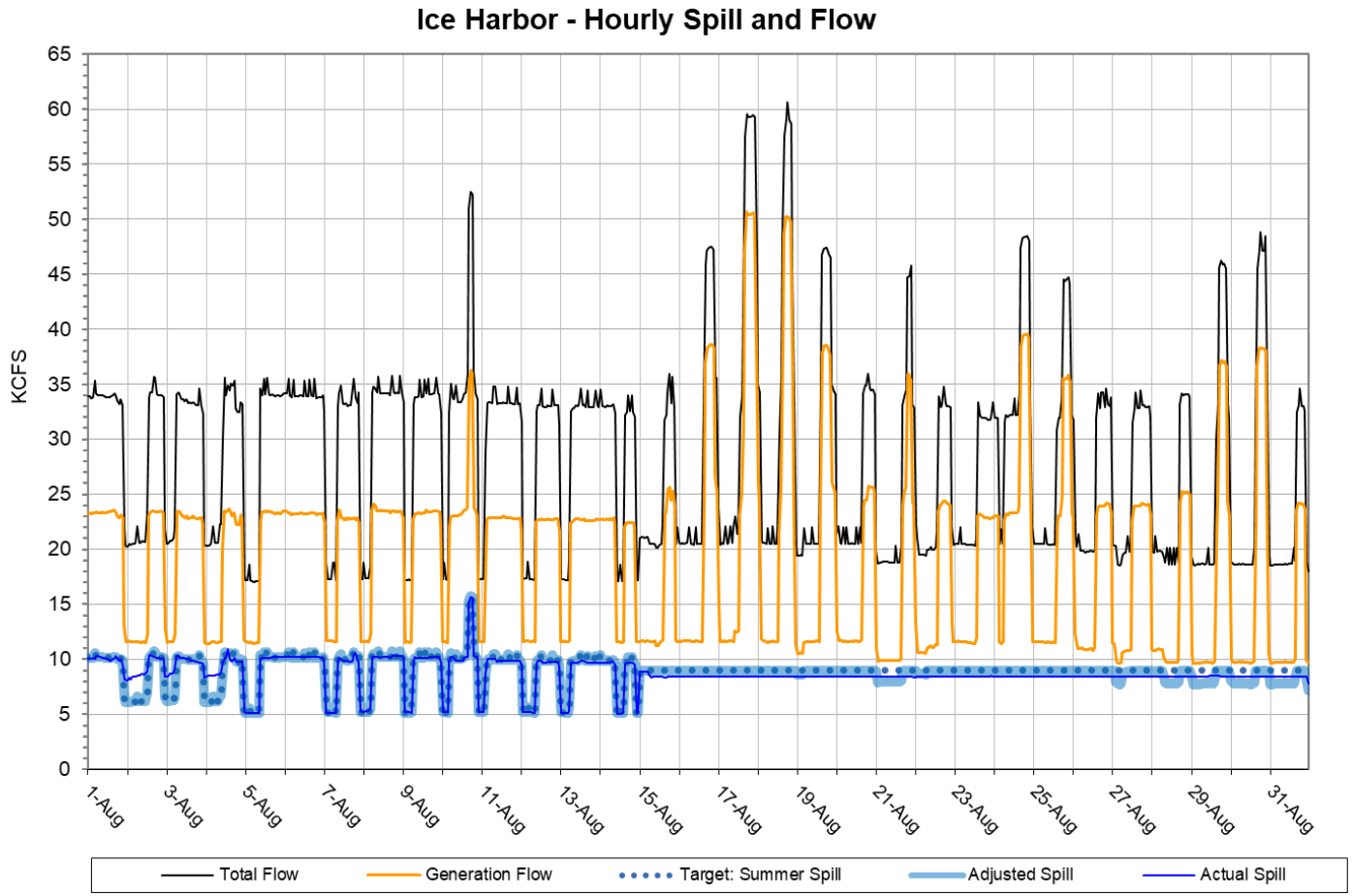
[17] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 3[18]



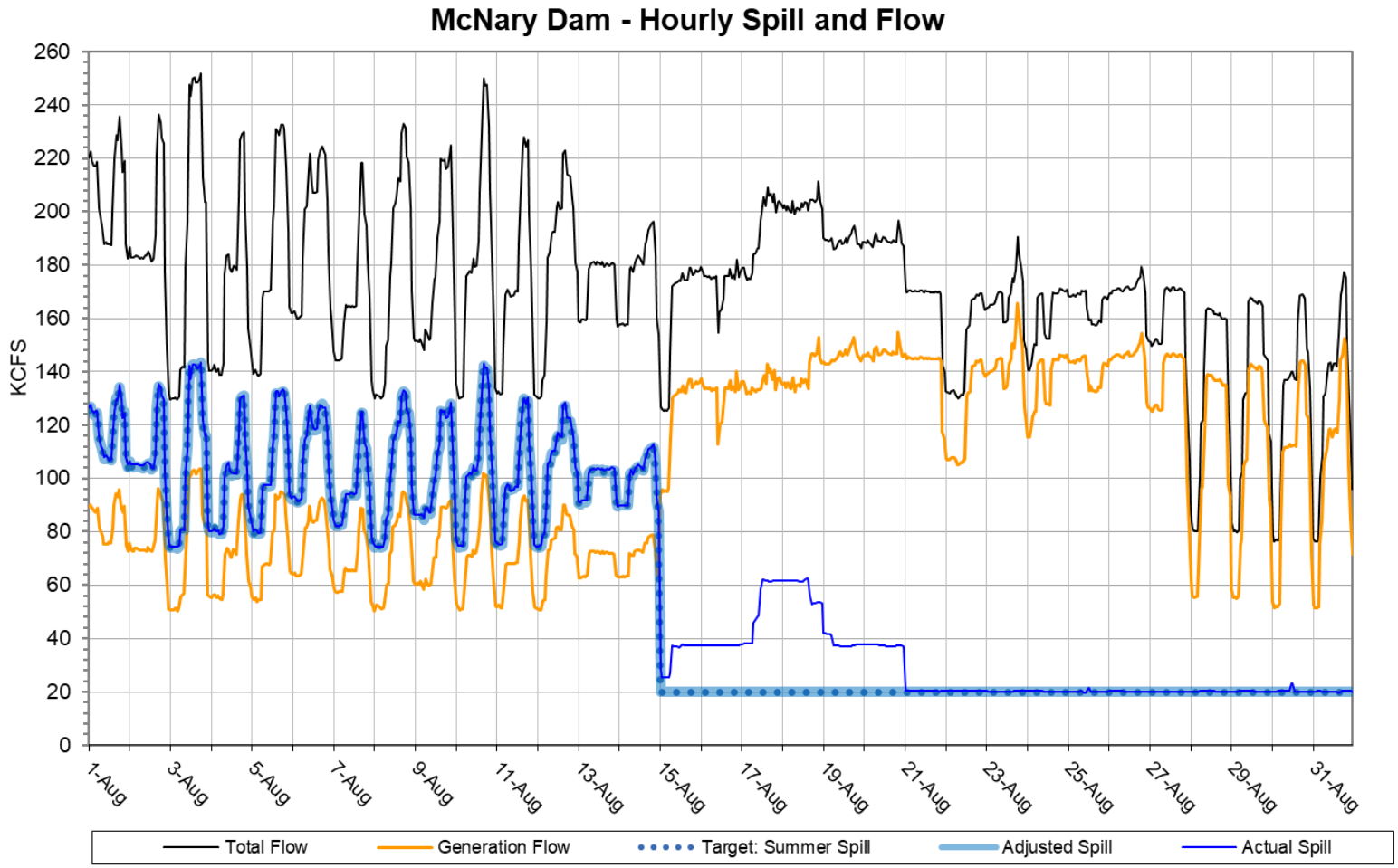
[18] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 4[19]



