FISH OPERATIONS PLAN IMPLEMENTATION REPORT
August 2014

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 2014 Summer Fish Operations Plan (FOP) posted to the TMT website on June 13, 2014. The 2014 Summer FOP describes the Corps' project operations for fish passage at its Federal Columbia River Power System (FCRPS) dams during the summer fish migration season, generally mid-June through August. To the extent Corps project operations that are not specified in the 2014 Summer FOP, the FCRPS operations will be consistent with the 2014 NOAA Fisheries Supplemental Biological Opinion (2014 Supplemental BiOp), the USFWS 2000 and 2006 BiOps, and/or other operative documents, including the 2014 Water Management Plan (WMP), WMP seasonal updates, and the 2014 Fish Passage Plan (FPP).

The Corps' August 2014 lower Snake and Columbia River project and fish passage operations are contained in this report. In particular, information in this report includes the following:

- Hourly flow through the powerhouse at each dam;
- Hourly flow over the spillway compared to the spill target for that hour; and,
- Daily average Total Dissolved Gas (TDG) levels (percent of saturation) in the tailwater at each project, and in the subsequent downstream project's forebay.[1]

This report also provides information on presented issues and unanticipated or emergency situations that arose during implementation of the 2014 Summer FOP in August.

Data Reporting:

I. For each project providing fish passage operations, this report contains two graphs per operational week[2] in August displaying the performance of the fish passage spill program as follows:

(A) Average %TDG Values - displayed in the upper graph.
(B) Hourly Spill and Generation Flows - described in the lower graph.

[1] Averages reported consistent with the current and applicable Oregon TDG waiver (120% tailwater) and Washington TDG criteria adjustments (120% tailwater/115% forebay). The Oregon TDG waiver and the Washington TDG criteria adjustment have different methodologies for calculating TDG. When the standards vary or conflict, the Corps applies the more stringent standard.
[2] Operations are implemented from Monday through Sunday.

The weekly graphs begin on August 4 and end on August 31 for the following lower Snake River and lower Columbia River projects: Lower Granite, Little Goose, Lower Monumental, Ice Harbor, McNary, John Day, The Dalles, and Bonneville.
Each figure represents one week of a project's operation. The graphs start at 0000 hours (%TDG graphs) and 0100 hours (flow/spill graphs) on August 4 for the lower Snake River and the lower Columbia River projects.

August 4 – August 10	Figures 1 – 8
August 11 – August 17	Figures 9 – 16
August 18 – August 24	Figures 17 – 24
August 25 – August 31	Figures 25 – 32

A. Upper Graph: Displays the average daily %TDG for the Corps' lower Snake River and lower Columbia River projects. The Corps' objective is to operate each project in accordance with the spill levels in the 2014 Summer FOP; and to the extent practicable, avoid exceeding the applicable state TDG limits.

1. The green dashed line represents the Oregon 120%TDG waiver limit for the tailwater of the dam.
2. The blue dot-dash line represents the Washington 120%TDG criteria adjustment for the tailwater of the dam.
3. The black solid line represents the Washington 115%TDG criteria adjustment for the forebay of the next dam downstream.

B. Lower Graph: Displays the hourly flow and spill at each dam.

- The dashed blue line shows the flow through the powerhouse each hour, in thousand cubic feet per second (kcfs).
- The heavy grey line represents the average hourly total river flow through the project in kcfs.
- The dotted pink line represents the average hourly flow through the spillway in kcfs.
- The thin black line represents the hourly spill level as defined in the 2014 Summer FOP.
- The heavy green line represents the target spill. This is the hourly maximum spill level. The hourly target spill may vary as a function of total river flow, forebay elevation and generator capacity, subject to the following conditions:

    - spill percentage or flow rate specified in the 2014 Summer FOP;
    - spill caps as set daily for TDG management;
    - test spill levels for fish passage research;
    - minimum generation for power system needs;
    - minimum spill at Bonneville (50 kcfs) dam;
    - minimum spill at John Day is 25% of project outflow.

II. A table is included at the end of the figures that lists the average daily %TDG for all projects. 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 (controlling limit), and the lower value is displayed with a strikethrough.

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 spill levels briefly deviate below or above the level specified in the 2014 Summer FOP, the dotted pink line will be below or above the heavy green line in the graphs. Actual deviations from the target operation during voluntary spill hours are described below in the August 2014 Spill Variance Table.[3] The Spill Variance Table includes average hourly data; therefore, while spill may vary from target FOP spill for only a portion of an hour, the Spill Variance Table characterizes the reduction as a full hour. There are instances when the hourly FOP 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 2014 Summer FOP level of spill while also avoiding exceeding the %TDG spill cap to the extent practicable.

"Low flow" operations at the lower Columbia and Snake projects are triggered when inflow is insufficient to provide both minimum generation and the specified 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. During low flow periods at Little Goose Dam, the overall project spill percentage appears to be reduced because the calculations do not account for the volume of water released during navigational lockages; however, the actual spill volume remains constant. When these variances occur, they are recorded in the monthly Spill Variance Table for Little Goose under the variance type "Navigation."

Actual spill levels at Corps projects with set flow targets may vary up to ±2 kcfs within the hour (except as otherwise noted in the 2014 Summer FOP for Bonneville and The Dalles dams,[4] which may range up to ±3 kcfs) as compared to those specified in the 2014 Summer FOP and the RCC spill priority list (defining the project %TDG spill caps). A number of factors influence actual spill, including hydraulic efficiency, exact gate opening calibration, spillway gate hoist

[3] Involuntary spill conditions appear in the graphs but are not considered variances and are not reported in the Spill Variance Table. Involuntary spill conditions 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, or any other operational and/or maintenance activities required to manage dam facilities for safety and authorized project uses.

[4] As specified in the 2014 Summer FOP (p. 14), this applies when the spill level is below 40% of total flow at The Dalles Dam.

cable stretch due to temperature changes, and forebay elevation (e.g. a higher forebay results in a greater volume of spill since more water can pass under the spill gate).

The 2014 Summer FOP describes project "Operations during Rapid Load Changes" (p. 6). For reporting purposes, the notation "Transmission Stability" in the Spill Variance Report Table replaces "Rapid Load Changes," and identifies instances when hourly spill levels were not met as a result of load swing hours and other related within-hour load variability issues.

"Transmission Stability" occurs because projects must be available to respond to within-hour load variability to satisfy North American Electric Reliability Corporation (NERC) reserve requirements ("on response"). In addition to within-hour load variability, projects on response must be responsive to within hour changes resulting from intermittent generation (such as wind generation). During periods of rapidly changing loads and intermittent generation, projects on response may have significant changes in turbine discharge within the hour while spill quantity remains the same within the hour. Under normal conditions, within-hour load changes primarily occur immediately preceding and following the peak load hours; however, within-hour changes in intermittent generation can occur at any hour of the day. Occasionally, several hours after peak load hours, the project may be decreasing total outflow and generation faster than the corresponding spill decreases causing the percent spill to be slightly higher. Due to the high variability of within-hour load, reporting actual spill percentages that vary by more than the ±1 percent within hour requirement (or other ranges specified in the 2014 Summer FOP) may occur with greater frequency with "Transmission Stability" hours than other hours.

Occurrences requiring an adjustment in operations and/or regional coordination are described in greater detail in the "Operational Adjustments" section below.

August Operations:

The month of August was characterized by below average flows for the lower Snake River and slightly above average flows for the lower Columbia River. The NOAA Northwest River Forecast Center's Runoff Processor indicated that the August 2014 adjusted volume runoff on the. lower Snake was below the 30 year average (1981-2010): 1.1 MAF or 86% of average as measured at Lower Granite Dam. For the lower Columbia, the Runoff Processor indicated the August 2014 adjusted volume runoff was above the 30 year average (1981-2010): 7.8 MAF (million acre feet) or 102% of average as measured at The Dalles. The monthly precipitation summary for August was well above average at 192% on the Snake River above Ice Harbor Dam and above average on the Columbia River above The Dalles Dam at 117%.

During the August reporting period, the planned 2014 Summer FOP spill operations were carried out as follows:

- Lower Granite Dam - The hourly target spill level was 18 kcfs 24-hours/day.
- Little Goose Dam - The hourly target spill level transitioned to uniform spill of 9 kcfs on August 1 and to 7 kcfs on August 22 as inflow decreased.
- Lower Monumental Dam - The hourly target spill level was 17 kcfs 24 hours/day.

- Ice Harbor Dam - The hourly target spill level was 45 kcfs during the daytime and the %TDG cap during the nighttime. Nighttime spill hours are 1800-0500.
- McNary Dam - The hourly target spill level was 50% of total river flow for 24-hours/day.
- John Day Dam - The hourly target spill level was 30% of total river flow for 24-hours/day. The Dalles Dam - The hourly target spill level was 40% of total river flow for 24-hours/day.
- Bonneville Dam - The hourly target spill level alternated every two days between 95 kcfs 24-hours/day vs. 85 kcfs daytime/121 kcfs nighttime.

Operational Adjustments

Dworshak Dam.

On August 15 at 1411 hours, turbine Unit 3 at Dworshak Dam was forced out of service due to a ground fault, reducing project turbine output from approximately 10 kcfs to 4.5 kcfs. Prior to the Unit 3 outage, the Corps had coordinated with TMT to maintain Dworshak total outflow at approximately 10 kcfs (full powerhouse) to provide cool water for temperature moderation in the lower Snake River and to draft Dworshak reservoir to elevation 1,535 feet by August 31, in accordance with the 2014 FCRPS BiOp. As a result of the Unit 3 outage and reduced project output, maintaining outflow at 10 kcfs to achieve BiOp temperature and elevation objectives would require spill in excess of the State of Idaho 110% TDG water quality standard. On August 18, the Corps provided information about the outage to regional salmon managers, and at the August 20 TMT meeting a Systems Operations Request (SOR) was submitted recommending the Corps increase output from Dworshak Dam though spill up to 120% TDG. The Corps coordinated with the Idaho Department of Environmental Quality (IDEQ) for a temporary exemption of the 110% TDG water quality standard. The Corps also coordinated with the Nez Perce Tribe and contacted the hatchery operators downstream of Dworshak Dam. The hatchery operators indicated that 120% TDG would have adverse impacts on hatchery smolts. IDEQ provided a short-term TDG standard exemption on August 22. Beginning that day at 1600 hours, the Corps implemented a spill operation targeting 115% TDG in the tailrace, resulting in total outflow of approximately 8.8 kcfs. During the period that the short-term exemption was implemented from August 22–31, Dworshak spill ranged from 3.3–4.3 kcfs (average 3.9 kcfs) and TDG ranged from 113.1–116.1% (average 114.7%). This operation was coordinated with TMT on August 20 and 27 and salmon managers either supported or did not object. The Dworshak reservoir was drafted to elevation 1535 feet on September 6.

August 2014 Spill Variance Table

Table 1: August 2014 (8/4 – 8/31) – Summer FOP Implementation Report Table

Project	Parameter	Date	Time[5]	Hours	Type	Reason
Lower Granite	Reduced Spill	8/14/14	0900	1	Maintenance	Spill was reduced from 18 kcfs to 13.3 kcfs to operate unit 6 for maintenance in addition to operating unit 5 at minimum generation (FOP Table 1).
Lower Granite	Reduced Spill	8/27/14	1300	1	Maintenance	Spill was reduced from minimum generation spill of 14.9 kcfs to 11.9 kcfs to operate unit 5 for maintenance in addition to operating unit 2 at minimum generation (FOP Table 1).
Lower Monumental	Reduced Spill	8/8/14	0500	1	Maintenance	Spill was reduced from minimum generation spill of 14.4 kcfs to 13.0 kcfs to operate units for maintenance in addition to operating unit 2 at minimum generation (FOP Table 1).
Lower Monumental	Reduced Spill	8/10/14	0200	1	Maintenance	Spill was reduced from minimum generation spill of 16.2 kcfs to 14.9 kcfs to operate units for maintenance in addition to operating unit 2 at minimum generation (FOP Table 1).
Lower Monumental	Reduced Spill	8/10/14	1800	1	Navigation	Spill was reduced from minimum generation spill of 16.6 kcfs to 10.0 kcfs. Reduced spill for safe passage of a fish barge.
Lower Monumental	Reduced Spill	8/11/14	0600	1	Navigation	Spill was reduced from minimum generation spill of 16.6 kcfs to 14.9 kcfs. Reduced spill for safe passage of a commercial barge.
Lower Monumental	Reduced Spill	8/14/14	1800-1900	2	Navigation	Spill was reduced from minimum generation spill of 13.7 kcfs and 15.2 kcfs to 11.6 kcfs and 14.5 kcfs respectively. Reduced spill for safe passage of a fish barge.
Lower Monumental	Reduced Spill	8/16/14	0200-0400	3	Navigation	Spill was reduced to 0 kcfs to allow recovery of a barge that disconnected from the tug while passing below the spillway. After the barge was recovered and the tow reconnected, spill of approximately 15 kcfs resumed at 0400.
Lower Monumental	Reduced Spill	8/21/14	1700	1	Maintenance	Spill was reduced from minimum generation spill of 12.9 kcfs to 11.6 kcfs to operate unit 3 for maintenance in addition to operating unit 5 at minimum generation (FOP Table 1).

