FISH OPERATIONS PLAN IMPLEMENTATION REPORT

July 2018

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

Introduction

The U.S. Army Corps of Engineers (Corps) is submitting this report in accordance with the 2018 Summer Fish Operations Plan[1] (2018 Summer FOP). The 2018 Summer FOP describes operations during the summer fish migration season, generally June 16 through August 31, 2018. To the extent Corps project operations are not specified in the 2018 Summer FOP, the FCRPS operations will be consistent with the 2014 NOAA Fisheries Supplemental Biological Opinion (2014 Supplemental BiOp), the U.S. Fish and Wildlife Service 2000 and 2006 Biological Opinions, and/or other operative documents, including the 2018 Water Management Plan (WMP), WMP seasonal updates, and the 2018 Fish Passage Plan (FPP).

This report describes the Corps' implementation of the 2018 Summer FOP during the month of July 2018. In particular, 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, i.e. the specified spill level or percent spill identified in the 2018 Summer FOP, or the spill cap;[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 subject to routine operational adjustments that limit the ability to spill to the target spill (see 2018 Summer FOP, section 4.1);
- actual spill: the hourly flow over the spillway; and,
- the resultant 12-hour average TDG for the tailwater at each project and for the next project's forebay downstream.[3]

This report also provides information on issues and unanticipated or emergency situations that

[1] The 2018 Summer FOP was posted to the TMT website on June 1, 2018 (http://pweb.crohms.org/tmt/documents/fpp/2018/final/FPP18_AppE_Summer.pdf).
[2] The term "spill cap" means the maximum spill level at each project that is estimated to meet, but not exceed, the gas cap (the applicable state TDG water quality standard) in the tailrace and the downstream forebay. There are occasions when the spill cap is less than the 2018 Summer FOP spill level, and in these instances, the Corps operates to the spill cap.
[3] Averages reported are consistent with the current and applicable Oregon TDG standard modification (120% tailwater) and Washington TDG criteria adjustments (120% tailwater/115% forebay). The Oregon TDG standard modification and the Washington TDG criteria adjustments have different methodologies for calculating TDG. When the standards vary or conflict, the Corps applies the more stringent standard. See 2018 Summer FOP section 2.1.

arose during implementation of the 2018 Summer FOP in July 2018.

Data Reporting

I. For each project providing fish passage operations, this report contains a graph displaying the performance of the summer fish passage spill program for the month of July, with hourly spill, target 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 dark tan line represents the average hourly total river flow through the project in thousand cubic feet per second (kcfs).
- The dotted blue line represents the average hourly generation flow through the powerhouse each hour in kcfs.
- The dotted pink line represents the actual average hourly spill level through the spillway in kcfs.
- The thin green line represents the hourly target spill.
- The thick green 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 (2018 Summer FOP section 4.1).

II. The average daily %TDG for the 12 highest hours for all projects is shown in the July 2018 Average Percent TDG Values Table (Table 3) . The numbers in red indicate the project exceeded the %TDG cap - i.e. 115% (forebay of the next downstream dam) or 120% (tailwater) for each project. For the lower Columbia projects, tailwater TDG values are presented by displaying the highest value %TDG (i.e., controlling limit, labelled “comb” for combined).

General Implementation Remarks

For all projects that spill for fish passage, the actual spill may vary from the target spill due to various conditions as described below. When actual spill levels are below or above the level specified in the 2018 Summer FOP, the dotted pink line will be below or above the thick green line in the figures.[4] When actual spill varied from target spill levels during periods of voluntary spill, the change in spill level is described below in the July 2018 Spill Variance Table (Table 1).[5] The Spill Variance Table includes average hourly data. When spill varies from target spill for a portion of an hour, resulting in the average hourly data varying from target spill, it is characterized as a variance for a full hour. There are instances when the hourly target spill levels

[4] The actual thickness of the adjusted spill level (thick green line) is not representative of the spill cap range; if the actual spill level is slightly outside the adjusted spill level, it should not be construed to indicate a spill variance or involuntary spill.

[5] Involuntary spill conditions shown in the graphs are not considered variances and are not reported in the Spill Variance Table. Involuntary 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.

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 target spill to the extent practicable. Other routine activities that changed spill levels and had been coordinated with regional partners are identified in the monthly Pre-Coordinated Operations Table (Table 2).

"Low flow" operations at the lower Columbia and Snake projects are triggered when inflow is insufficient to provide both minimum generation and the target spill levels. 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 2018 Summer 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).

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 flows for the lower Snake and lower Columbia rivers along with well above average air temperatures and extremely low precipitation across the Columbia Basin. The July 2018 observed precipitation was 4% of average on the Snake River above Ice Harbor and 16% of average on the Columbia River above The Dalles.[7] The NOAA Northwest River Forecast Center indicated that the July 2018 adjusted runoff for the Snake River at Lower Granite was 72% of the 30-year average (1981-2010), with a volume of 1.6 MAF (Million acre-feet).[8] The July 2018 adjusted runoff for the Columbia River at The Dalles was 77% of the 30-year average (1981-2010) with a volume of 11.2 MAF.

