FISH OPERATIONS PLAN IMPLEMENTATION REPORT

June 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 January 8, 2018 Order from the U.S. District Court for the District of Oregon (Court Order), the 2018 Spring Fish Operations Plan[1] (2018 Spring FOP), and the 2018 Summer Fish Operations Plan[2] (2018 Summer FOP). The 2018 Spring FOP describes the Corps' project operations for fish passage at its Federal Columbia River Power System (FCRPS) dams during the spring fish migration season, generally April 3 through June 20, 2018. Similarly, 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 Court Order or the 2018 Spring and Summer FOPs, 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 Spring and Summer FOPs during the month of June 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 spill cap[3] or a specified spill level;[4]
- 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] The 2018 Spring FOP was posted to the Technical Management Team (TMT) website on March 1, 2018 (http://pweb.crohms.org/tmt/documents/fpp/2018/).
[2] 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).
[3] During the spring, the terms "spill caps" and "target spill" are typically synonymous and both mean 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; however, in the event the spill cap is constrained (e.g. 150 kcfs maximum spill for Bonneville Dam or containing fish passage spill within the spillwall (bays 1-8) at The Dalles), the monthly FOP Implementation Reports plots will display this level of spill rather than the gas cap spill level. In these specified instances in which the target spill differs from the spill cap, the Corps will provide the spill cap information at the regularly scheduled TMT meetings and reflected in the monthly FOP Implementation Reports.
[4] During the summer, the term "target spill" typically refers to a specified spill level (kcfs) or spill as a percentage (%) of the total project outflow.

subject to routine operational adjustments that limit the ability to spill to the target spill (see 2018 Spring and Summer FOPs, 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.[5]

This report also provides information on issues and unanticipated or emergency situations that arose during implementation of the 2018 Spring and Summer FOPs in June 2018.

Data Reporting

I. For each project providing fish passage operations, this report contains a graph displaying the performance of the spring and summer fish passage spill program for the month of June, with hourly spill, target 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 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 Spring and Summer FOPs section 4.1).

II. The average daily %TDG for the 12 highest hours for all projects is shown in the June 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

[5] 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 Spring and Summer FOPs section 2.1.

specified in the 2018 Spring and Summer FOPs, the dotted pink line will be below or above the thick green line in the figures.[6] When actual spill varied from target spill levels during periods of voluntary spill, the change in spill level is described below in the June 2018 Spill Variance Table (Table 1).[7] 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 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 Spring and Summer FOPs for Bonneville and The Dalles dams,[8] 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.

June Operations

The month of June was characterized by below average flows for the lower Snake and lower Columbia rivers along with average to above average air temperatures and widely varying

[6] 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.

[7] 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.

[8] As specified in the 2018 Spring and Summer FOPs section 3.

precipitation across the Columbia Basin. The June 2018 observed precipitation was 85% of average on the Snake River above Ice Harbor and 82% of average on the Columbia River above The Dalles.[9] The NOAA Northwest River Forecast Center indicated that the June 2018 adjusted runoff for the Snake River at Lower Granite was 85% of the 30-year average (1981-2010), with a volume of 5.1 MAF (Million acre-feet).[10] The June 2018 adjusted runoff for the Columbia River at The Dalles was 88% of the 30-year average (1981-2010) with a volume of 23.1 MAF.

During the June 2018 reporting period, the planned 2018 Spring and Summer FOPs spill operations were carried out as follows:

- Lower Granite Dam – The hourly target spill level was the spill cap to achieve the 120%/115% Gas Cap from June 1 through June 20. The operation transitioned to the summer hourly target spill level of 18 kcfs, 24 hours/day on June 21.
- Little Goose Dam – The hourly target spill level was the spill cap to achieve the 120%/115% Gas Cap from June 1 through June 20. The operation transitioned to the summer hourly target spill level of 30% of the total flow, 24 hours/day on June 21.
- Lower Monumental Dam – The hourly target spill level was the spill cap to achieve the 120%/115% Gas Cap from June 1 through June 20. The operation transitioned to the summer hourly target spill level of 17 kcfs, 24 hours/day on June 21.
- Ice Harbor Dam – The hourly target spill level was the spill cap to achieve the 120%/115% Gas Cap from June 1 through June 20. The operation transitioned to the summer hourly target spill level on June 21 of alternating two-day treatments of 30% of the total flow, 24 hours/day vs. 45 kcfs during the daytime and the spill cap during the nighttime. Nighttime spill hours are 2100–0800.
- McNary – The hourly target spill level was the spill cap to achieve the 120%/115% Gas Cap from June 1 through June 15. The operation transitioned to the summer hourly target spill level of 50% of the total flow, 24 hours/day on June 16.
- John Day Dam – The hourly target spill level was the spill cap to achieve the 120%/115% Gas Cap from June 1 through June 15. The operation transitioned to the summer hourly target spill level on June 16 with alternating two-day treatments of 30% vs. 40% of the total flow, 24 hours/day. Spill level changes occur at 2100 hours.
- The Dalles Dam – The hourly target spill level was the spill cap to achieve the 120%/115% Gas Cap from June 1 through June 15. The operation transitioned to the summer hourly target spill level of 40% of the total flow, 24 hours/day on June 16.
- Bonneville Dam – The hourly target spill level was the spill cap to achieve the 120%/115% Gas Cap from June 1 through June 15. On June 16, the operation transitioned to the summer hourly target spill level with alternating two-day treatments of 95 kcfs, 24 hours/day vs. 85 kcfs during the day and 121 kcfs during the nighttime. Nighttime hours are 2130-0430 through June 30.