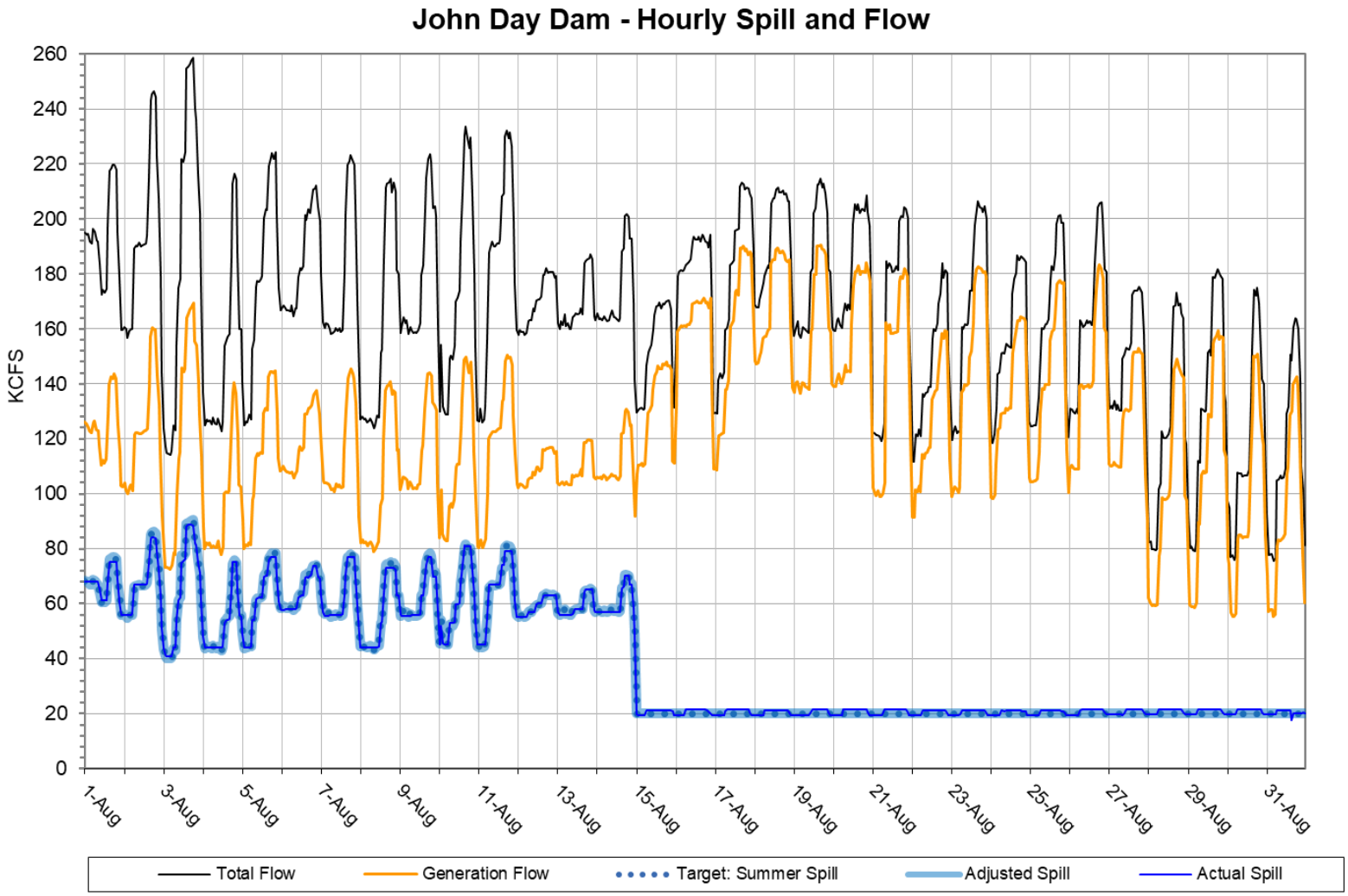
[19] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations. On August 27, hourly spill was reduced to between 26 and 27% (less