During the July 2018 reporting period, the planned 2018 Summer FOP spill operations were carried out as follows:

[6] As specified in the 2018 Summer FOP, Section 3.
[7] Retrieved August 1, 2018: https://www nwrfc noaa.gov/water_supply/wy_summary/wy_summary.php?tab=5
[8] Retrieved August 1, 2018: https://www nwrfc noaa.gov/runoff/runoff_summary.php

- Lower Granite Dam – The hourly target spill level was 18 kcfs, 24 hours/day.
- Little Goose Dam – The hourly target spill level was 30% of the total flow, 24 hours/day.
- Lower Monumental Dam – The hourly target spill level was 17 kcfs, 24 hours/day.
- Ice Harbor Dam – The hourly target spill level alternated between two-day treatments of 30% of the total flow, 24 hours per day and 45 kcfs during the daytime and the spill cap during the nighttime from July 1 to July 13. The operation transitioned to the hourly target spill level of 45 kcfs during the daytime and the spill cap during the nighttime on July 13 at 0800.
- McNary – The hourly target spill level was 50% of the total flow, 24 hours/day.
- John Day Dam – The hourly target spill level alternated between two-day treatments of 30% and 40% of the total flow, 24 hours per day through July 20. Spill level changes occur at 2100 hours. The operation transitioned to the hourly target spill level of 30% of the total flow, 24 hours per day, on July 20.
- The Dalles Dam – The hourly target spill level was the 40% of the total flow, 24 hours/day.
- Bonneville Dam – The hourly target spill level was alternating two-day treatments of 95 kcfs, 24 hours per day vs. 85 kcfs during the day and 121 kcfs during the nighttime.

Operational Adjustments

No operational adjustments to report during this period.

Table 1: Spill Variance Table – July 2018 (7/1 to 7/31)

Project	Parameter	Date	Time[9]	Hours	Type	Reason
The Dalles	Reduced Spill	7/28/18	1000	1	Human Error	Hourly spill decreased to 38% (less than 40% ±1% range) due to a delay in implementing a spill change. Daily average spill was 40%.

Table 2: Pre-Coordinated Operations – July 2018 (7/1 to 7/31)

Project	Parameter	Date	Time[9]	Hours	Type	Reason
Little Goose	Reduced Spill	7/1/18 7/20/18 7/21/18 7/23/18	1300 & 1800 0900 0200 0800 & 1100	2 1 1 2	Navigation	Hourly spill decreased to 28% (less than 30% ±1%) due to volume of water needed to empty the navigation lock. Daily average spills were 30%. Regionally coordinated via 2018 Summer FOP, Sections 4.1 and 4.6.
Lower Monumental	Reduced Spill	7/1/18 7/3/18 7/5/18 7/7/18 7/9/18 7/11/18 7/13/18 7/15/18 7/17/18 7/19/18 7/21/18 7/23/18 7/25/18 7/27/18 7/29/18 7/31/18	1700 1700-1800 1800 1800 1800 1700 1700-1800 1800-1900 1700-1900 1800-1900 1700-1800 1700 1700-1800 1800 1700 1800-1900	1 2 1 1 1 1 2 2 3 2 2 1 2 1 1 2	Navigation	Hourly spill reduced to less than target spill (17 kcfs ± 2 kcfs) for safe navigation. Regionally coordinated via 2018 Summer FOP, Sections 4.1 and 4.6.
Lower Monumental	Additional Spill	7/26/18	0600-1700	12	Maintenance	Hourly spill increased while generation operated for station service due to a scheduled transmission line outage and Doble testing. Regionally coordinated via June and July Fish Passage Operations and Maintenance (FPOM) meetings and FPP, Appendix A, page A-2.
McNary	Additional Spill	7/18/18	1700	1	Transmission Stability	Hourly spill increased to 53% (greater than 50% ± 1% range) due to a Remedial Action Scheme (RAS) event. Daily average spill was 50%. Regionally coordinated via the Summer FOP, Section 4.4.1.

[9] Spill variances and pre-coordinated operations are reported using hourly average data. If hourly average spill varies from the target, it is reported as one hour even if it occurred for less than one hour.

Table 3: July 2018 Average Percent TDG Values (7/1/ to 7/31)

Date	FIXED MONITORING STATIONS															
	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW[a]
	Lower Granite FB	Lower Granite TW	Little Goose FB	Little Goose TW	Lower Monumental FB	Lower Monumental TW	Ice Harbor FB	Ice Harbor TW	McNary FB	McNary TW	John Day FB	John Day TW	The Dalles FB	The Dalles TW	Bonneville FB	Bonneville TW
Gas Cap %:	115	120	115	120	115	120	115	120	115	120	115	120	115	120	115	120
Method:	WA	WA	WA	WA	WA	WA	WA	WA	WA	Comb	WA	Comb	WA	Comb	WA	Comb
7/1/2018	101	115	109	112	111	116	112	114	112	117	107	115	109	115	110	•
7/2/2018	101	115	109	112	111	116	112	114	111	117	107	114	107	113	109	•
7/3/2018	101	115	108	112	109	116	112	112	110	117	106	116	108	114	109	•
7/4/2018	102	115	108	113	110	116	112	112	111	116	107	115	111	116	110	•
7/5/2018	102	116	108	113	110	116	112	113	109	116	107	114	111	116	113	•
7/6/2018	100	115	108	113	110	116	111	114	110	117	106	114	110	115	112	•
7/7/2018	101	115	108	113	111	116	111	113	109	116	106	114	108	114	111	•
7/8/2018	102	115	112	114	111	116	113	112	111	116	106	114	110	115	111	•
7/9/2018	102	115	112	114	111	116	113	114	111	116	107	114	110	115	111	•
7/10/2018	102	115	112	114	111	117	113	114	110	116	107	114	108	113	109	•
7/11/2018	103	115	110	113	112	117	113	114	109	116	107	115	110	115	111	117
7/12/2018	103	115	110	113	112	117	113	112	109	116	108	116	112	116	114	117
7/13/2018	103	116	110	113	112	117	113	113	111	116	108	116	112	116	115	117
7/14/2018	103	116	110	113	112	117	114	112	111	116	108	115	111	115	114	117
7/15/2018	104	116	113	114	113	117	116	113	111	116	109	114	111	116	113	117
7/16/2018	105	116	113	114	113	117	116	113	111	117	111	117	112	117	114	117
7/17/2018	106	116	113	114	113	117	114	112	111	117	111	117	112	117	113	117
7/18/2018	106	116	113	113	114	117	114	113	110	117	111	115	110	116	111	117
7/19/2018	104	115	112	116	113	117	113	113	109	116	109	115	107	113	108	116
7/20/2018	103	116	111	116	112	116	112	113	108	116	107	114	107	112	106	116
7/21/2018	103	116	110	114	111	117	111	112	108	116	106	115	107	113	105	116
7/22/2018	103	116	109	115	110	117	111	112	107	115	105	114	108	114	108	117
7/23/2018	103	116	109	115	110	116	111	112	108	117	105	114	109	115	112	117
7/24/2018	103	116	110	114	110	117	111	113	108	117	105	114	109	115	112	117
7/25/2018	102	115	110	114	111	116	113	113	109	116	106	114	108	114	112	116
7/26/2018	102	115	110	114	112	119	115	113	111	116	107	115	108	114	111	117
7/27/2018	104	116	111	114	113	118	115	114	112	117	108	114	108	114	111	117
7/28/2018	104	116	112	114	113	117	115	114	112	117	109	115	108	114	110	117
7/29/2018	103	116	112	110	112	117	114	113	111	116	109	115	110	115	110	116
7/30/2018	103	116	112	111	112	117	115	114	111	117	110	115	111	116	112	117
7/31/2018	103	116	112	113	112	117	115	114	111	117	110	114	111	116	112	117