The 2018 spring fish passage spill operation at the Corps' eight lower Snake and lower Columbia River projects is a more complex operation to implement than the past years' operations. In its implementation of the 2018 Spring FOP in June (ending June 15 in the lower Columbia River and June 20 in the lower Snake River), the Corps evaluated conditions each day to establish spill

[9] Retrieved July 2, 2018: https://www nwrfc noaa.gov/water_supply/wy_summary/wy_summary.php?tab=5
[10] Retrieved July 2, 2018: https://www nwrfc noaa.gov/runoff/runoff_summary.php

caps at a level that was estimated to meet, but not exceed, the gas cap in the tailrace and the next downstream forebay (see Table 3).[11] 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). For the month of June 2018, conditions constraining the 2018 spring spill cap operation at Bonneville and The Dalles dams did not occur.[3]

Operational Adjustments

1. Lower Granite

On Wednesday, June 20, from 1200–1830 hours, all six units at Lower Granite Dam were out of service due to a transmission line outage. The operation was the second and final outage required for transmission line equipment repairs initiated on May 2, 2018.[12] During the outage, Unit 5 was operated to provide station service (approximately 5 kcfs) and the remainder of outflow was spilled up to a maximum of 50 kcfs to avoid exceeding 120% TDG in the Lower Granite tailrace. Total project outflow ranged from 44.7–56.1 kcfs and the remainder of inflow was stored in the Lower Granite pool up to a maximum of 735.5 feet, which was within the variable MOP range of 734.5–735.5 feet.[13] When the powerhouse returned to service at 1830 hours, the Corps resumed spilling at the daily spill cap level to meet but not exceed the gas cap (39 kcfs) through the end of Spring FOP operations at 2359 hours on June 20, then transitioned to the Summer FOP spill level of 20 kcfs at 0001 hours on June 21. The Corps and BPA coordinated this operation with the TMT sovereign representatives on April 30, June 6, and June 13; all TMT representatives either supported or did not object.

2. Little Goose

a) From May 30 through June 2, 0400–1200 hours each day, the Corps reduced the level of involuntary spill at Little Goose Dam to 30% of total outflow to improve upstream passage of adult spring Chinook salmon.[14] To accomplish this, inflow above approximately 128 kcfs (powerhouse capacity plus 30% spill) was stored in the Little Goose forebay as necessary above the MOP range of 633–634 feet. Each day, spill was increased so that total outflow was equal to inflow from 1200–1600 hours. Then spill was increased again, as necessary, to draft back to MOP between the hours of 1600 and 0400.

Over the four days of this operation, hourly average spill ranged from 38–80 kcfs (average 55 kcfs), which was above the spill cap of 26 kcfs , and the forebay elevation ranged from 633.1–634.8 feet (average 633.9 feet).

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[11] See 2018 Spring FOP section 2.2 and attachment "Procedure for Setting 2018 Spring Spill Caps."
[12] See the May FOP Implementation Report, Operational Adjustments section.
[13] The Lower Granite variable MOP operation began on April 3, 2018, as coordinated with TMT on March 7, 2018. Under the observed inflows on June 20, the variable MOP operation was MOP+1.5, or 734.5–735.5 feet.
[14] The description of this operation is included in the Operational Adjustments section in both the May and June FOP Implementation Reports. However, tables and figures in each report only include operations that occurred in that month.

Prior to implementing this operation, in accordance with the 2018 Spring FOP Table 2, the Action Agencies coordinated with TMT sovereign representatives at meetings on May 23, 25, and 29, to review PIT-tag monitoring tools and daily dam passage counts that indicated adult spring Chinook were being delayed below Little Goose. From May 24–29, daily counts of adult spring Chinook at Little Goose were in the range of 368–677 per day, and the total count differential between Lower Monumental and Little Goose had increased to 8,752. At the meeting on May 29, all TMT representatives either supported or did not object to implementing the operation from May 30 through June 1. During the three days of the operation, daily counts of adult spring Chinook passing Little Goose Dam increased to 2,689 (May 30), 2,892 (May 31), and 2,309 (June 1), and the count differential between Lower Monumental and Little Goose decreased to 5,015. The TMT reconvened on June 1 and all TMT members either supported or did not object to extending the operation for one more day. The daily count of adult spring Chinook on June 2 was 1,531, which decreased the differential to 4,237. Starting on June 3, flows in the Snake River decreased and the Action Agencies resumed the Gas Cap spill operation in accordance with the 2018 Spring FOP.

b) On Thursday, June 28, from 0700-1700 hours, spill at Little Goose was above the target 30% spill level identified in the 2018 Summer FOP due to a powerhouse equipment outage that reduced powerhouse capacity. During the 11-hour outage, hourly average spill ranged from 49%–84% (average 68%). The outage was required to facilitate the inspection of a failed breaker that provides power to the adult fish ladder cooling pump and the juvenile fish facility. As a result of the inspection, the breaker was repaired and returned to service by 1930 hours. The Corps notified the TMT sovereign representatives of this operation at the meeting on June 27, and followed-up with the results via an email to the Fish Passage Operations and Maintenance (FPOM) team on June 29.

Table 1: Spill Variance Table – June 2018 (6/1 to 6/30)

Project	Parameter	Date	Time[15]	Hours	Type	Reason
Ice Harbor	Reduced Spill	6/1/18	1800-1900	2	Human Error	Hourly spill decreased to 76 kcfs (below 80 ±2 kcfs range) due to a miscalculation of spill.
Little Goose	Additional Spill	6/28/18	0700-1700	11	Maintenance	Hourly spill increased to 49-84% of the total outflow (above the 2018 Summer FOP spill target of 30%) due to transmission/powerhouse maintenance, which necessitated a generation flow decrease. See Operational Adjustments section for more information.

Table 2: Pre-Coordinated Operations – June 2018 (6/1 to 6/30)

Project	Parameter	Date	Time[15]	Hours	Type	Reason
Lower Granite	Additional Spill	6/20/18	1300-1600	4	Maintenance	Hourly spill was 5-10 kcfs above target spill due to a powerhouse outage for transmission line repairs. See Operational Adjustments section for more information.
Little Goose	Additional Spill	6/5/18	0800-1000	3	Maintenance	Hourly spill increased to 44 kcfs (above Spring FOP spill cap of 26 kcfs, ±2 kcfs) because Unit 2 was out of service for scheduled maintenance. Regionally coordinated via 2018 Spring FOP, Section 4.1.
Little Goose	Additional Spill	6/11/18	0900-1500	7	Maintenance	Hourly spill increased to 31-34 kcfs (above Spring FOP spill cap of 26 kcfs, ±2 kcfs) due to fish screen inspections and removing debris from trash racks, which necessitated a generation flow decrease. Regionally coordinated via 2018 FPP, page LGS-12, Sections 2.3.2.1.v and 2.3.2.2.
Lower Monumental	Reduced Spill	6/3/18 6/5/18 6/7/18 6/9/18 6/11/18 6/13/18 6/15/18 6/17/18 6/19/18 6/21/18 6/23/18 6/25/18 6/27/17 6/29/18	1800 1800 1800 1700-1800 1700-1800 1700-1800 1700-1800 1700-1800 1700-1800 1800 1700 1700-1800 1700-1900 1700-1800	1 1 1 2 2 2 2 2 2 1 1 2 3 2	Navigation	Hourly spill reduced below target spill for safe navigation. Regionally coordinated via 2018 Spring and Summer FOPs, Sections 4.1 and 4.6.
Lower Monumental	Additional Spill	6/5/18 6/6/18	0800-1700 0800-1500	10 8	Maintenance	Hourly spill increased to 30-46 kcfs (above Spring FOP spill cap of 27 kcfs, ±2 kcfs) during fish screen inspections, which necessitated a generation flow decrease. Regionally coordinated via 2018 FPP, page LMN-12, Section 2.3.2.2.