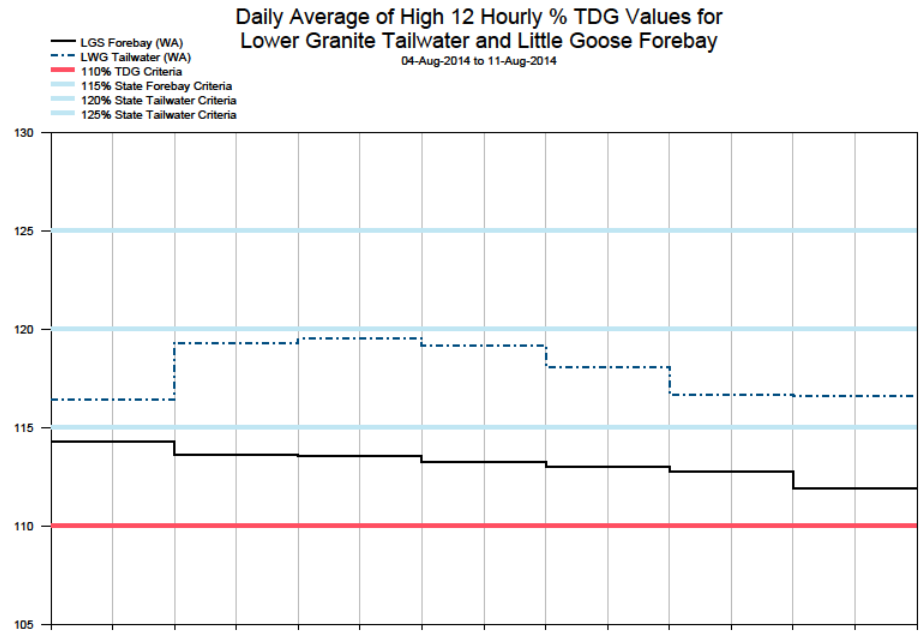
[5] Note: Data collected for reporting spill variances is reported using hourly-averaged data. Therefore, while spill may be increased or decreased for only a portion of an hour, it is represented in the Spill Variance Table as an hour.

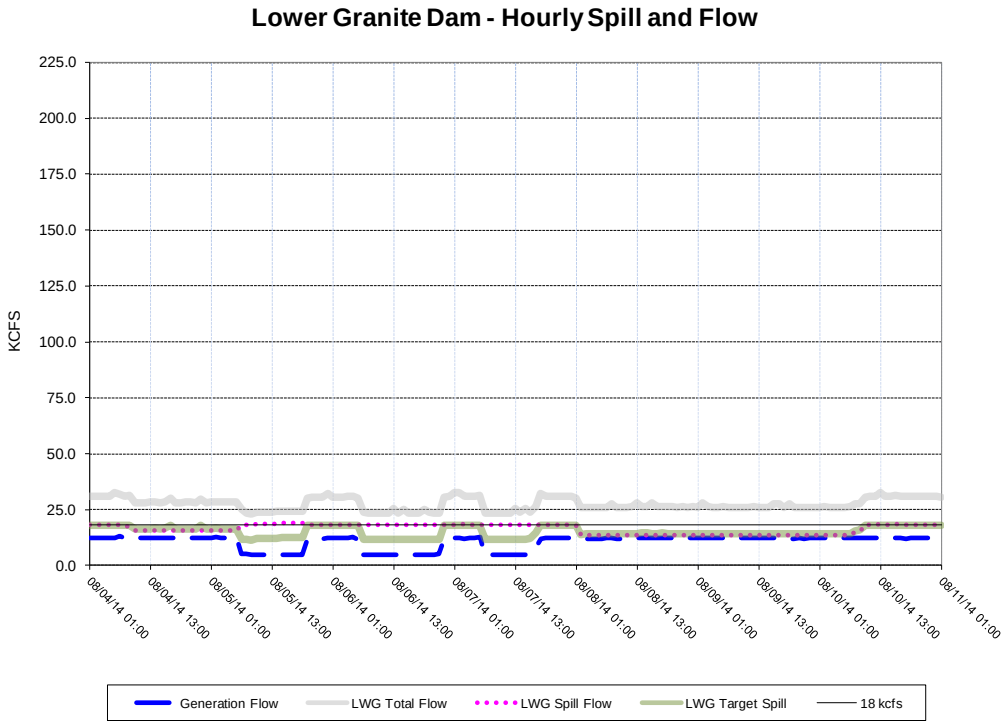
Project	Parameter	Date	Time[5]	Hours	Type	Reason
Lower Monumental	Reduced Spill	8/27/14	0400	1	Maintenance	Spill was reduced from minimum generation spill of 12.0 kcfs to 9.9 kcfs to operate units for maintenance in addition to operating unit 2 at minimum generation (FOP Table 1).
Lower Monumental	Reduced Spill	8/31/14	0100	1	Maintenance	Spill was reduced from minimum generation spill of 15.0 kcfs to 12.0 kcfs to operate units for maintenance in addition to operating unit 2 at minimum generation (FOP Table 1).
Ice Harbor	Reduced Spill	8/7/14	0800	1	Maintenance	Spill was reduced from minimum generation spill of 20.0 kcfs to 18.9 kcfs to operate unit 2 for maintenance in addition to operating unit 1 at minimum generation (FOP Table 1).
Ice Harbor	Reduced Spill	8/7/14	1100-1200	2	Maintenance	Spill was reduced from minimum generation spill of 25.0 kcfs to 18.9 kcfs to operate unit 2 for maintenance in addition to operating unit 1 at minimum generation (FOP Table 1).
Ice Harbor	Reduced Spill	8/11/14	1600	1	Maintenance	Spill was reduced from minimum generation spill of 22.7 kcfs to 20.2 kcfs to operate unit 2 for maintenance in addition to operating unit 1 at minimum generation (FOP Table 1).
McNary	Reduced Spill	8/4/14	0200	1	Human/Program Error	Hourly spill decreased to 48.7% (below 50.0% ±1% range). Delay in changing to 88 kcfs. 24-hr avg spill 50.2%.
John Day	Reduced Spill	8/7/14	1300	1	Transmission Stability	Hourly spill decreased to 28.9% (below 30.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 30.0%.
John Day	Additional Spill	8/10/14	0100	1	Transmission Stability	Hourly spill increased to 31.1% (above 30.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 29.9%.
John Day	Reduced Spill	8/14/14	1000	1	Human/Program Error	Hourly spill decreased to 28.8% (below 30.0% ±1% range). Delay in changing to 47 kcfs. 24-hr avg spill 29.9%.
John Day	Additional Spill	8/19/14	2300	1	Human/Program Error	Hourly spill increased to 31.1% (above 30.0% ±1% range). Delay in changing to 36 kcfs. 24-hr avg spill 30.0%.

Project	Parameter	Date	Time[5]	Hours	Type	Reason
John Day	Additional Spill	8/20/14	0100	1	Transmission Stability	Hourly spill increased to 31.2% (above 30.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 30.1%.
John Day	Reduced Spill	8/28/14	0800	1	Transmission Stability	Hourly spill decreased to 28.9% (below 30.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 30.1%.
John Day	Reduced Spill	8/28/14	1300	1	Human/Program Error	Hourly spill decreased to 28.5% (below 30.0% ±1% range). No spill through bays 18-19 during planned closure of SWs. 24-hr avg spill 30.1%.
John Day	Additional Spill	8/28/14	1400	1	Human/Program Error	Hourly spill increased to 32.7% (above 30.0% ±1% range). Computer program was reconfiguring to new spill pattern after planned closure of SWs. 24-hr avg spill 30.1%.
John Day	Additional Spill	8/30/14	1400	1	Transmission Stability	Hourly spill increased to 31.4% (above 30.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 30.1%.
John Day	Additional Spill	8/30/14	1600	1	Transmission Stability	Hourly spill increased to 32.0% (above 30.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 30.1%.
The Dalles	Reduced Spill	8/11/14	1900	1	Transmission Stability	Hourly spill decreased to 37.9% (below 40.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 39.8%.
The Dalles	Reduced Spill	8/28/14	1300	1	Transmission Stability	Hourly spill decreased to 37.4% (below 40.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 39.8%.
The Dalles	Reduced Spill	8/28/14	1500	1	Transmission Stability	Hourly spill decreased to 37.4% (below 40.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p.3-4). 24-hr avg spill 39.8%.
The Dalles	Additional Spill	8/30/14	1600	1	Transmission Stability	Hourly spill increased to 43.0% (above 40.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 40.2%.

Project	Parameter	Date	Time[5]	Hours	Type	Reason
The Dalles	Additional Spill	8/30/14	1700	1	Transmission Stability	Hourly spill increased to 41.5 % (above 40.0% ±1% range). Project on response during rapidly changing load and/or intermittent generation (see p. 3-4). 24-hr avg spill 40.2%.

Figure 1


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
04-Aug-2014 to 11-Aug-2014
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


Lower Granite Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/04/14 01:00
08/04/14 13:00
08/05/14 01:00
08/05/14 13:00
08/06/14 01:00
08/06/14 13:00
08/07/14 01:00
08/07/14 13:00
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08/08/14 13:00
08/09/14 01:00
08/09/14 13:00
08/10/14 01:00
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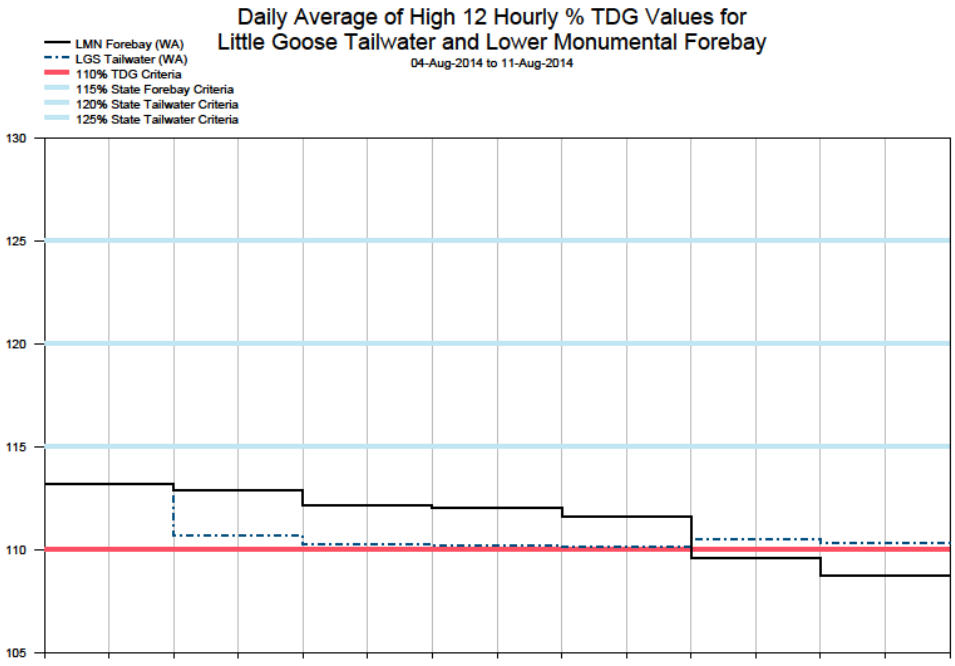
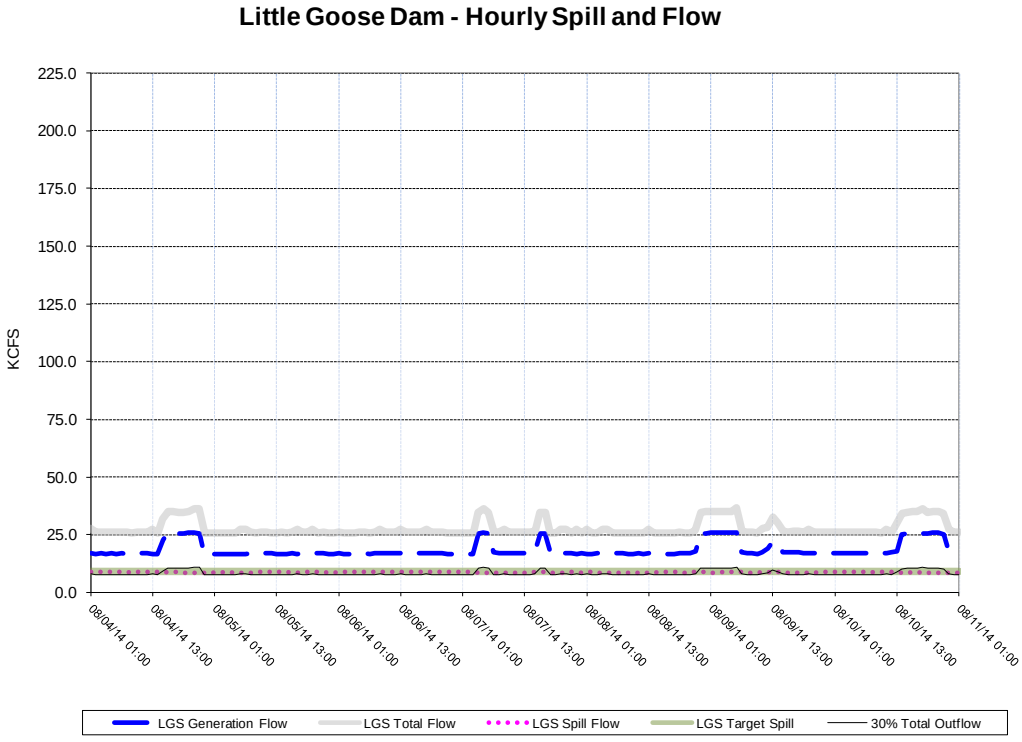
08/11/14 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
18 kcfs

Figure 2


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
04-Aug-2014 to 11-Aug-2014
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105