• Red shaded cells indicate no data due to malfunctioning gauge.

[a] The Bonneville tailwater gauge at Cascades Island (CCIW) was damaged by debris on May 13 and repaired on July 11.

Figure 1

Lower Granite Dam - Hourly Spill and Flow

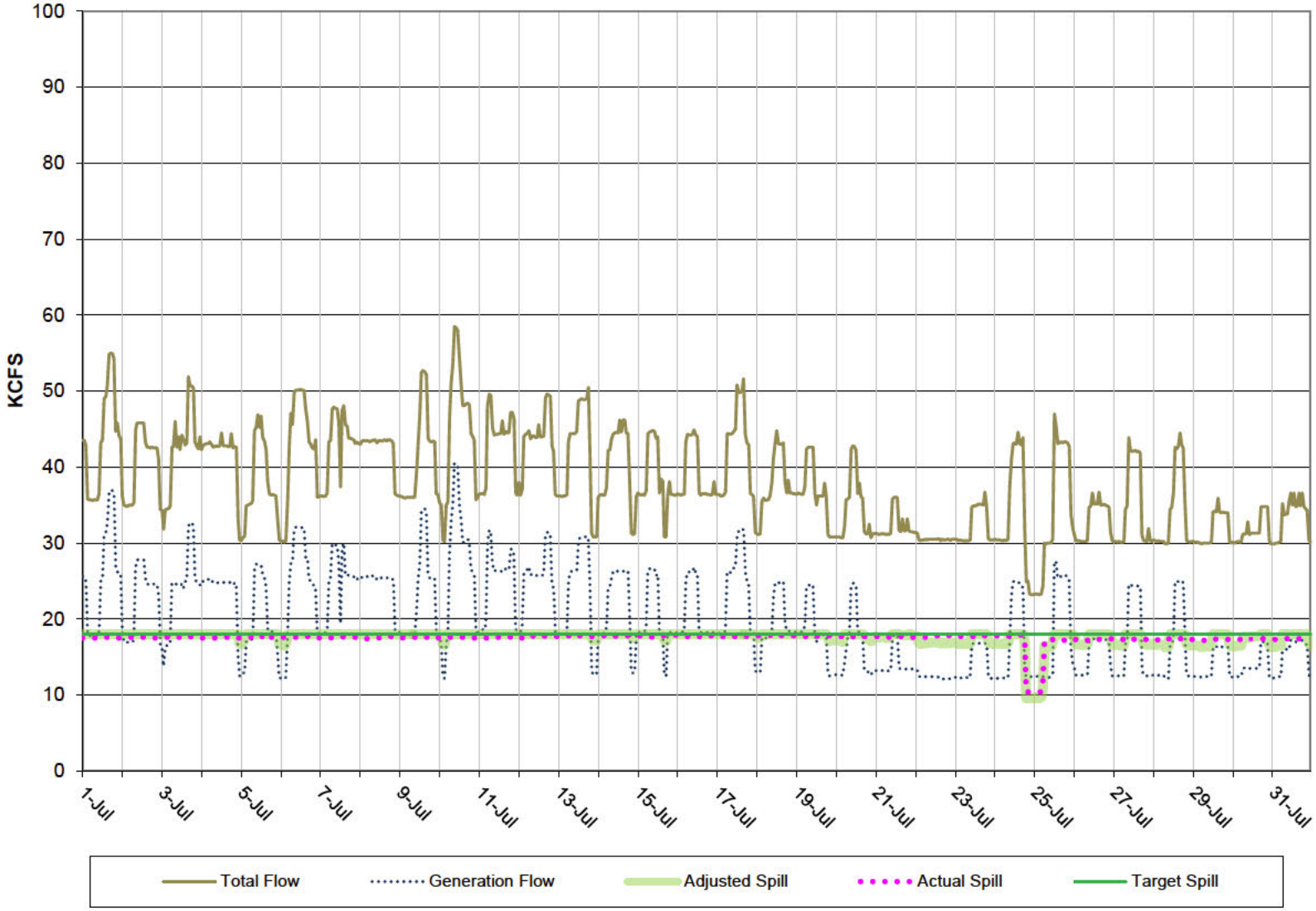


Figure 2

Little Goose Dam - Hourly Spill and Flow

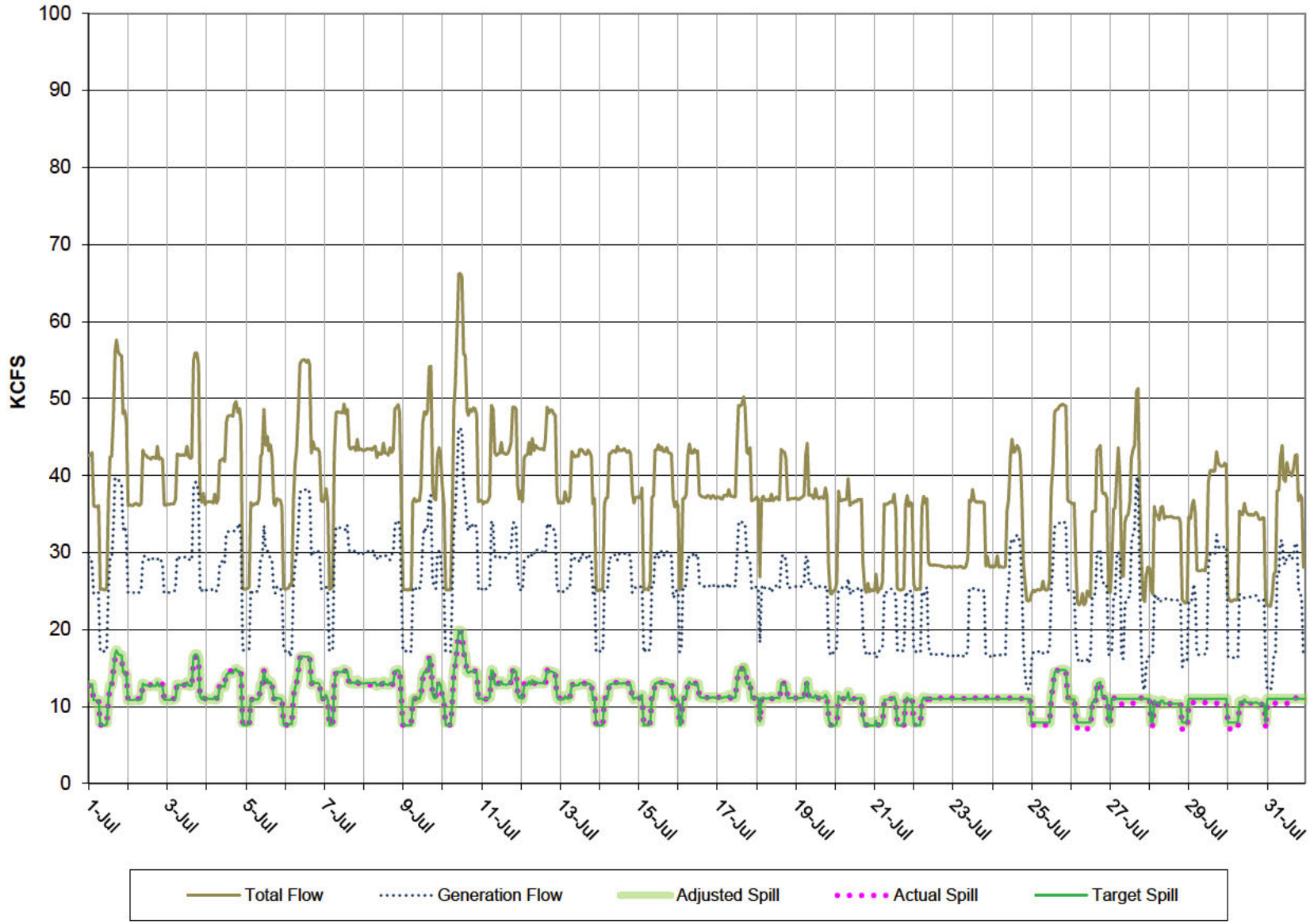
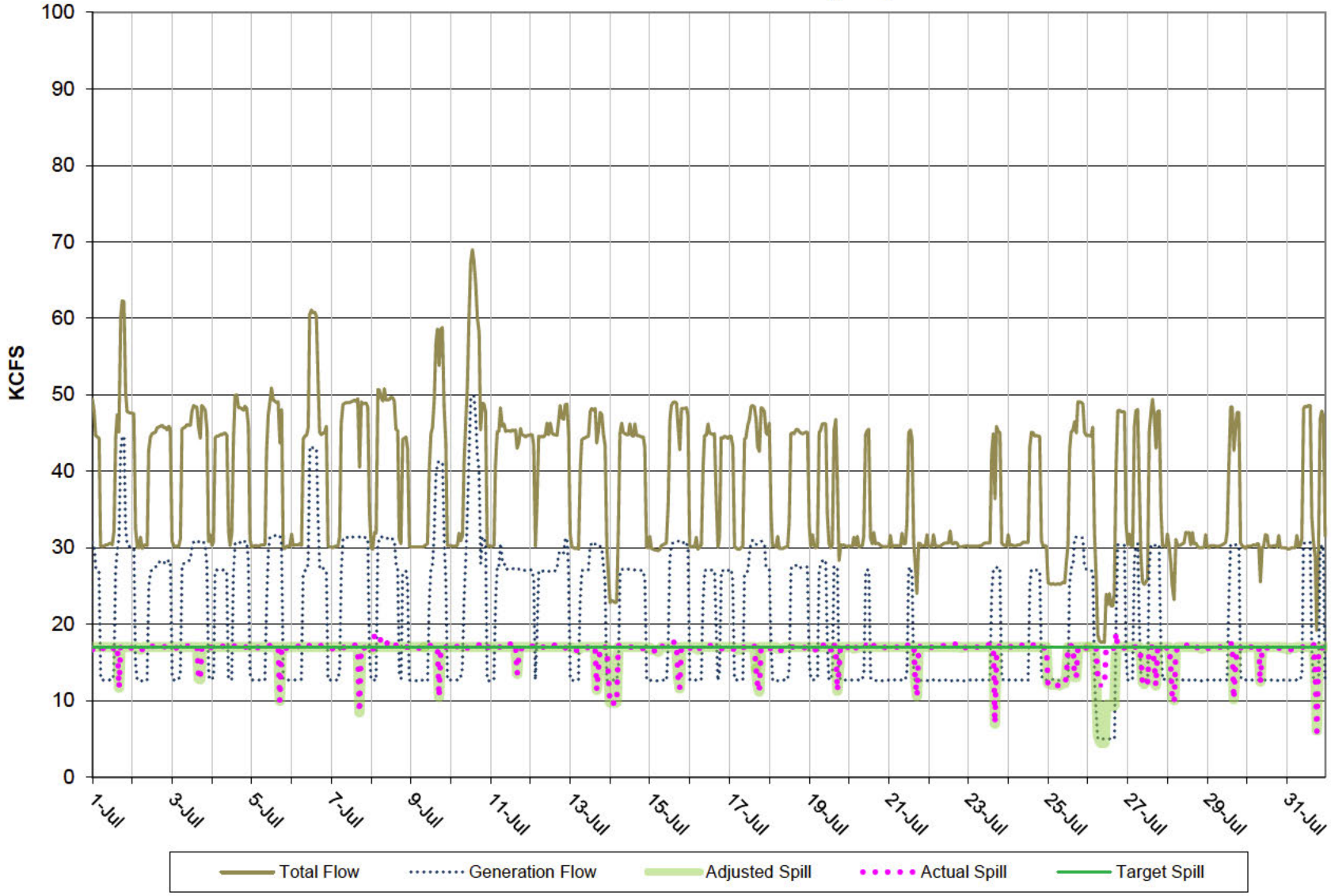