[15] 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.

Ice Harbor	Reduced Spill	6/20/18	1500	1	Maintenance	Hourly spill was below adjusted spill while minimum generation exceeded the range for Unit 3 (11.4 – 12.5 kcfs[16]) to 13.3 kcfs due to fish screen inspection. During this hour, Units 1 and 3 both operated as generation flow was transitioned back to Unit 1. Regionally coordinated via 2018 FPP, page IHR-10, Section 2.3.2.2.

[16] Range does not include ±2% due to generating unit governor "dead band." When 2% is applied to the minimum generation flow ranges for Ice Harbor unit 3, the range is 11.2-12.8 kcfs. See 2018 Spring FOP section 4.3.1.

Table 3: June 2018 Average Percent TDG Values (6/1 to 6/30)

Date	FIXED MONITORING STATIONS															
	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO[a]	BON	CCIW[b]
	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
6/1/2018	105	118	115	123	124	121	121	123	118	123	117	121	115	119	119	•
6/2/2018	105	117	112	123	123	121	118	125	117	123	117	122	119	121	123	•
6/3/2018	107	115	114	118	124	119	121	120	121	122	117	120	119	120	123	•
6/4/2018	107	115	114	114	120	115	121	119	120	121	116	119	114	114	120	•
6/5/2018	106	115	112	114	115	116	118	119	118	120	117	119	116	117	115	•
6/6/2018	104	115	112	114	115	115	115	119	117	121	117	119	117	119	117	•
6/7/2018	104	115	113	114	115	115	115	118	118	120	116	118	117	119	117	•
6/8/2018	105	117	113	114	114	114	115	118	118	118	115	117	113	116	114	•
6/9/2018	104	117	113	114	114	114	114	117	116	118	115	117	114	117	112	•
6/10/2018	103	116	111	114	113	114	112	117	113	118	112	117	111	116	113	•
6/11/2018	102	117	110	114	111	114	110	117	110	118	110	118	111	116	113	•
6/12/2018	103	117	110	113	112	114	111	118	114	118	109	118	113	116	115	•
6/13/2018	104	118	114	114	114	114	113	118	115	118	109	118	113	118	116	•
6/14/2018	104	117	113	114	113	115	113	116	114	119	109	117	113	119	114	•
6/15/2018	105	118	114	115	113	115	113	117	113	120	111	118	115	121	114	•
6/16/2018	105	118	114	116	114	115	114	116	113	119	111	117	116	119	115	•
6/17/2018	104	118	115	117	115	115	115	115	113	115	110	115	113	117	117	•
6/18/2018	103	117	115	117	115	115	115	115	113	118	110	115	113	117	117	•
6/19/2018	101	118	115	117	116	116	114	116	111	119	113	115	113	117	115	•
6/20/2018	101	118	119	116	117	116	116	116	112	119	115	115	114	118	117	•
6/21/2018	102	117	119	115	118	119	117	116	113	119	115	116	114	118	117	•
6/22/2018	103	114	117	113	118	119	117	116	113	119	112	116	110	115	112	•
6/23/2018	103	114	116	113	116	119	115	116	111	120	110	114	109	115	109	•
6/24/2018	103	114	115	112	113	118	115	116	111	121	110	115	112	117	113	•
6/25/2018	103	114	114	112	114	118	115	115	112	120	110	116	112	117	113	•
6/26/2018	102	114	111	112	113	118	114	115	109	118	108	118	111	116	111	•
6/27/2018	102	114	111	112	112	118	113	115	112	120	110	118	111	116	112	•
6/28/2018	102	114	111	117	112	117	114	116	112	119	110	117	110	115	111	•
6/29/2018	101	115	110	114	112	116	113	115	112	118	108	117	110	115	110	•
6/30/2018	101	115	110	112	111	116	113	112	112	118	107	116	110	115	110	•

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

[a] The Dalles tailwater gauge (TDDO) was stuck in the deployment pipe at 5 feet below the water from May 15 to June 6. All data appear to be reported correctly.

[b] The Bonneville tailwater gauge at Cascades Island (CCIW) was damaged by debris on May 13. Until the gauge is repaired, the Corps is setting Bonneville spill caps using SYSTDG and/or an analog using the gauge at Warrendale. The Corps and USGS are investigating options to resolve the issue.