Little Goose Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/04/14 01:00
08/04/14 13:00
08/05/14 01:00
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08/07/14 01:00
08/07/14 13:00
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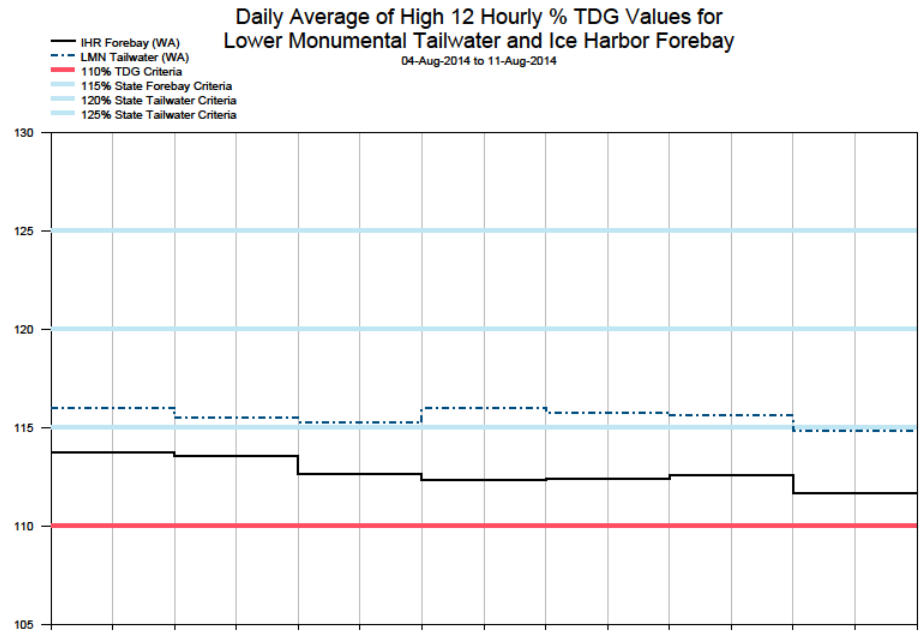
08/08/14 13:00
08/09/14 01:00
08/09/14 13:00
08/10/14 01:00
08/10/14 13:00
08/11/14 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

Figure 3


Daily Average of High 12 Hourly % TDG Values for
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04-Aug-2014 to 11-Aug-2014
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
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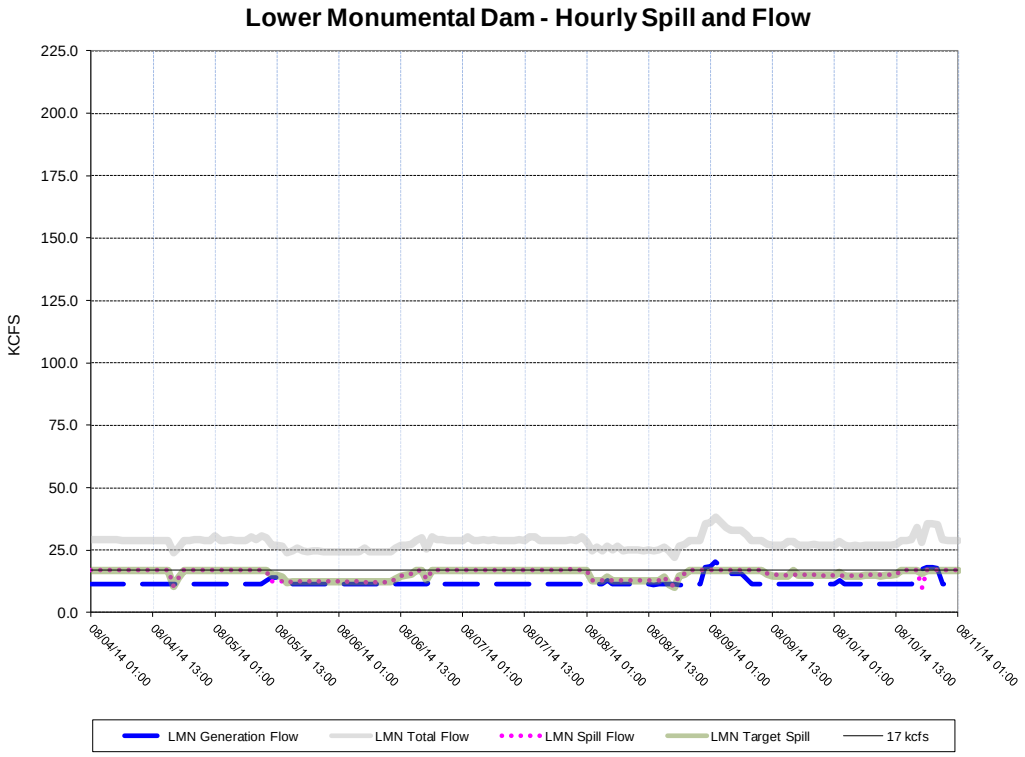
105


Lower Monumental Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/04/14 01:00
08/04/14 13:00
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08/08/14 13:00
08/09/14 01:00
08/09/14 13:00
08/10/14 01:00
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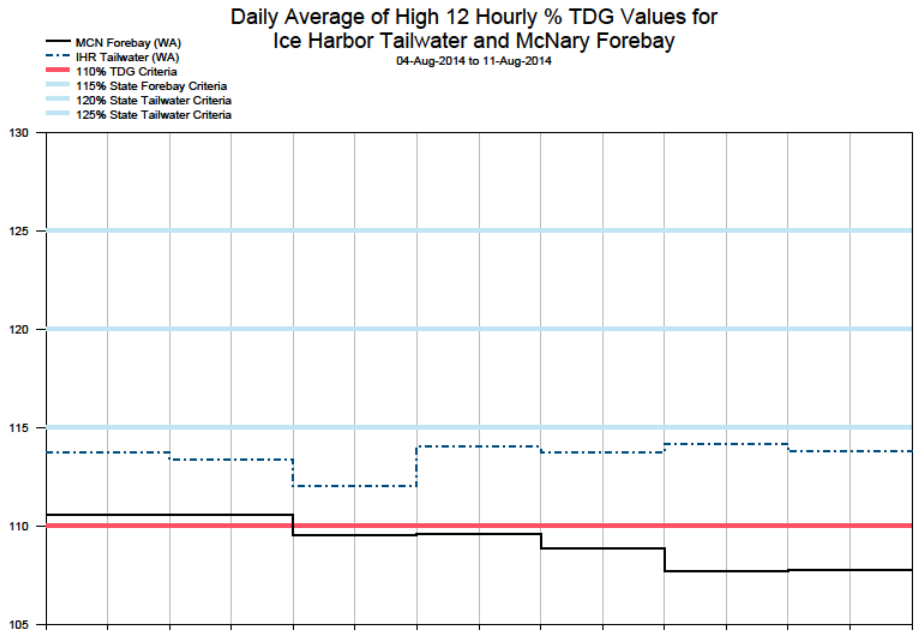
08/11/14 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
17 kcfs

Figure 4


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
04-Aug-2014 to 11-Aug-2014
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

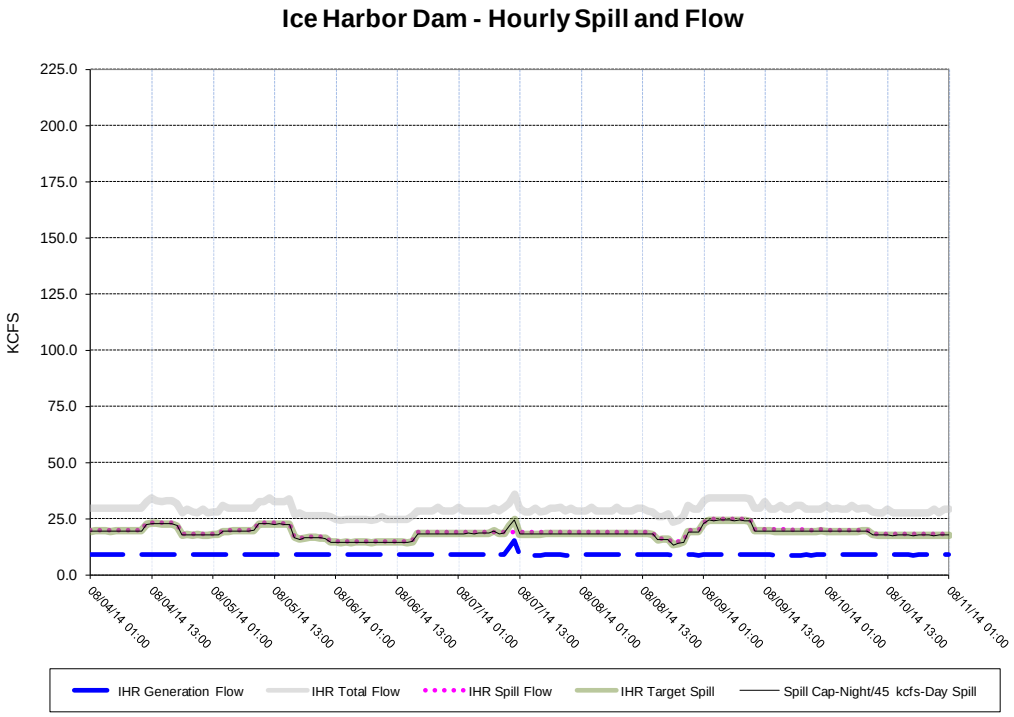
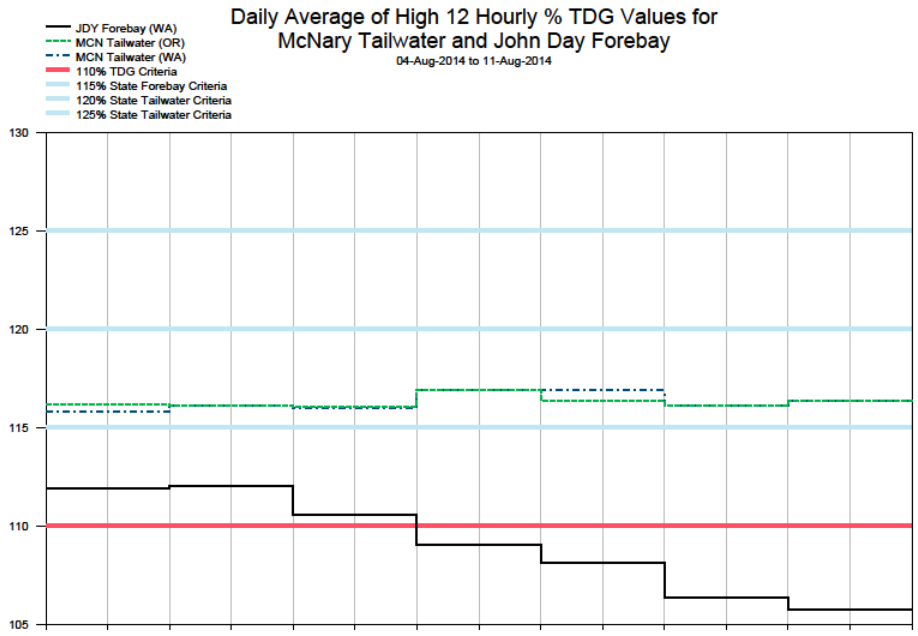

Ice Harbor Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/04/14 01:00
08/04/14 13:00
08/05/14 01:00
08/05/14 13:00
08/06/14 01:00
08/06/14 13:00
08/07/14 01:00
08/07/14 13:00
08/08/14 01:00
08/08/14 13:00
08/09/14 01:00
08/09/14 13:00
08/10/14 01:00
08/10/14 13:00
08/11/14 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
Spill Cap-Night/45 kcfs-Day Spill

Figure 5


Daily Average of High 12 Hourly % TDG Values for
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MCN Tailwater (OR)
MCN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

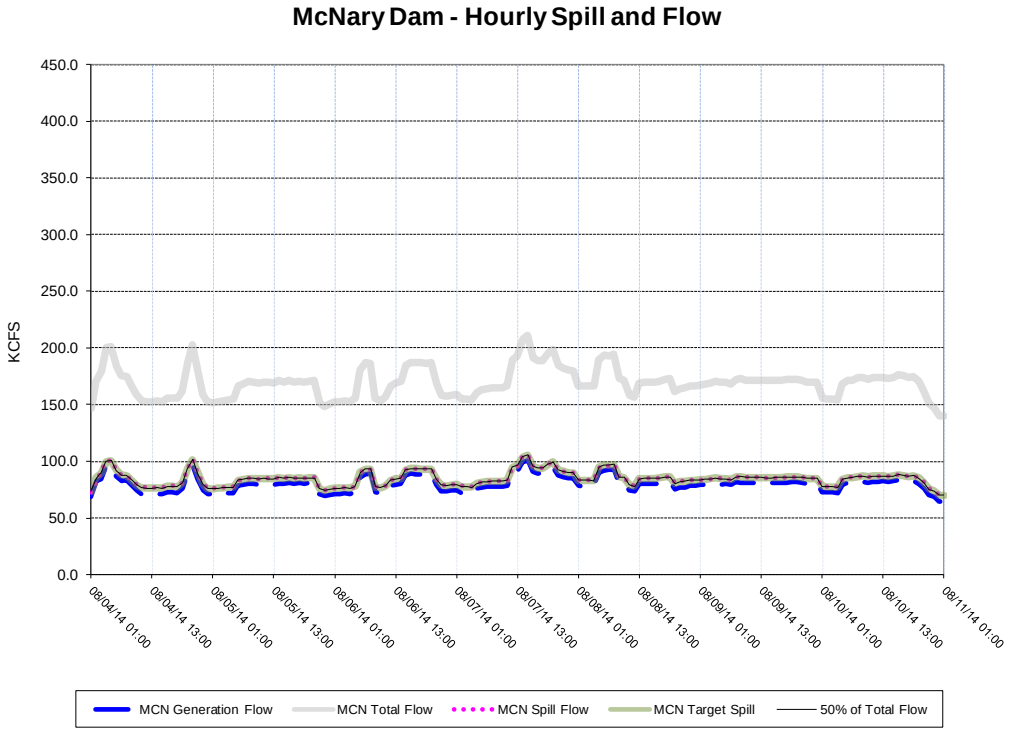
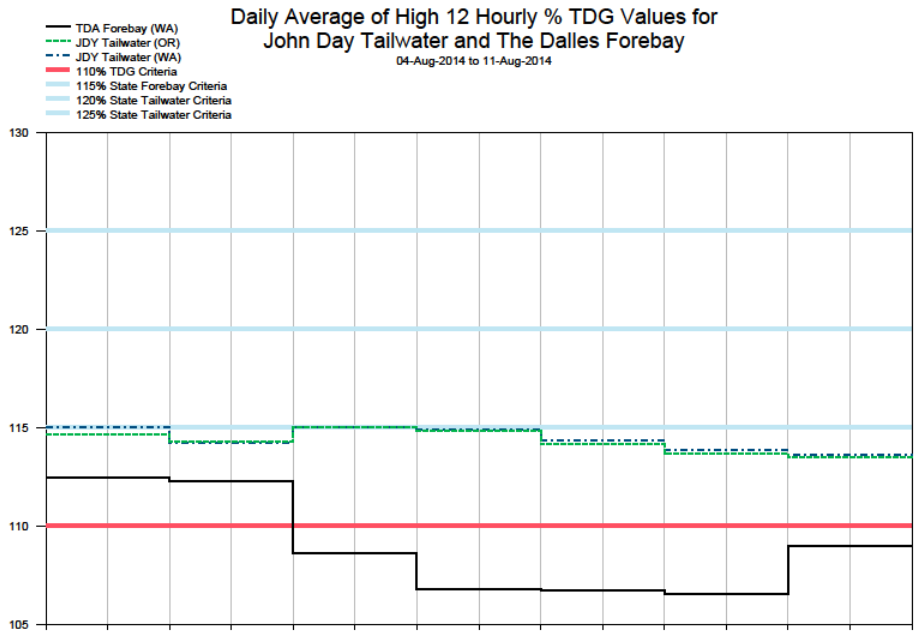