than adjusted spill target of 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 5[20]



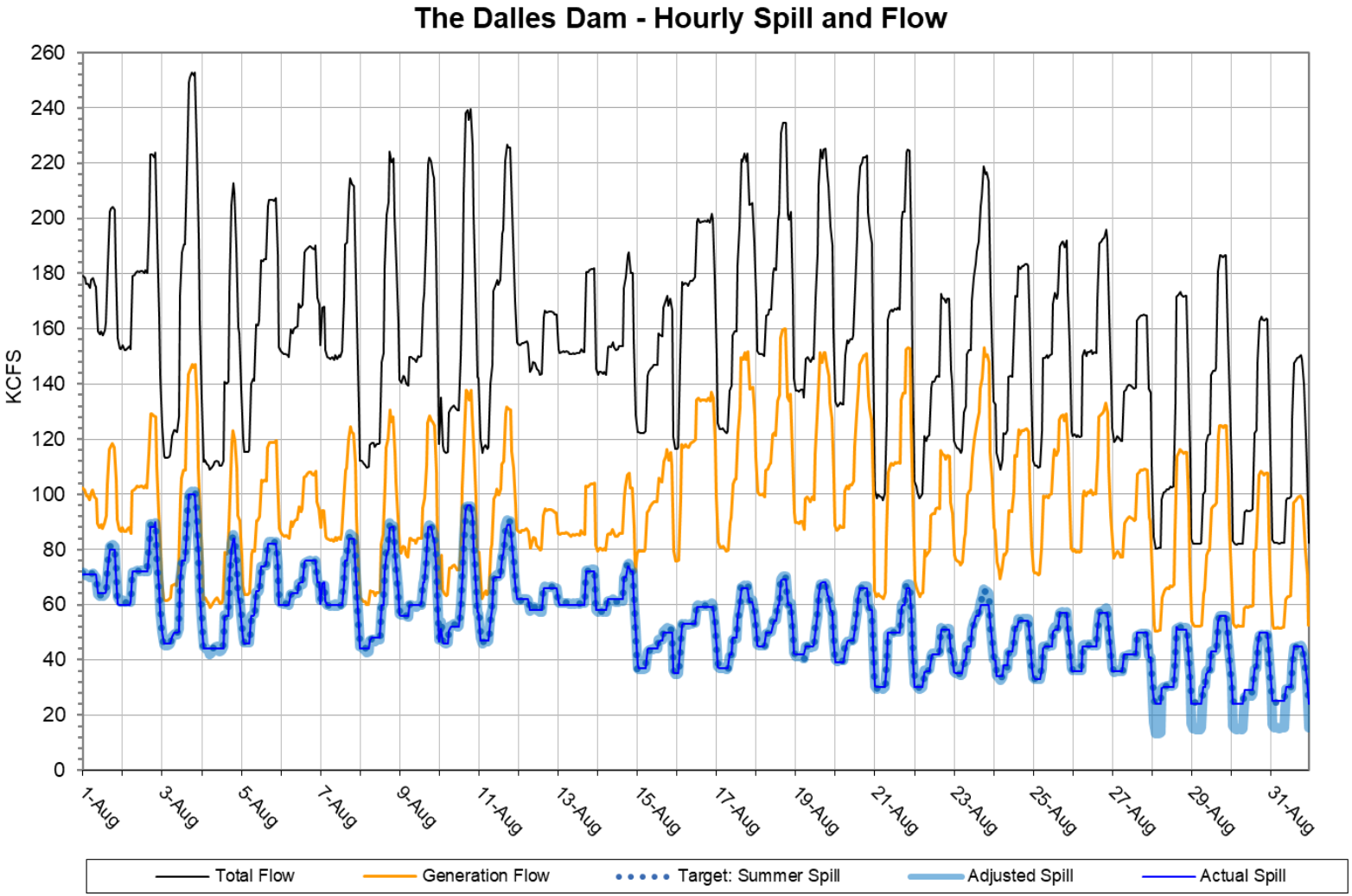
[20] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 6[21]