Figure 1

Lower Granite Dam - Hourly Spill and Flow

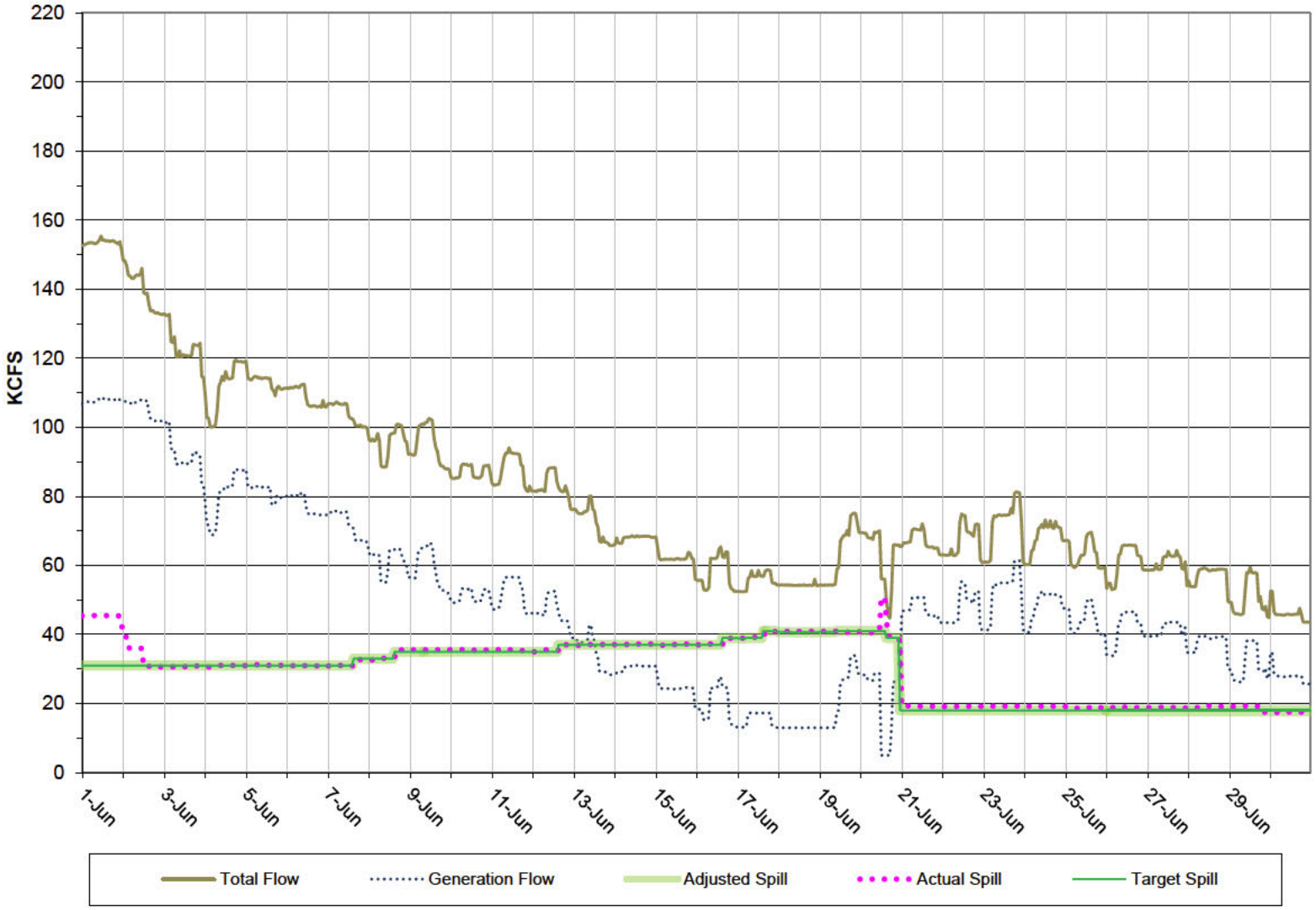


Figure 2

Little Goose Dam - Hourly Spill and Flow

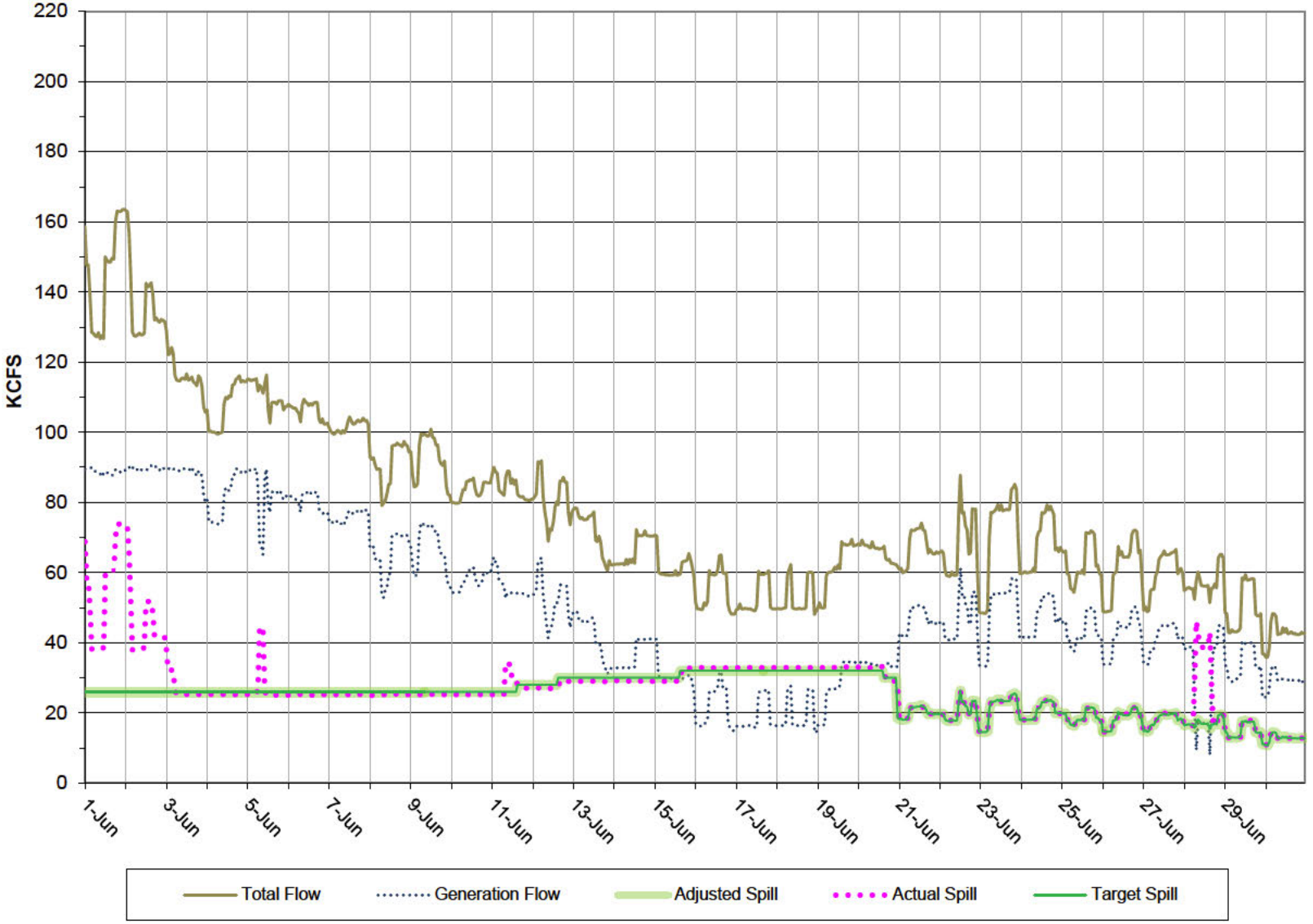


Figure 3

Lower Monumental Dam - Hourly Spill and Flow

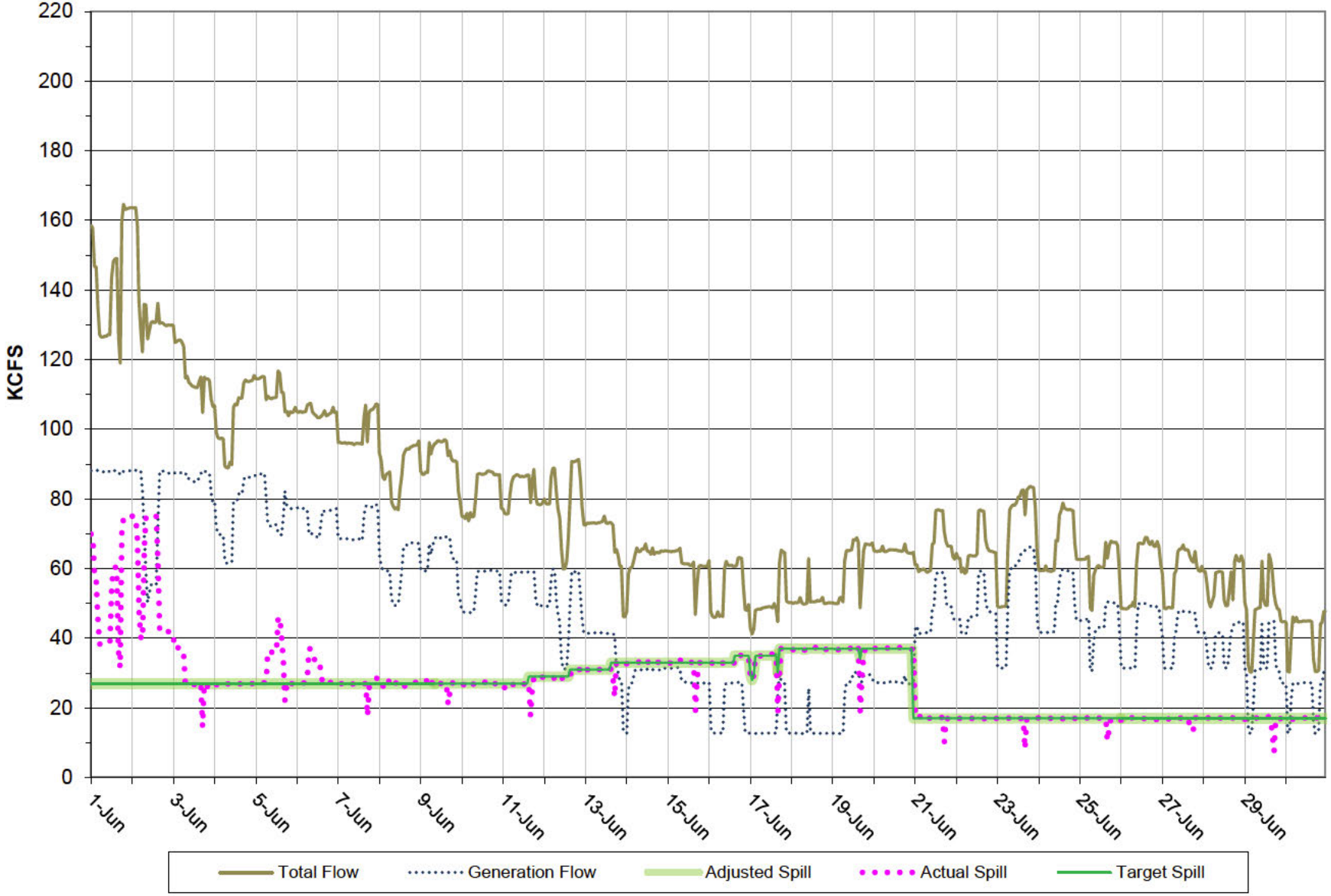


Figure 4