McNary Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/04/14 01:00
08/04/14 13:00
08/05/14 01:00
08/05/14 13:00
08/06/14 01:00
08/06/14 13:00
08/07/14 01:00
08/07/14 13:00
08/08/14 01:00
08/08/14 13:00
08/09/14 01:00
08/09/14 13:00
08/10/14 01:00
08/10/14 13:00
08/11/14 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
50% of Total Flow

Figure 6


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
04-Aug-2014 to 11-Aug-2014
TDA Forebay (WA)
JDY Tailwater (OR)
JDY Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

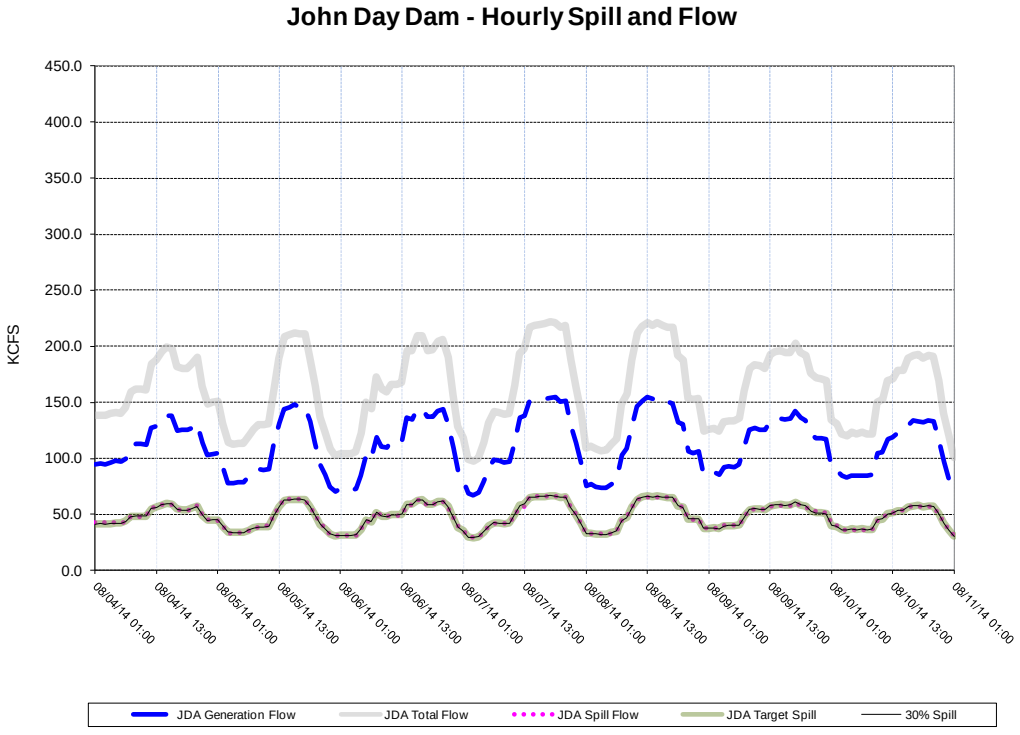
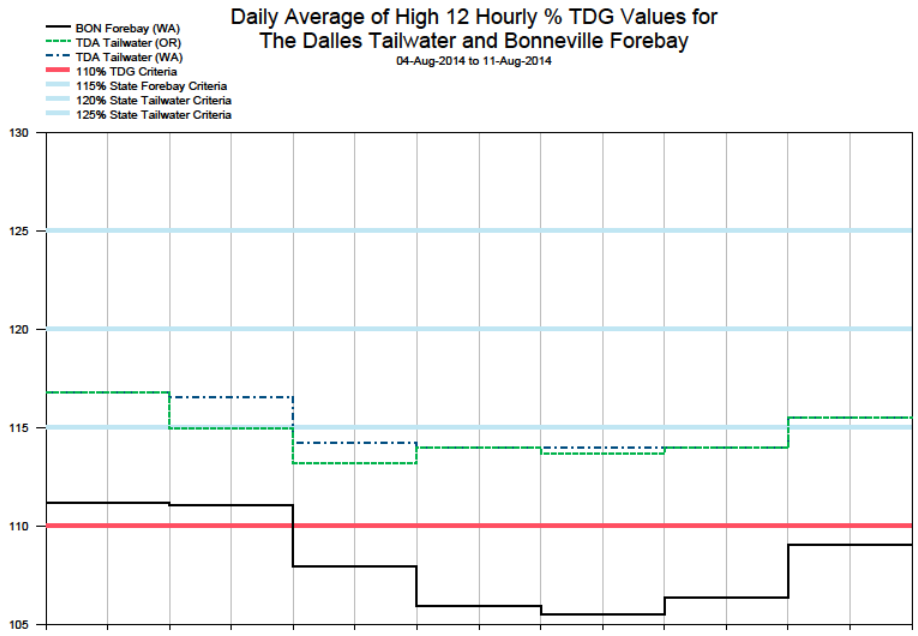

John Day Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/04/14 01:00
08/04/14 13:00
08/05/14 01:00
08/05/14 13:00
08/06/14 01:00
08/06/14 13:00
08/07/14 01:00
08/07/14 13:00
08/08/14 01:00
08/08/14 13:00
08/09/14 01:00
08/09/14 13:00
08/10/14 01:00
08/10/14 13:00
08/11/14 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% Spill

Figure 7


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
04-Aug-2014 to 11-Aug-2014
BON Forebay (WA)
TDA Tailwater (OR)
TDA Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

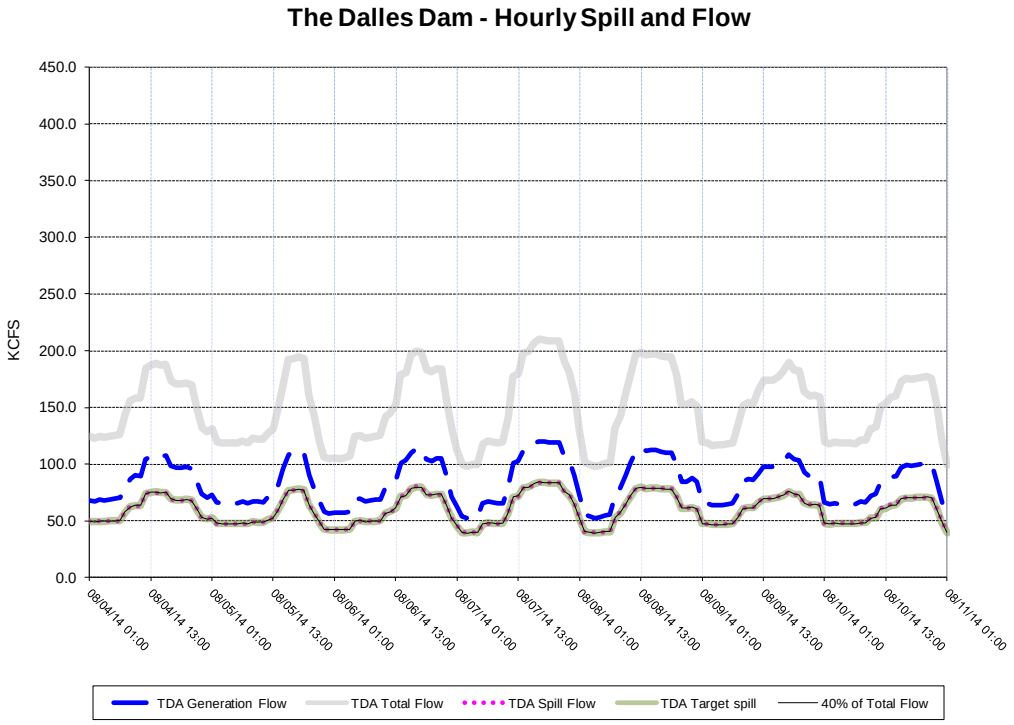
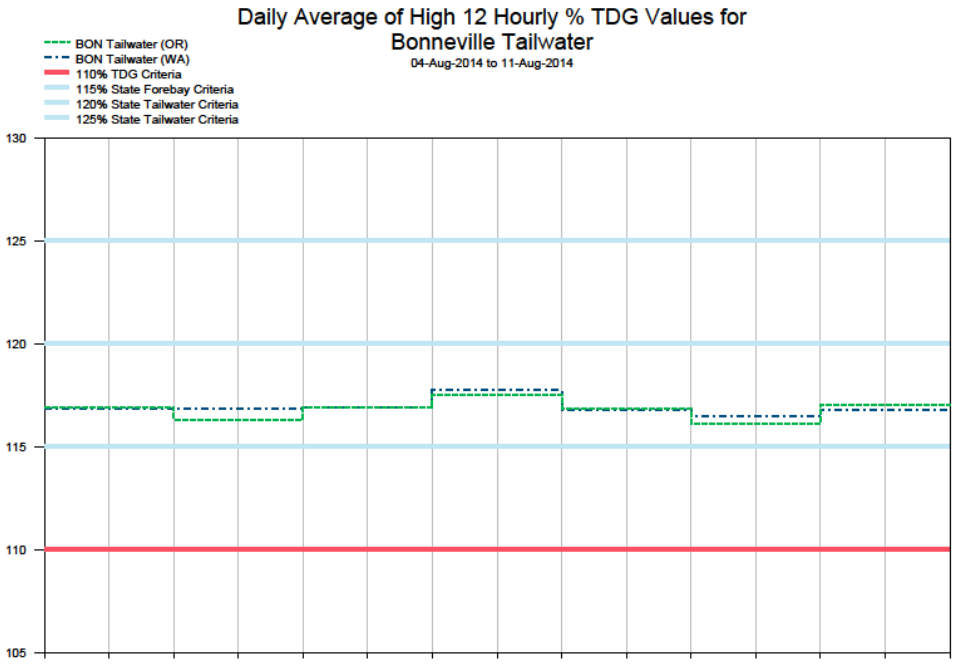

The Dalles Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/04/14 01:00
08/04/14 13:00
08/05/14 01:00
08/05/14 13:00
08/06/14 01:00
08/06/14 13:00
08/07/14 01:00
08/07/14 13:00
08/08/14 01:00
08/08/14 13:00
08/09/14 01:00
08/09/14 13:00
08/10/14 01:00
08/10/14 13:00
08/11/14 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

Figure 8


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
04-Aug-2014 to 11-Aug-2014
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