Figure 3

Lower Monumental Dam - Hourly Spill and Flow



Note: Figure 3 in the June 2018 FOP Implementation Report had an error in the Adjusted Spill (thick green line). This line should have matched the decreases in Actual Spill (pink dots) from barge reductions. An updated June 2018 Figure 3 can be obtained upon request.

Figure 4

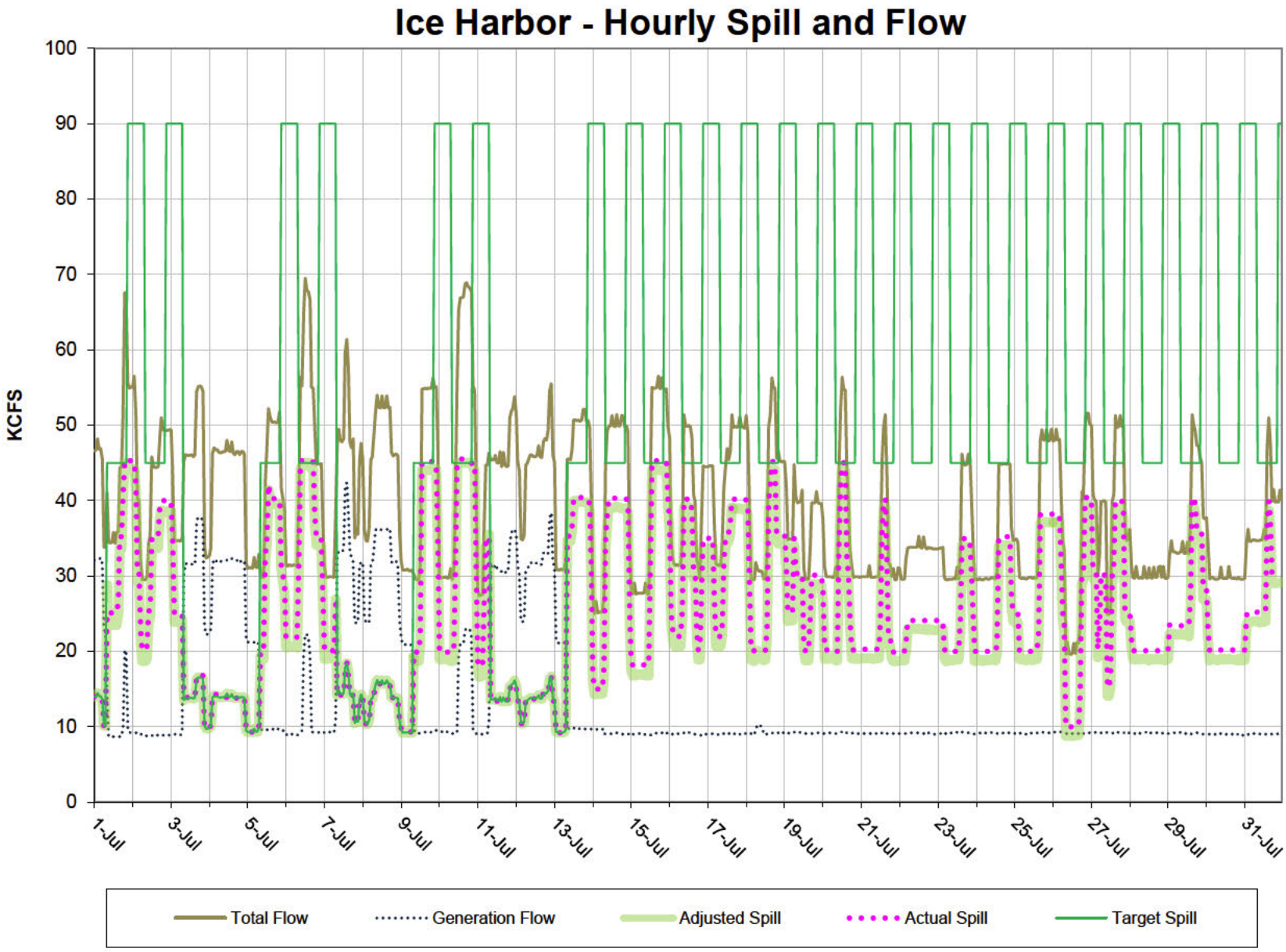

Ice Harbor - Hourly Spill and Flow
KCFS
100
90
80
70
60
50
40
30
20
10
0
1-Jul
3-Jul
5-Jul
7-Jul
9-Jul
11-Jul
13-Jul
15-Jul
17-Jul
19-Jul
21-Jul
23-Jul
25-Jul
27-Jul
29-Jul
31-Jul
Total Flow
Generation Flow
Adjusted Spill
Actual Spill
Target Spill