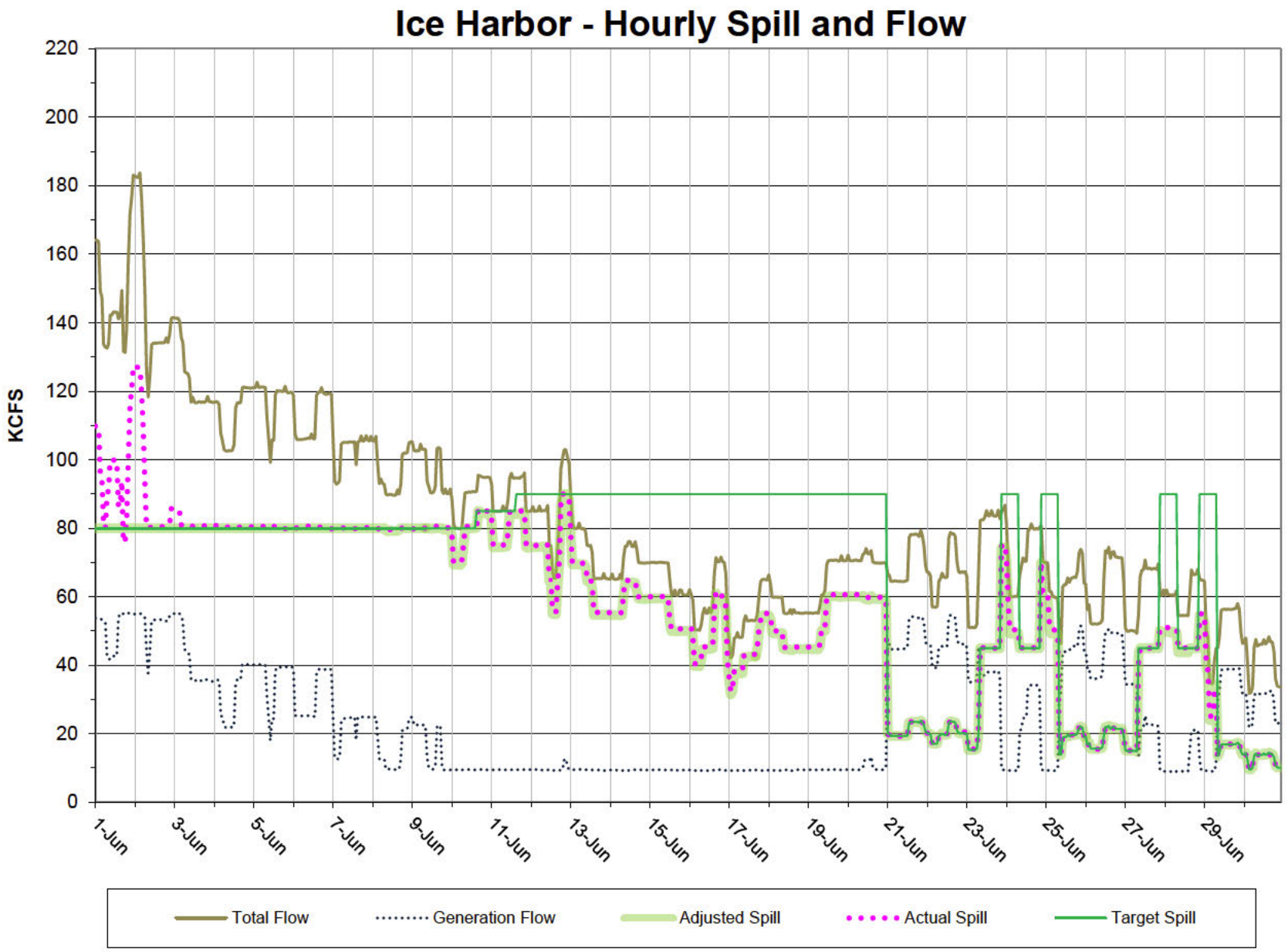

Ice Harbor - Hourly Spill and Flow
KCFS
220
200
180
160
140
120
100
80
60
40
20
0
1-Jun
3-Jun
5-Jun
7-Jun
9-Jun
11-Jun
13-Jun
15-Jun
17-Jun
19-Jun
21-Jun
23-Jun
25-Jun
27-Jun
29-Jun
Total Flow
Generation Flow
Adjusted Spill
Actual Spill
Target Spill

Figure 5