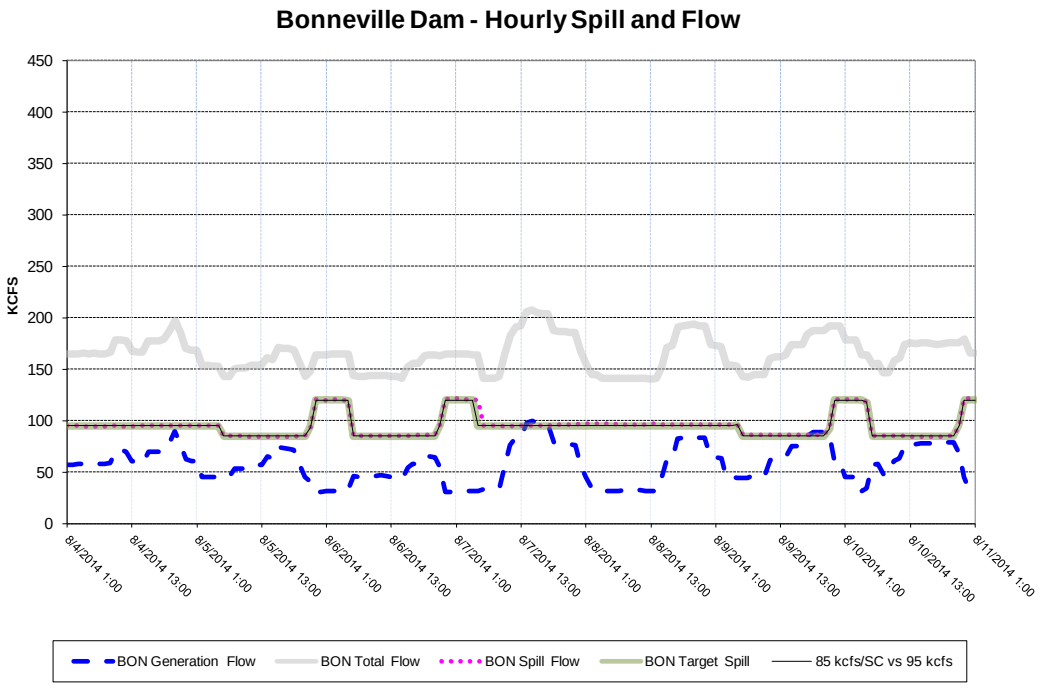
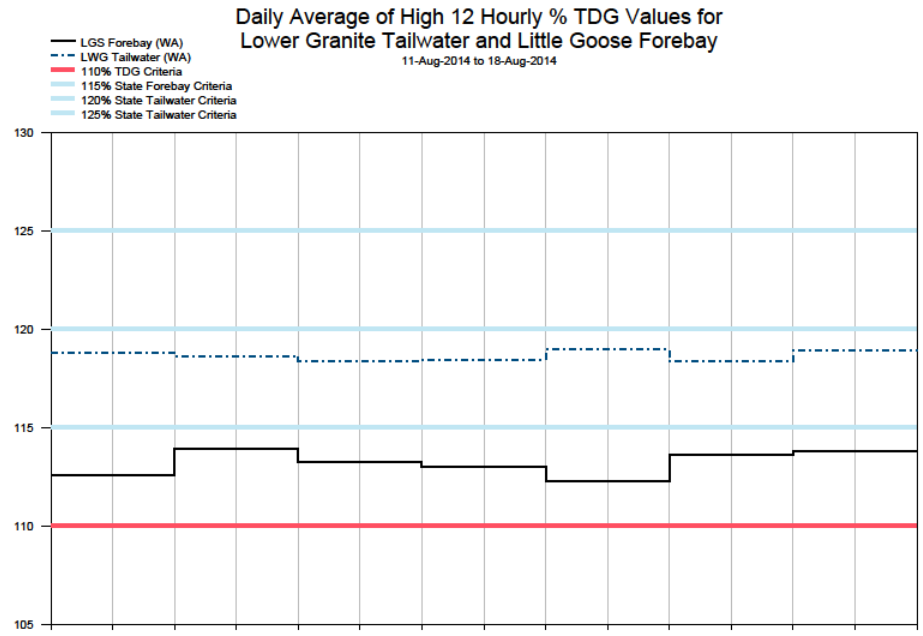

Bonneville Dam - Hourly Spill and Flow
KCFS
450
400
350
300
250
200
150
100
50
0
8/4/2014 1:00
8/4/2014 13:00
8/5/2014 1:00
8/5/2014 13:00
8/6/2014 1:00
8/6/2014 13:00
8/7/2014 1:00
8/7/2014 13:00
8/8/2014 1:00
8/8/2014 13:00
8/9/2014 1:00
8/9/2014 13:00
8/10/2014 1:00
8/10/2014 13:00
8/11/2014 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
85 kcfs/SC vs 95 kcfs

Figure 9


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
11-Aug-2014 to 18-Aug-2014
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

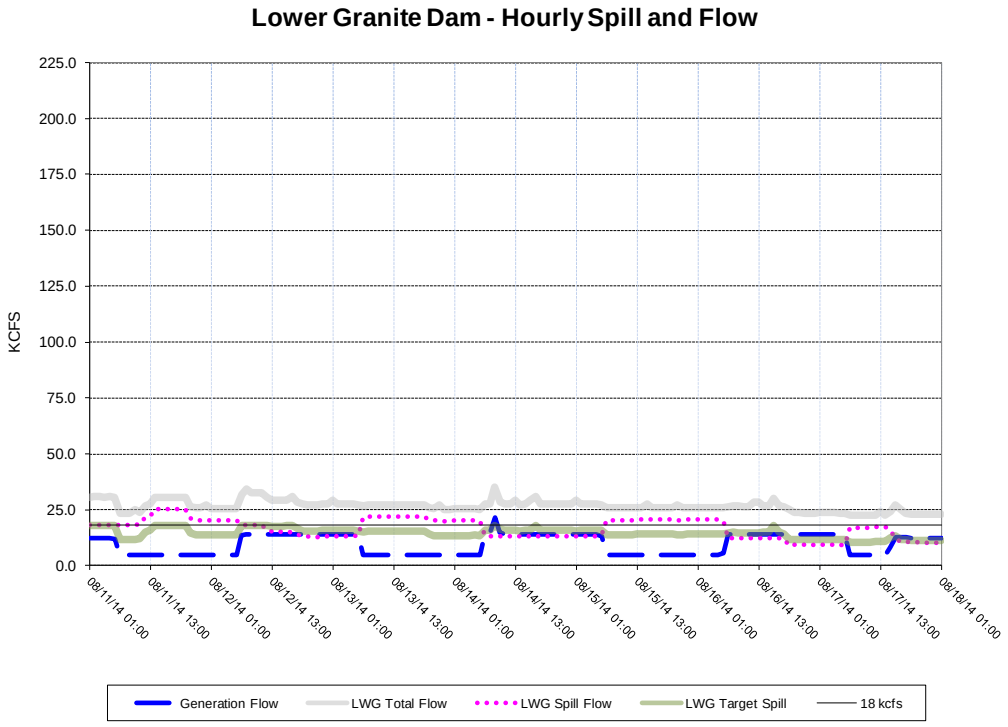
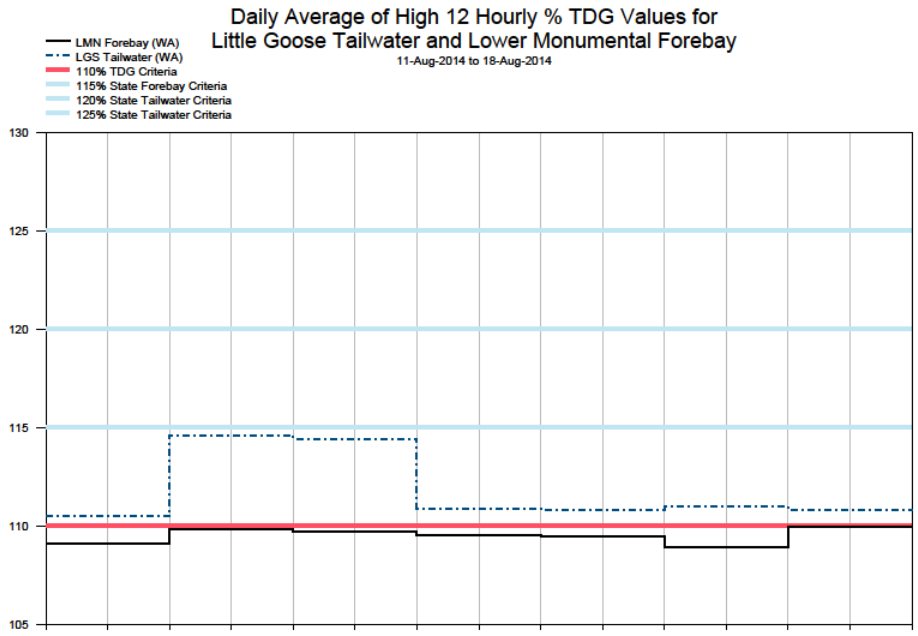

Lower Granite Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/11/14 01:00
08/11/14 13:00
08/12/14 01:00
08/12/14 13:00
08/13/14 01:00
08/13/14 13:00
08/14/14 01:00
08/14/14 13:00
08/15/14 01:00
08/15/14 13:00
08/16/14 01:00
08/16/14 13:00
08/17/14 01:00
08/17/14 13:00
08/18/14 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
18 kcfs

Figure 10


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
11-Aug-2014 to 18-Aug-2014
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

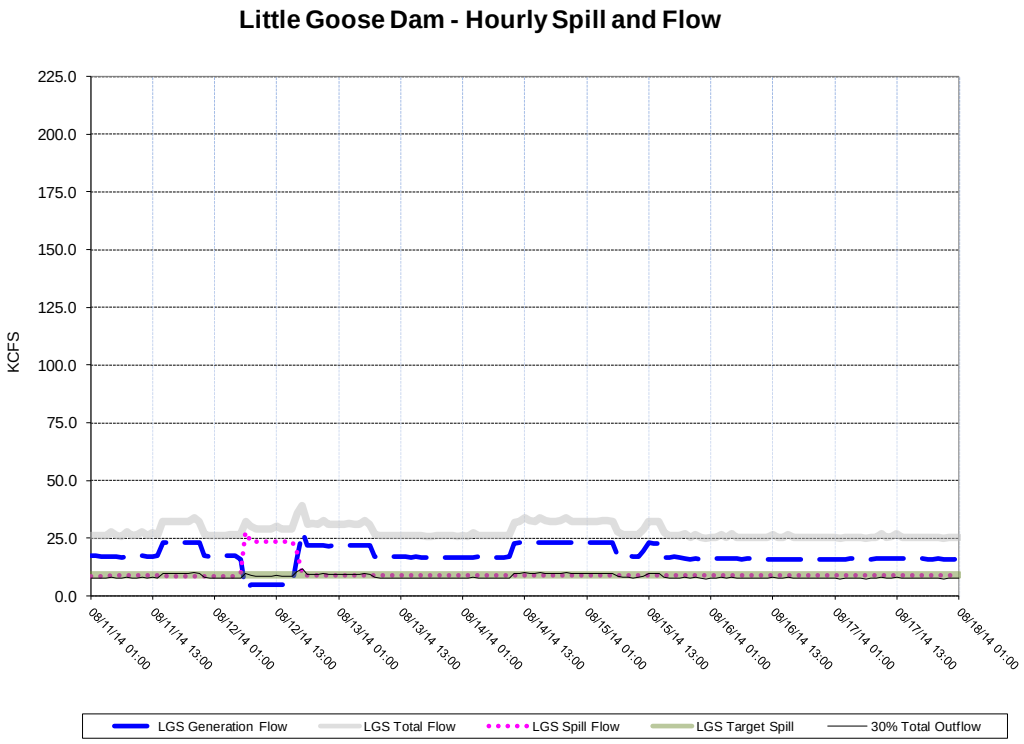
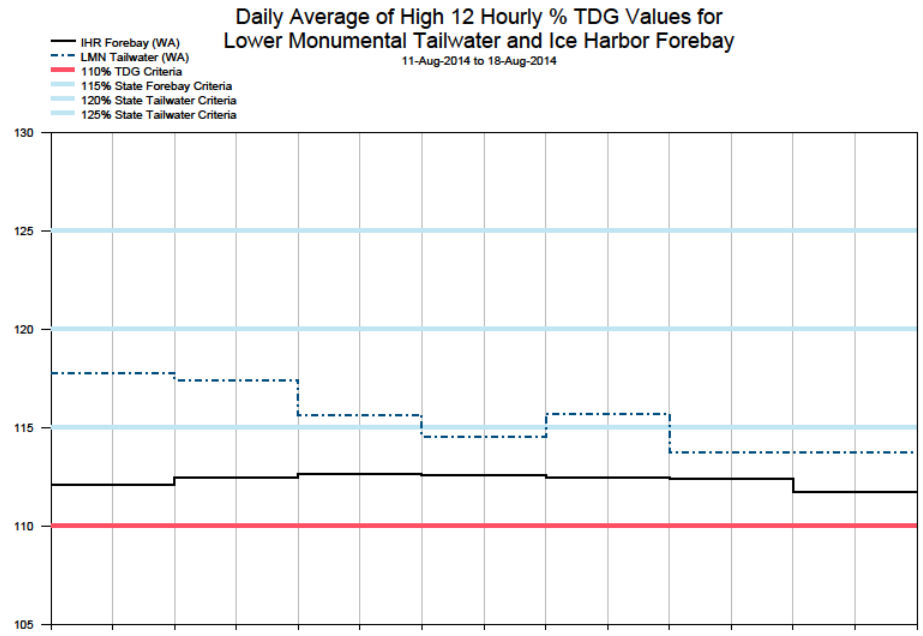

Little Goose Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/11/14 01:00
08/11/14 13:00
08/12/14 01:00
08/12/14 13:00
08/13/14 01:00
08/13/14 13:00
08/14/14 01:00
08/14/14 13:00
08/15/14 01:00
08/15/14 13:00
08/16/14 01:00
08/16/14 13:00
08/17/14 01:00
08/17/14 13:00
08/18/14 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

Figure 11


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
11-Aug-2014 to 18-Aug-2014
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