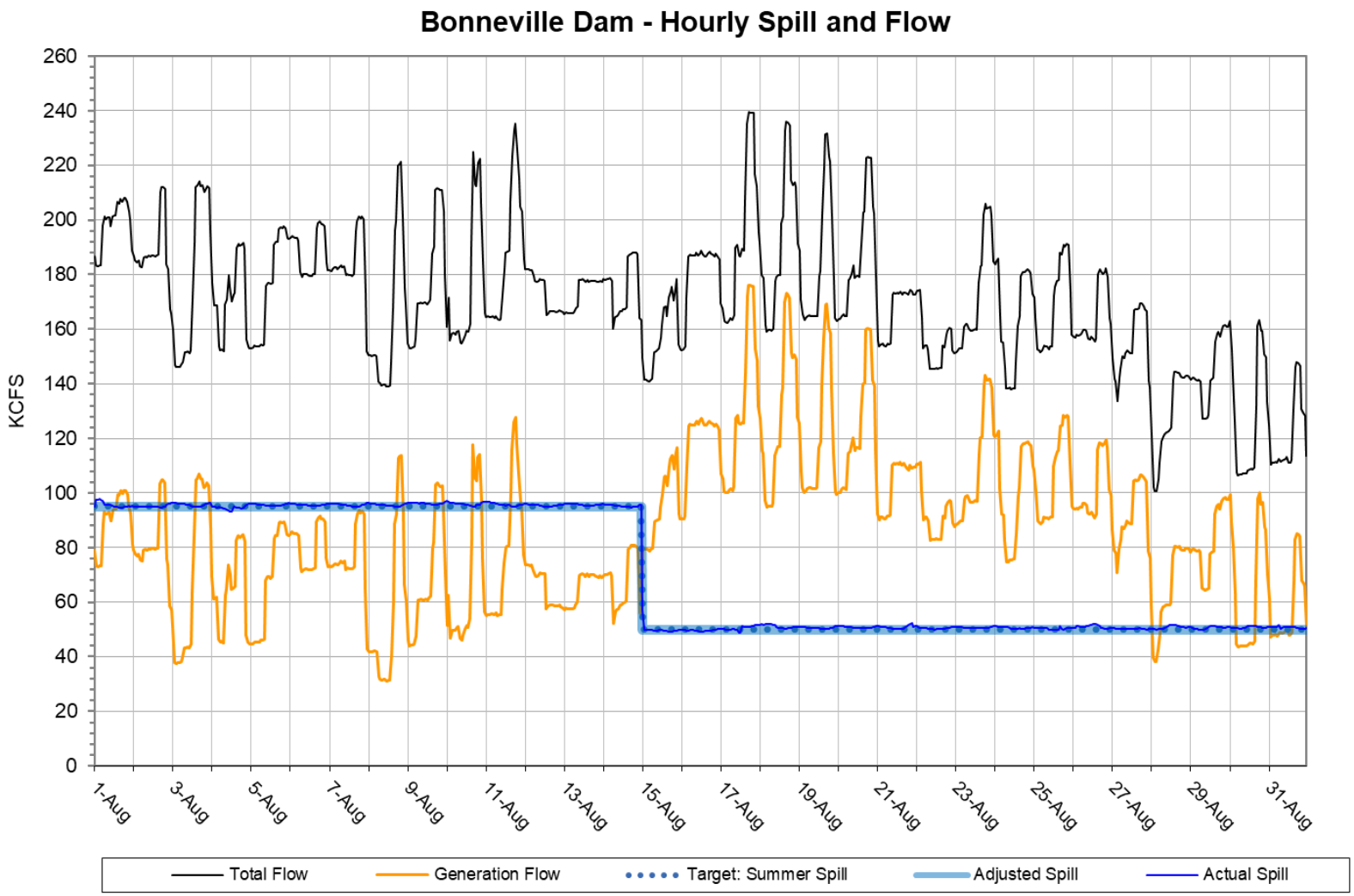
[21] The adjusted spill line is a simplified representation due to limitations of representing a range of minimum generation values. See Tables 2 and 3 for spill variances and pre-coordinated operations.

Figure 7[22]



[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 8[23]



[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.