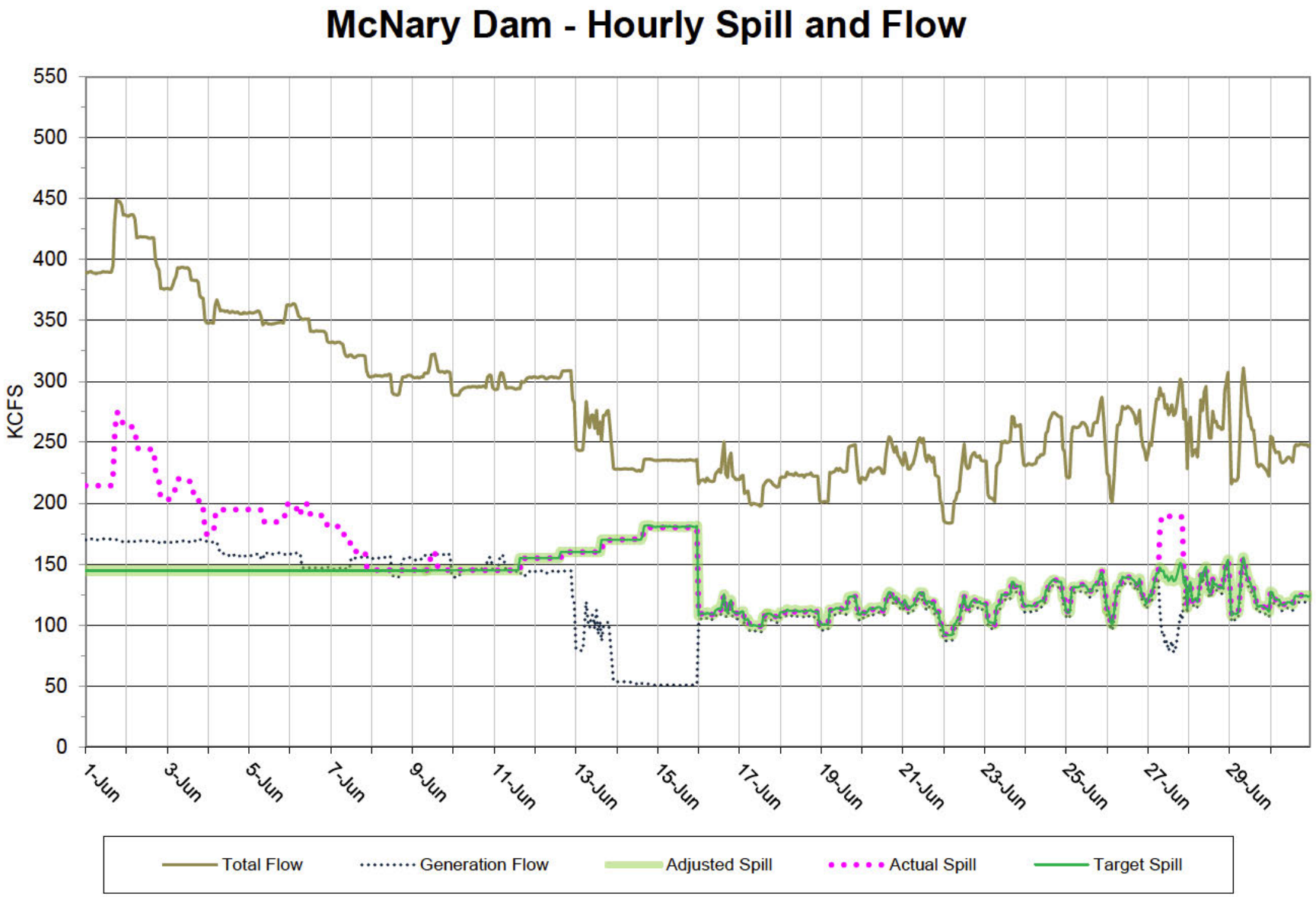

McNary Dam - Hourly Spill and Flow
KCFS
550
500
450
400
350
300
250
200
150
100
50
0
1-Jun
3-Jun
5-Jun
7-Jun
9-Jun
11-Jun
13-Jun
15-Jun
17-Jun
19-Jun
21-Jun
23-Jun
25-Jun
27-Jun
29-Jun
Total Flow
Generation Flow
Adjusted Spill
Actual Spill
Target Spill