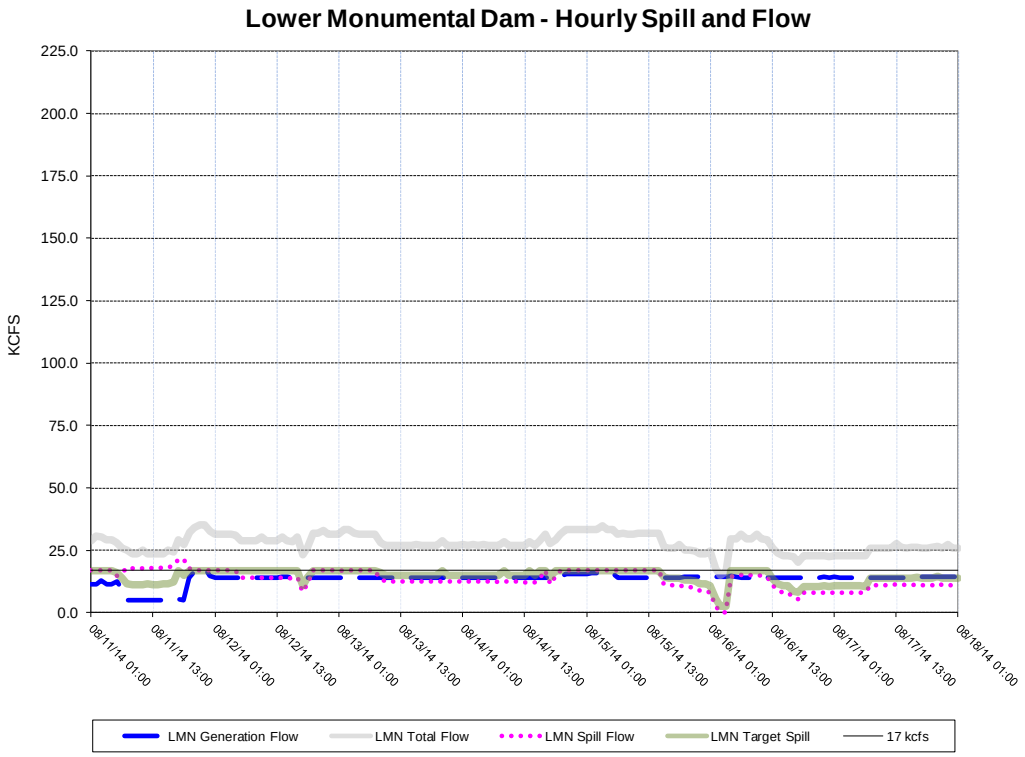
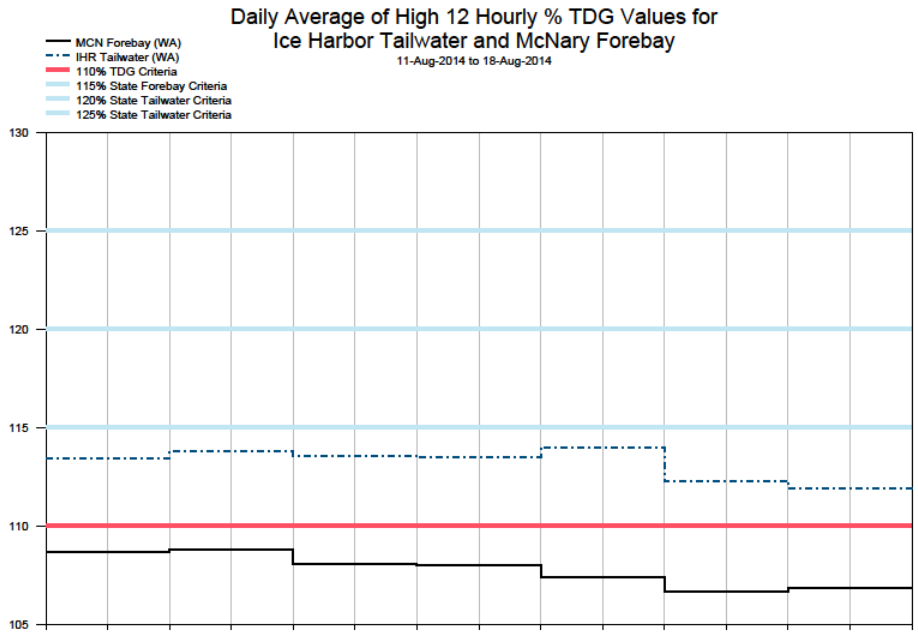

Lower Monumental Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/11/14 01:00
08/11/14 13:00
08/12/14 01:00
08/12/14 13:00
08/13/14 01:00
08/13/14 13:00
08/14/14 01:00
08/14/14 13:00
08/15/14 01:00
08/15/14 13:00
08/16/14 01:00
08/16/14 13:00
08/17/14 01:00
08/17/14 13:00
08/18/14 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
17 kcfs

Figure 12


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
11-Aug-2014 to 18-Aug-2014
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

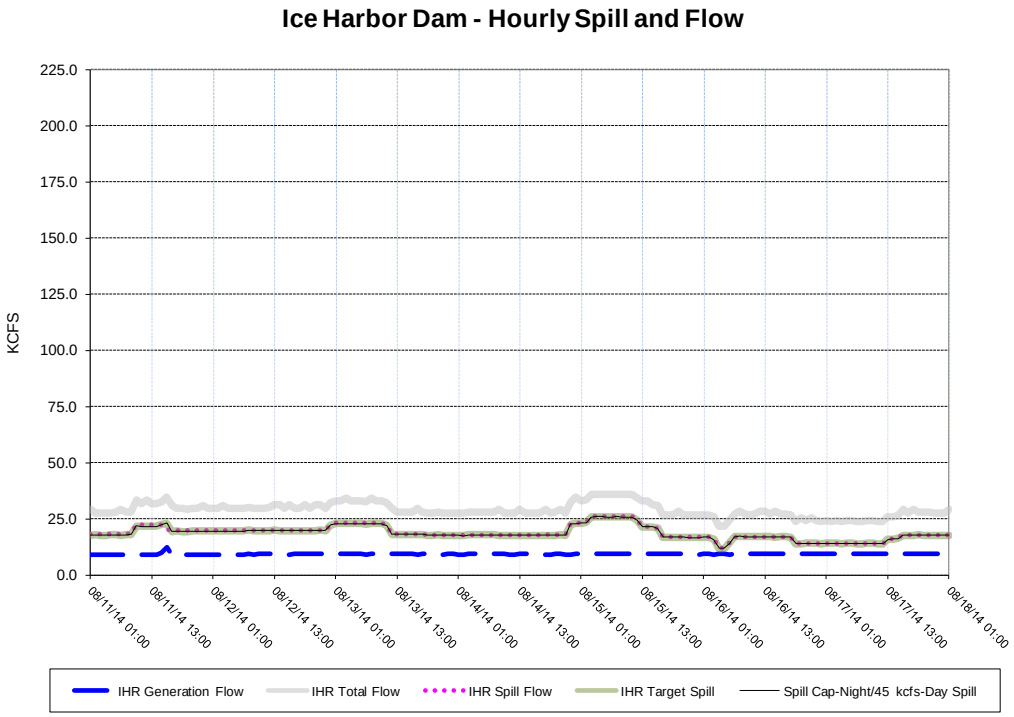
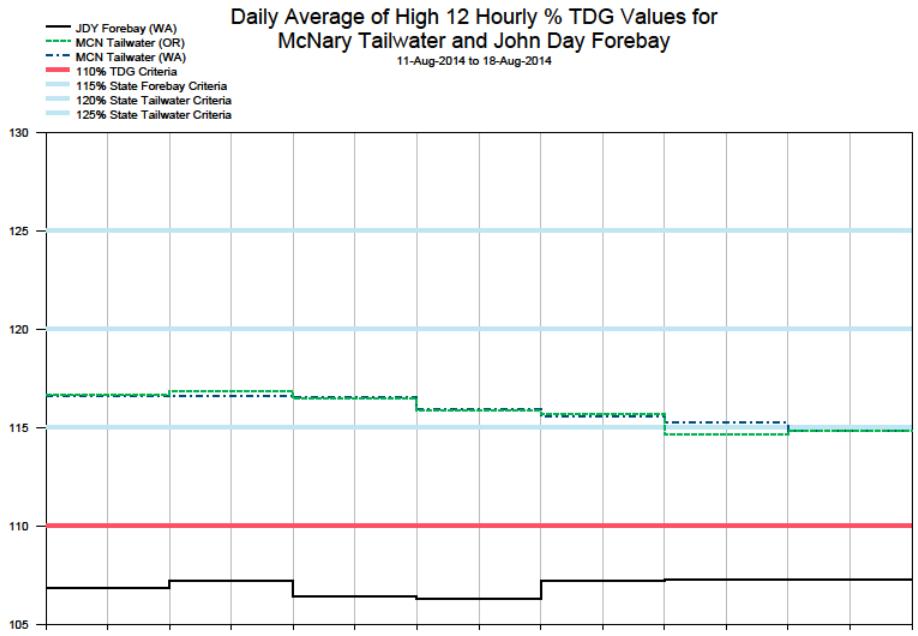

Ice Harbor Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/11/14 01:00
08/11/14 13:00
08/12/14 01:00
08/12/14 13:00
08/13/14 01:00
08/13/14 13:00
08/14/14 01:00
08/14/14 13:00
08/15/14 01:00
08/15/14 13:00
08/16/14 01:00
08/16/14 13:00
08/17/14 01:00
08/17/14 13:00
08/18/14 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
Spill Cap-Night/45 kcfs-Day Spill

Figure 13


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
11-Aug-2014 to 18-Aug-2014
JDY Forebay (WA)
MCN Tailwater (OR)
MCN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

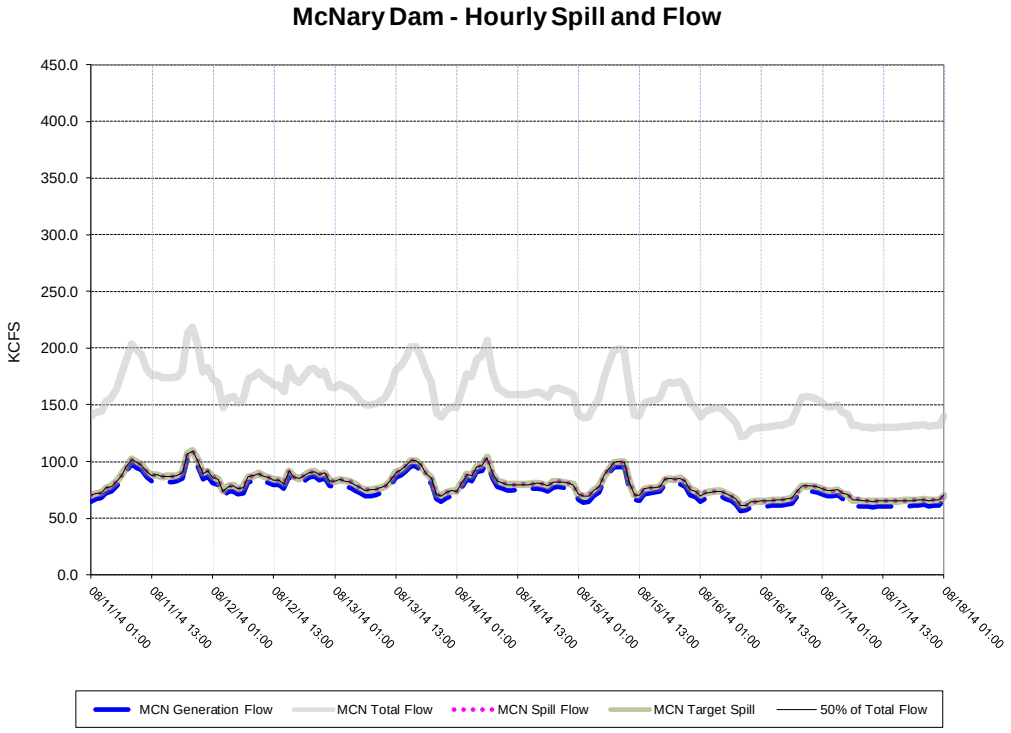
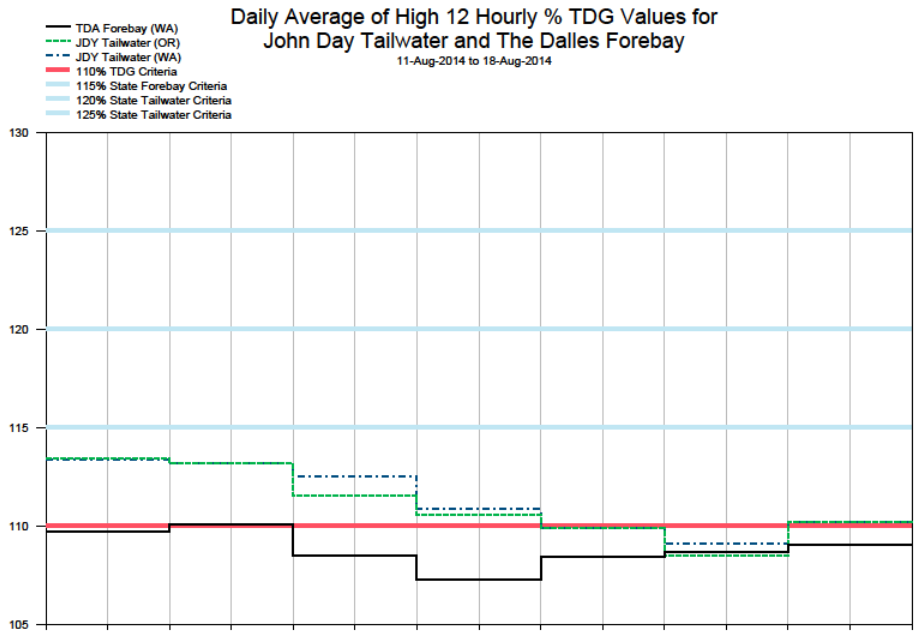

McNary Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/11/14 01:00
08/11/14 13:00
08/12/14 01:00
08/12/14 13:00
08/13/14 01:00
08/13/14 13:00
08/14/14 01:00
08/14/14 13:00
08/15/14 01:00
08/15/14 13:00
08/16/14 01:00
08/16/14 13:00
08/17/14 01:00
08/17/14 13:00
08/18/14 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
50% of Total Flow

Figure 14


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
11-Aug-2014 to 18-Aug-2014
TDA Forebay (WA)
JDY Tailwater (OR)
JDY Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