Figure 5

McNary Dam - Hourly Spill and Flow

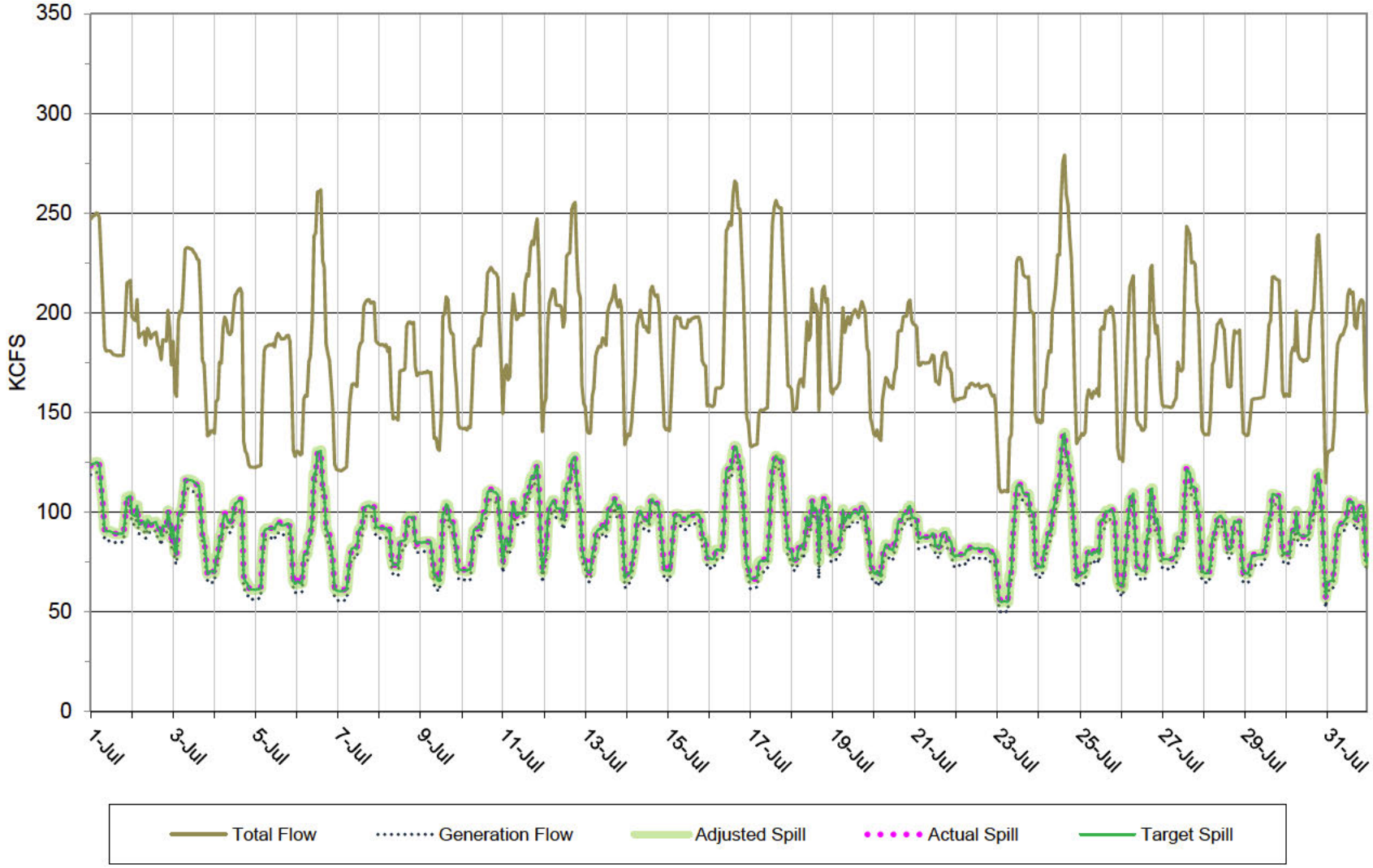


Figure 6

John Day Dam - Hourly Spill and Flow

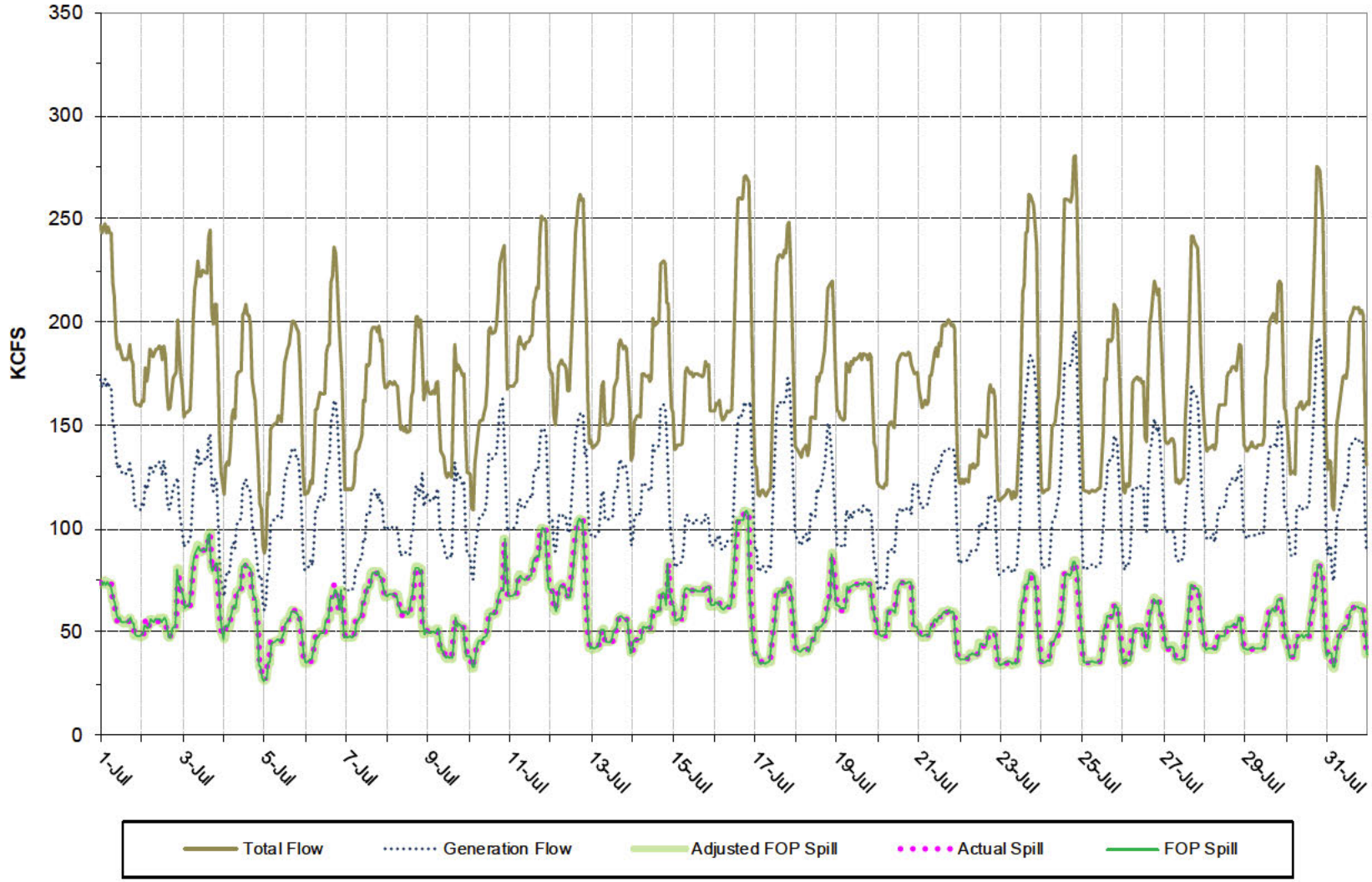


Figure 7

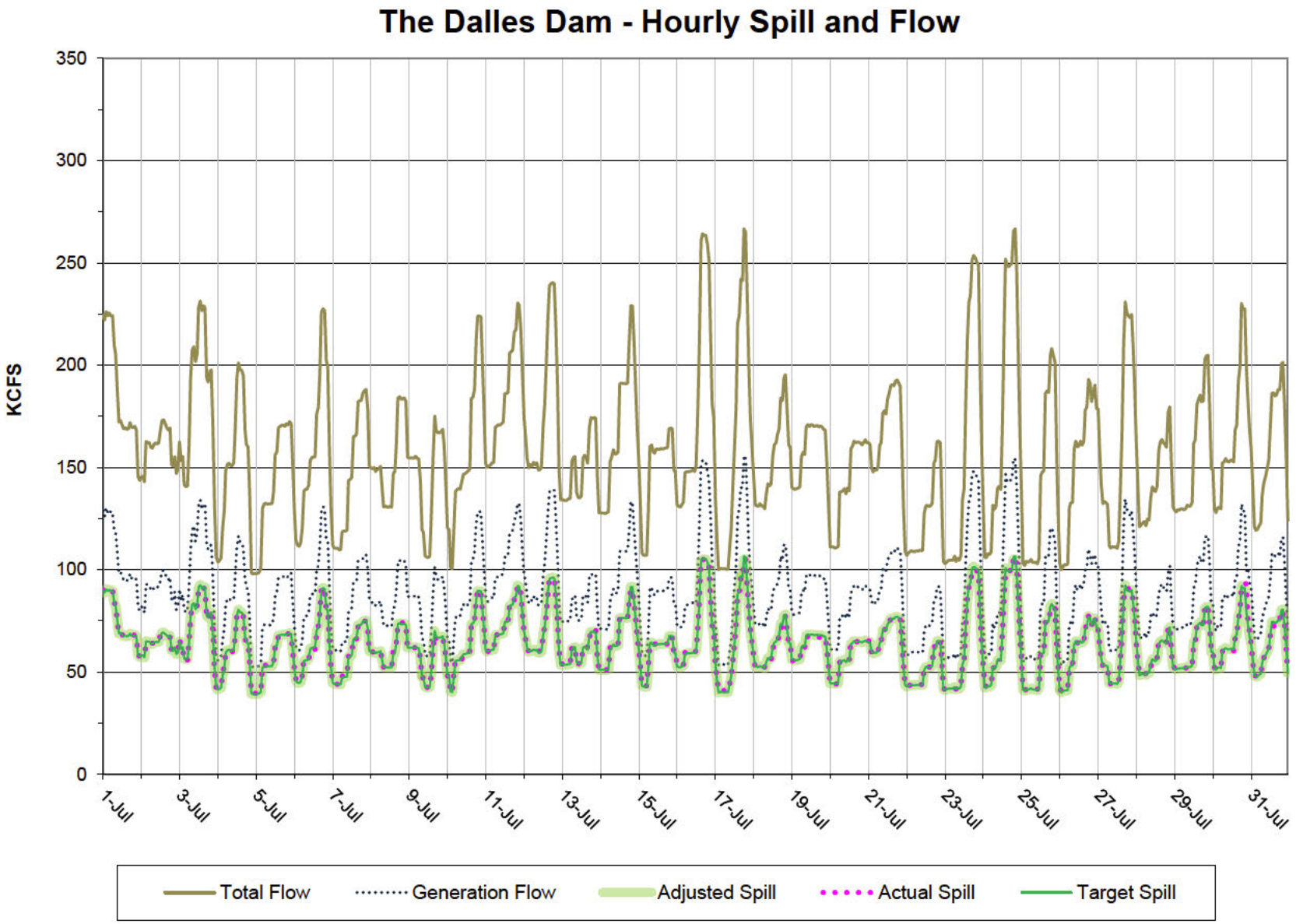
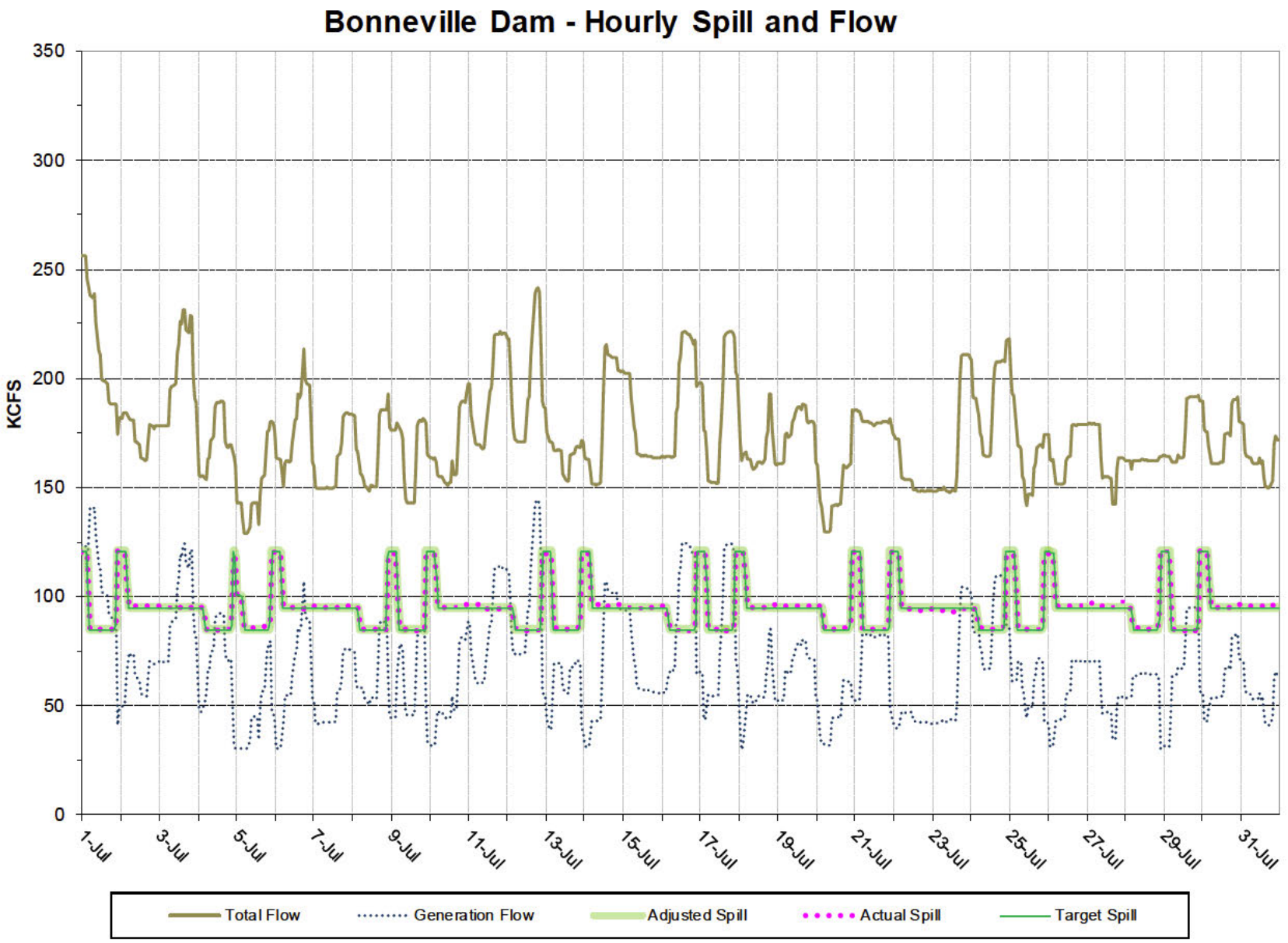

The Dalles Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
1-Jul
3-Jul
5-Jul
7-Jul
9-Jul
11-Jul
13-Jul
15-Jul
17-Jul
19-Jul
21-Jul
23-Jul
25-Jul
27-Jul
29-Jul
31-Jul
Total Flow
Generation Flow
Adjusted Spill
Actual Spill
Target Spill

Figure 8


Bonneville Dam - Hourly Spill and Flow
KCFS
350
300
250
200
150
100
50
0
1-Jul
3-Jul
5-Jul
7-Jul
9-Jul
11-Jul
13-Jul
15-Jul
17-Jul
19-Jul
21-Jul
23-Jul
25-Jul
27-Jul
29-Jul
31-Jul
Total Flow
Generation Flow
Adjusted Spill
Actual Spill
Target Spill