Figure 6

John Day Dam - Hourly Spill and Flow

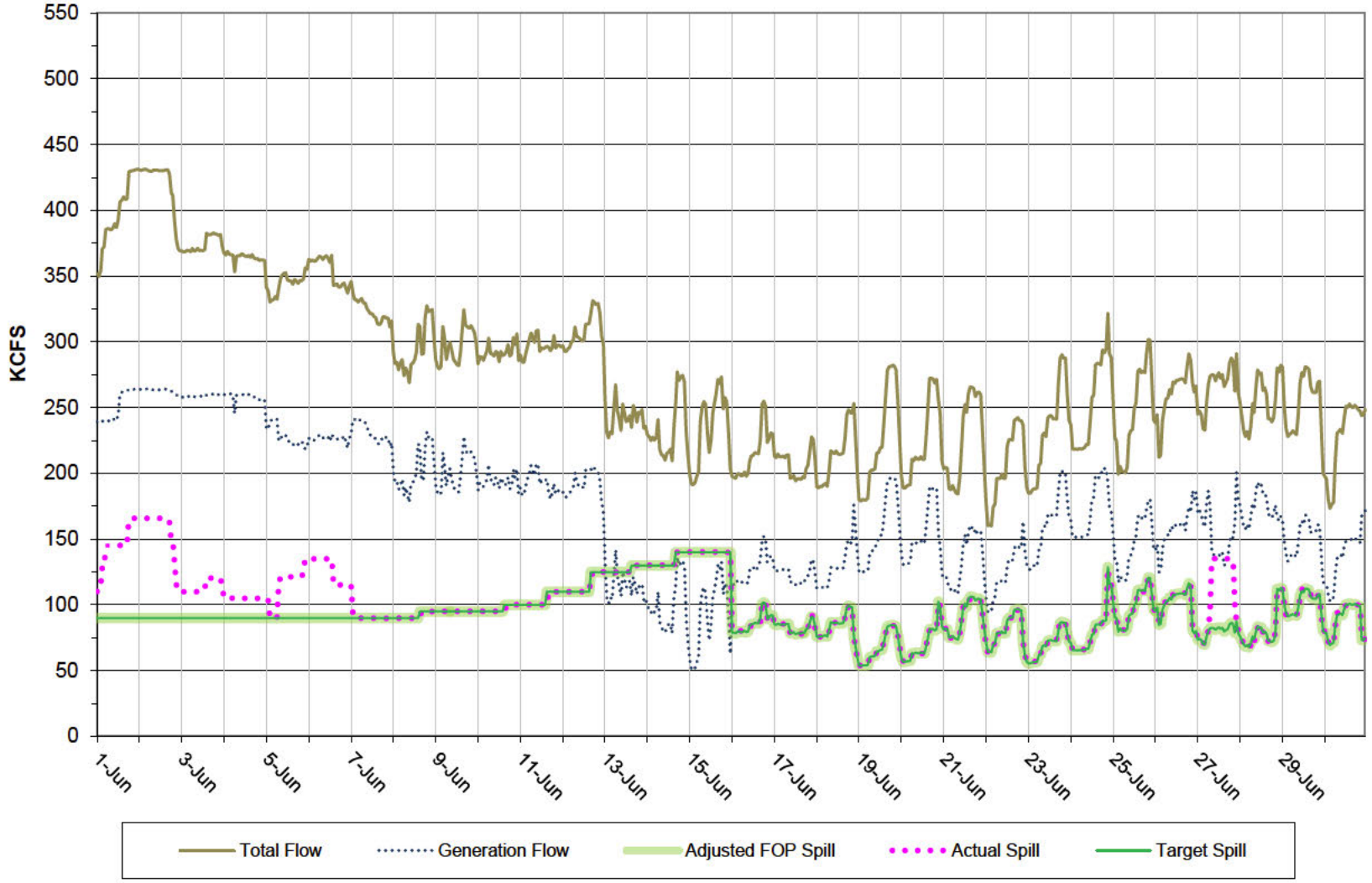


Figure 7

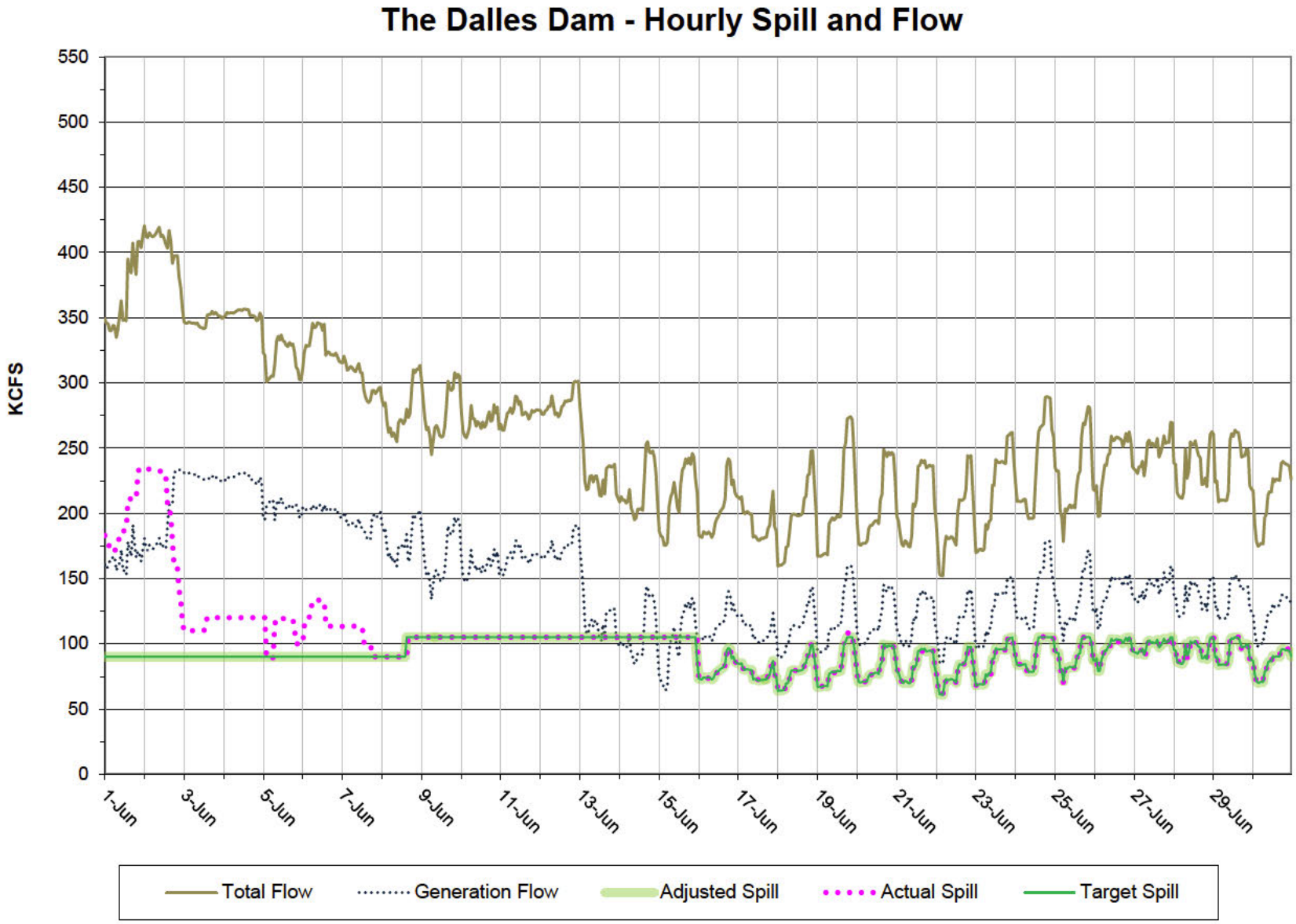
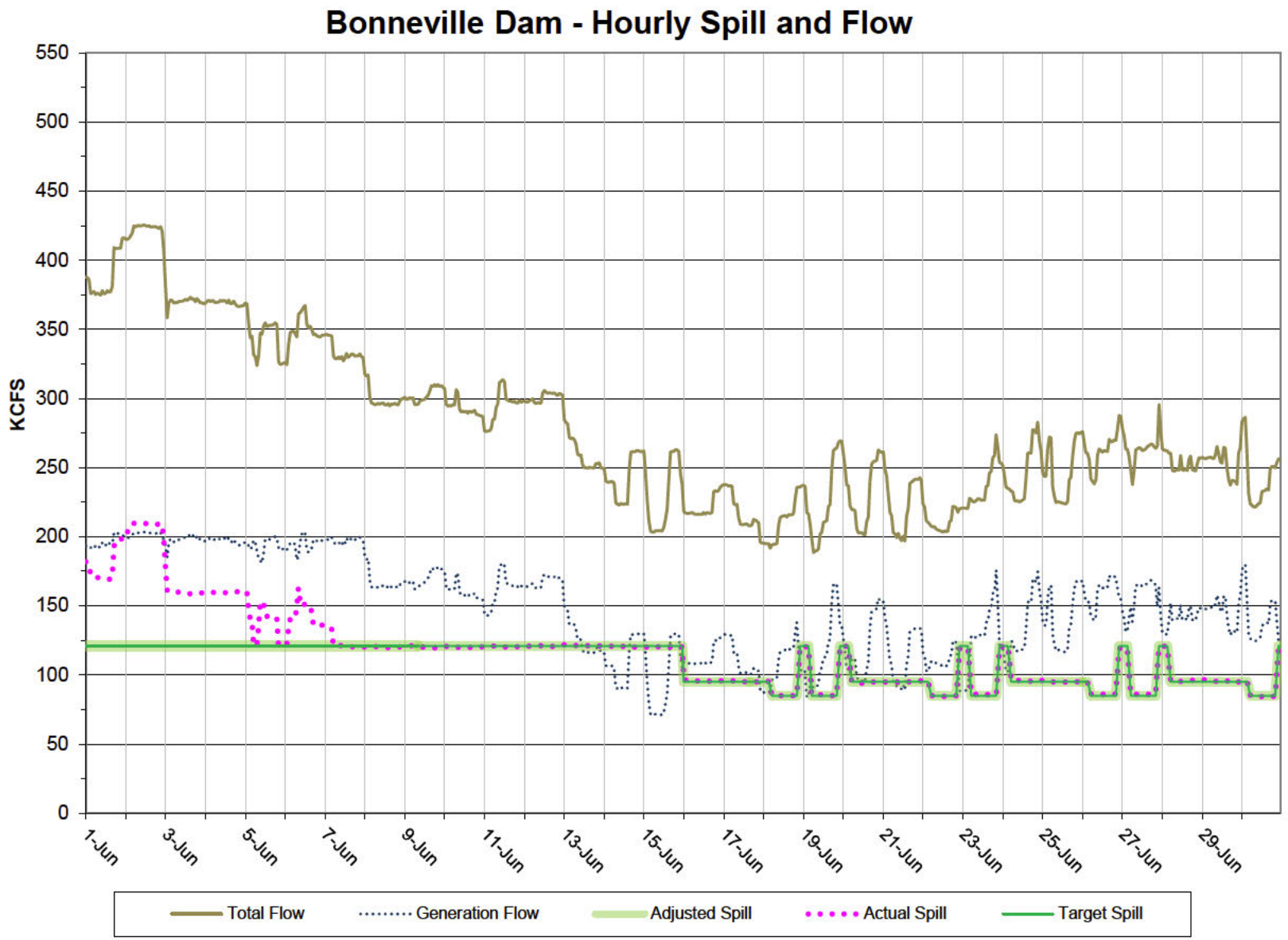

The Dalles Dam - Hourly Spill and Flow
KCFS
550
500
450
400
350
300
250
200
150
100
50
0
1-Jun
3-Jun
5-Jun
7-Jun
9-Jun
11-Jun
13-Jun
15-Jun
17-Jun
19-Jun
21-Jun
23-Jun
25-Jun
27-Jun
29-Jun
Total Flow
Generation Flow
Adjusted Spill
Actual Spill
Target Spill

Figure 8


Bonneville Dam - Hourly Spill and Flow
KCFS
550
500
450
400
350
300
250
200
150
100
50
0
1-Jun
3-Jun
5-Jun
7-Jun
9-Jun
11-Jun
13-Jun
15-Jun
17-Jun
19-Jun
21-Jun
23-Jun
25-Jun
27-Jun
29-Jun
Total Flow
Generation Flow
Adjusted Spill
Actual Spill
Target Spill