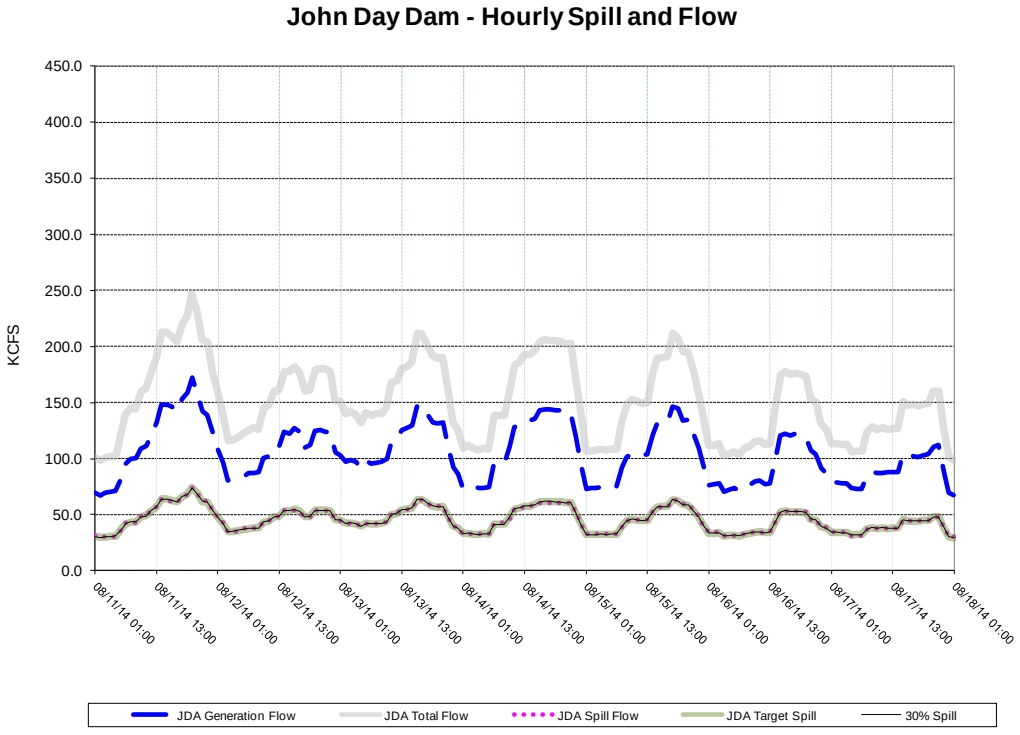
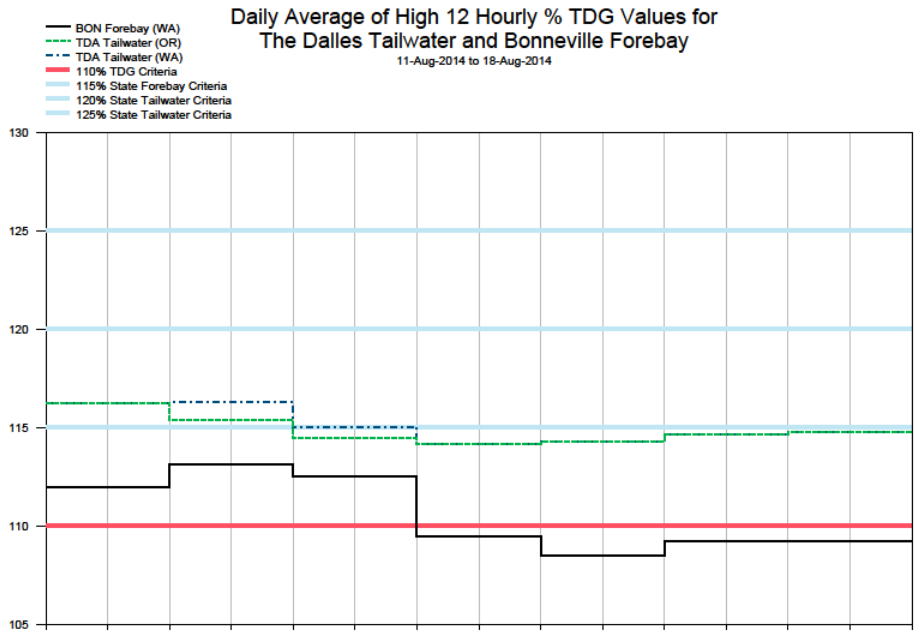

John Day Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/11/14 01:00
08/11/14 13:00
08/12/14 01:00
08/12/14 13:00
08/13/14 01:00
08/13/14 13:00
08/14/14 01:00
08/14/14 13:00
08/15/14 01:00
08/15/14 13:00
08/16/14 01:00
08/16/14 13:00
08/17/14 01:00
08/17/14 13:00
08/18/14 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% Spill

Figure 15


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
11-Aug-2014 to 18-Aug-2014
BON Forebay (WA)
TDA Tailwater (OR)
TDA Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

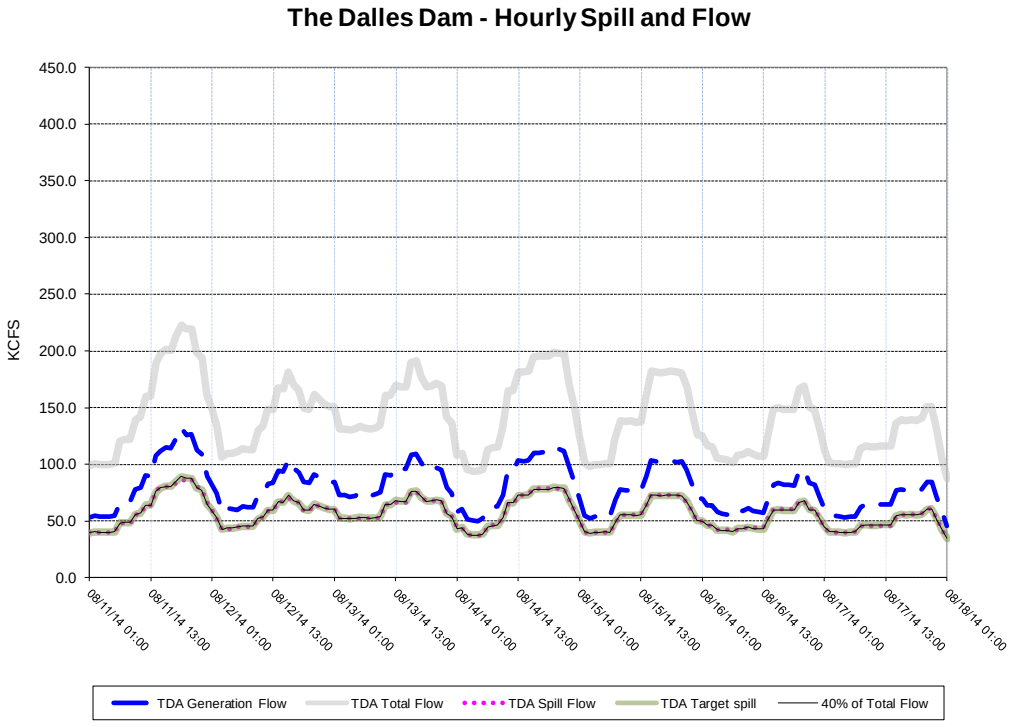
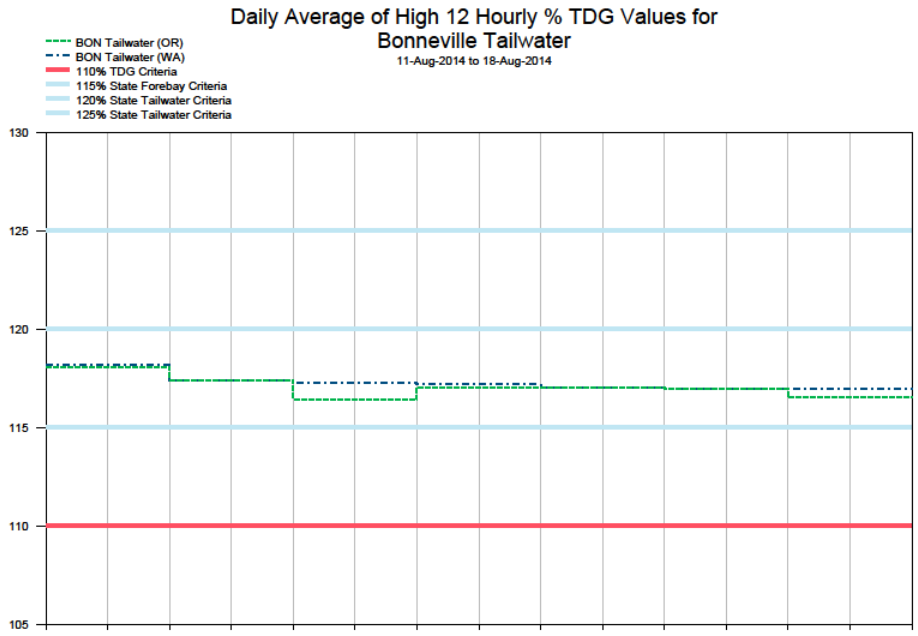

The Dalles Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/11/14 01:00
08/11/14 13:00
08/12/14 01:00
08/12/14 13:00
08/13/14 01:00
08/13/14 13:00
08/14/14 01:00
08/14/14 13:00
08/15/14 01:00
08/15/14 13:00
08/16/14 01:00
08/16/14 13:00
08/17/14 01:00
08/17/14 13:00
08/18/14 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

Figure 16


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
11-Aug-2014 to 18-Aug-2014
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

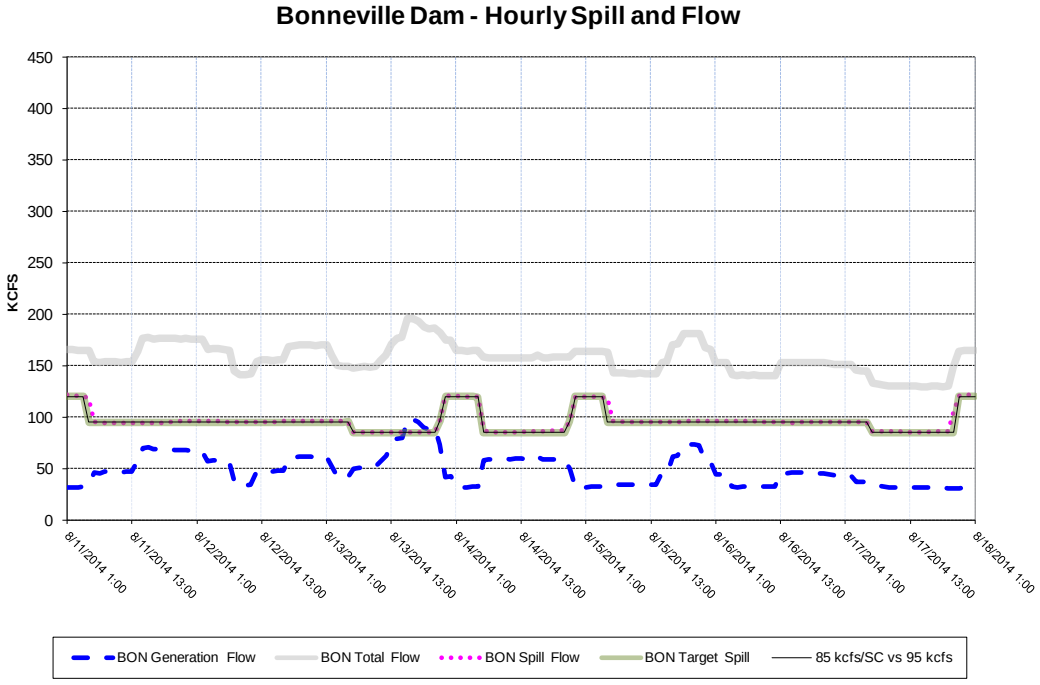
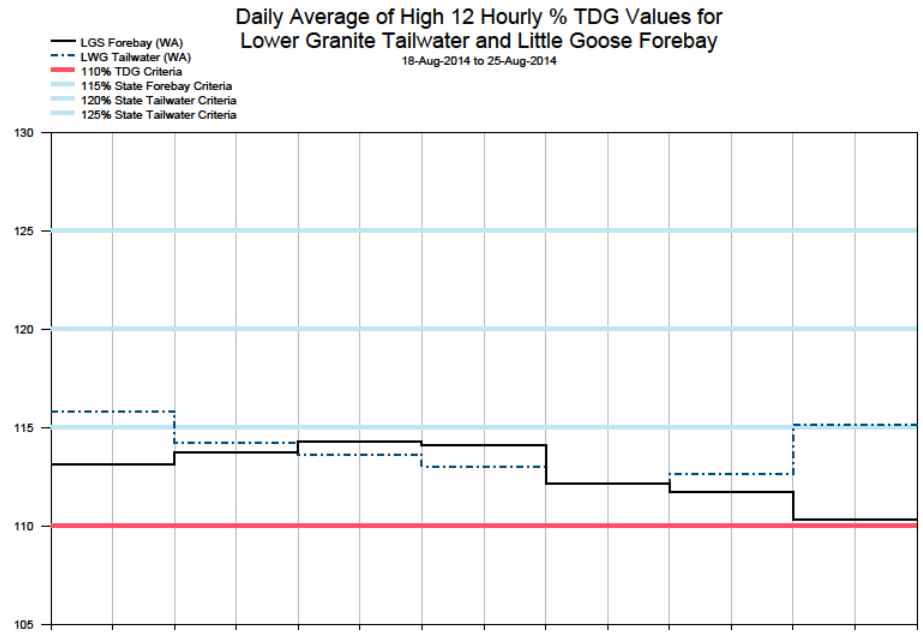

Bonneville Dam - Hourly Spill and Flow
KCFS
450
400
350
300
250
200
150
100
50
0
8/11/2014 1:00
8/11/2014 13:00
8/12/2014 1:00
8/12/2014 13:00
8/13/2014 1:00
8/13/2014 13:00
8/14/2014 1:00
8/14/2014 13:00
8/15/2014 1:00
8/15/2014 13:00
8/16/2014 1:00
8/16/2014 13:00
8/17/2014 1:00
8/17/2014 13:00
8/18/2014 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
85 kcfs/SC vs 95 kcfs

Figure 17


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
18-Aug-2014 to 25-Aug-2014
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

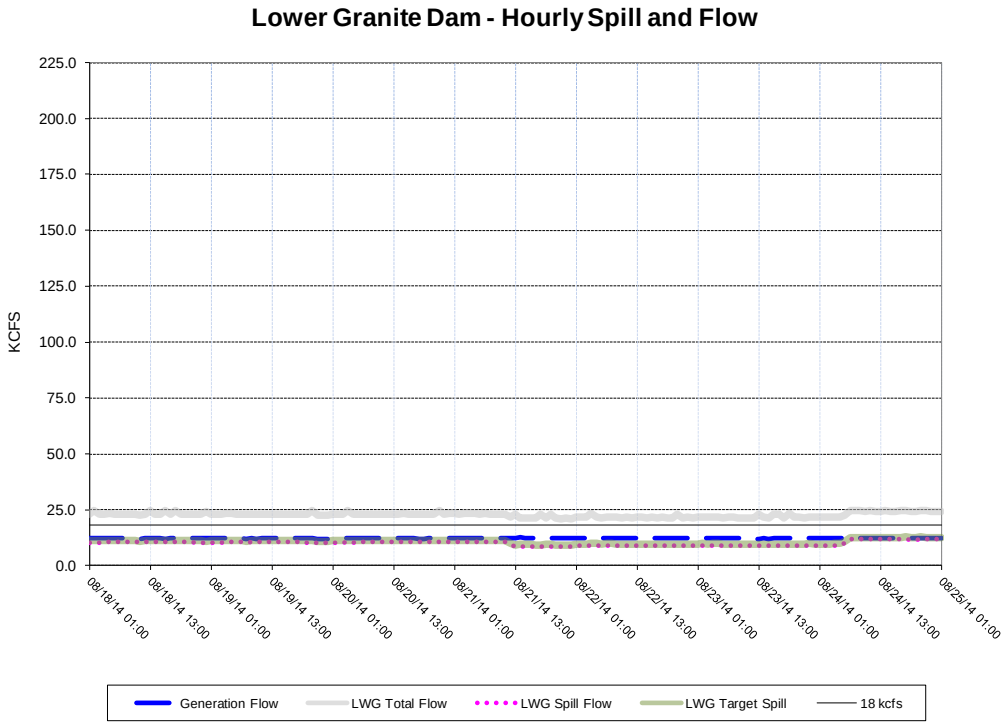
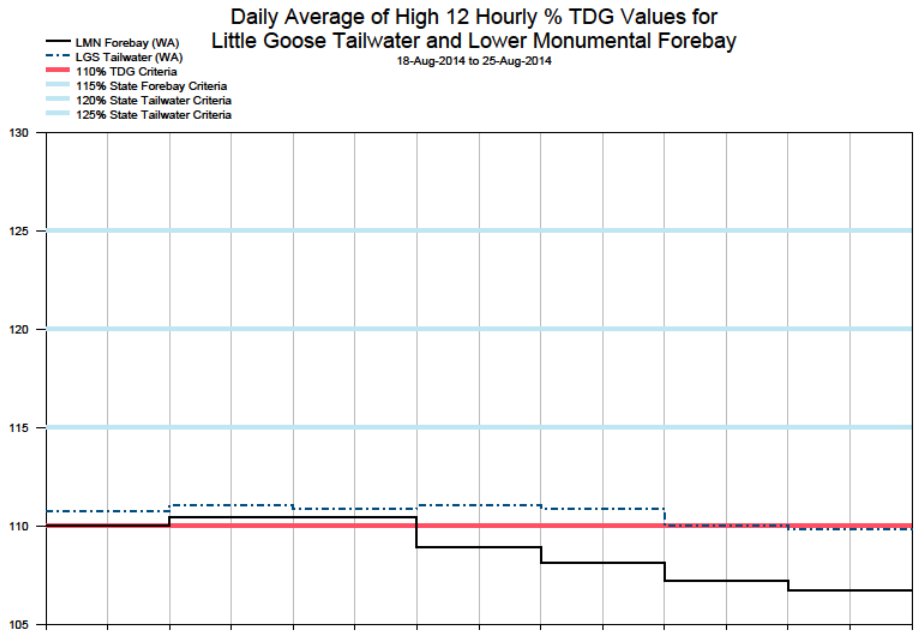

Lower Granite Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/18/14 01:00
08/18/14 13:00
08/19/14 01:00
08/19/14 13:00
08/20/14 01:00
08/20/14 13:00
08/21/14 01:00
08/21/14 13:00
08/22/14 01:00
08/22/14 13:00
08/23/14 01:00
08/23/14 13:00
08/24/14 01:00
08/24/14 13:00
08/25/14 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
18 kcfs

Figure 18


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
18-Aug-2014 to 25-Aug-2014
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

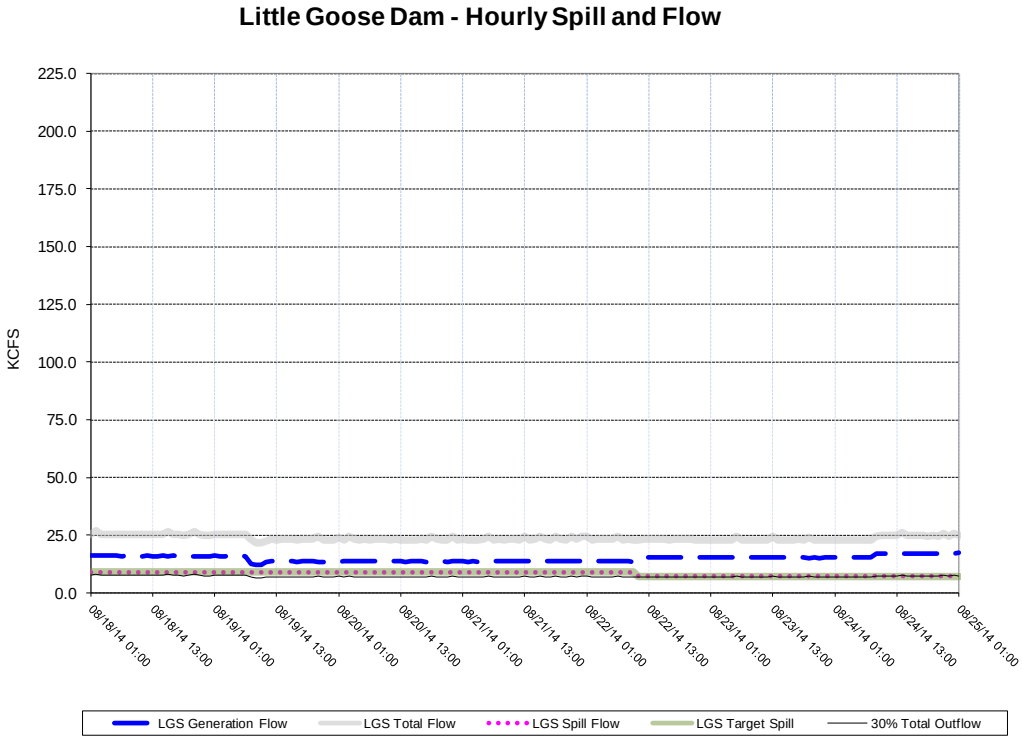
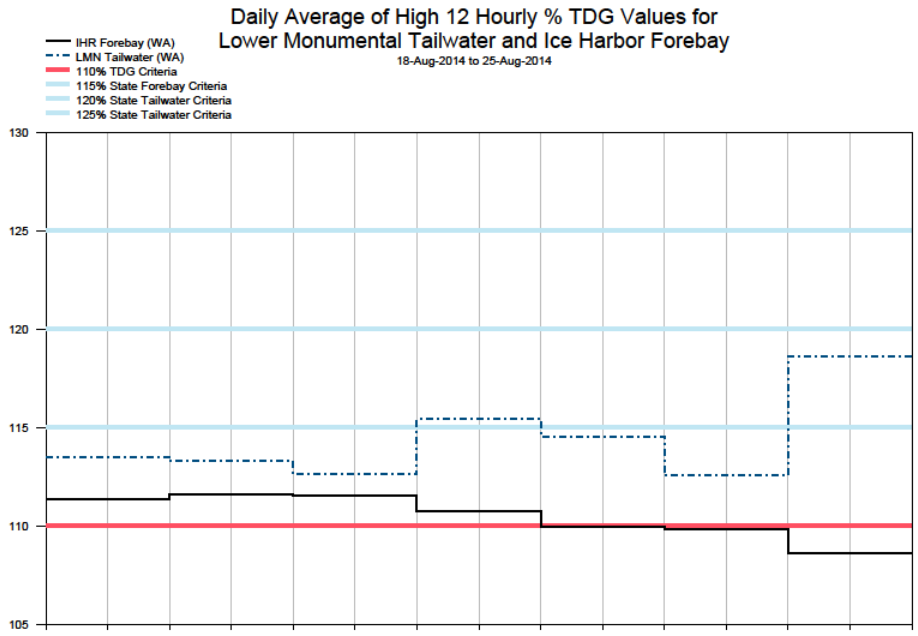

Little Goose Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/18/14 01:00
08/18/14 13:00
08/19/14 01:00
08/19/14 13:00
08/20/14 01:00
08/20/14 13:00
08/21/14 01:00
08/21/14 13:00
08/22/14 01:00
08/22/14 13:00
08/23/14 01:00
08/23/14 13:00
08/24/14 01:00
08/24/14 13:00
08/25/14 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

Figure 19


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
18-Aug-2014 to 25-Aug-2014
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

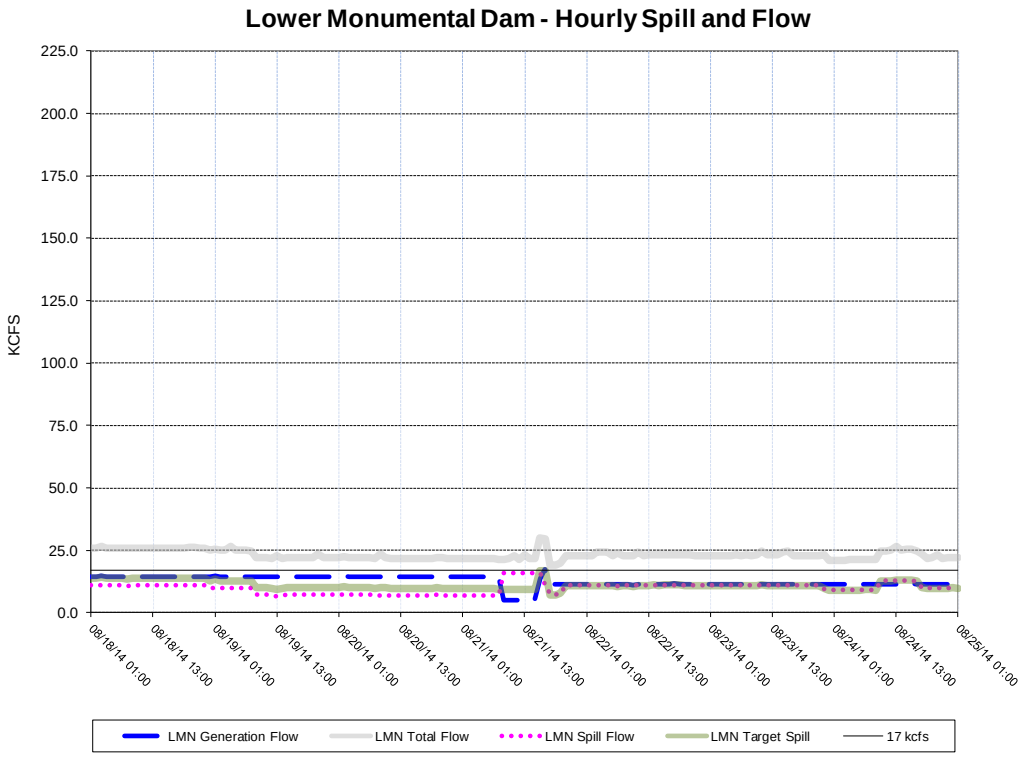
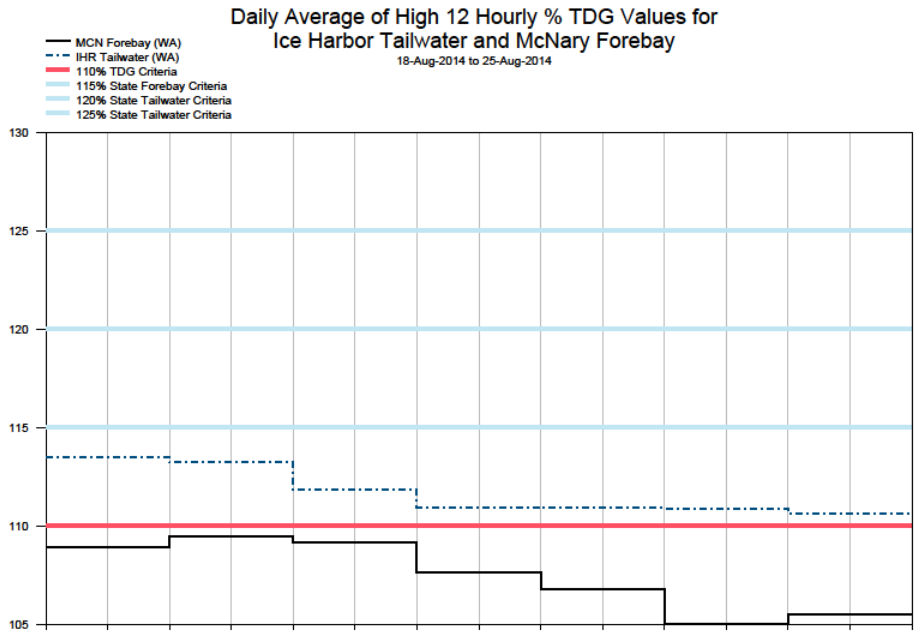

Lower Monumental Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/18/14 01:00
08/18/14 13:00
08/19/14 01:00
08/19/14 13:00
08/20/14 01:00
08/20/14 13:00
08/21/14 01:00
08/21/14 13:00
08/22/14 01:00
08/22/14 13:00
08/23/14 01:00
08/23/14 13:00
08/24/14 01:00
08/24/14 13:00
08/25/14 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
17 kcfs

Figure 20


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
18-Aug-2014 to 25-Aug-2014
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

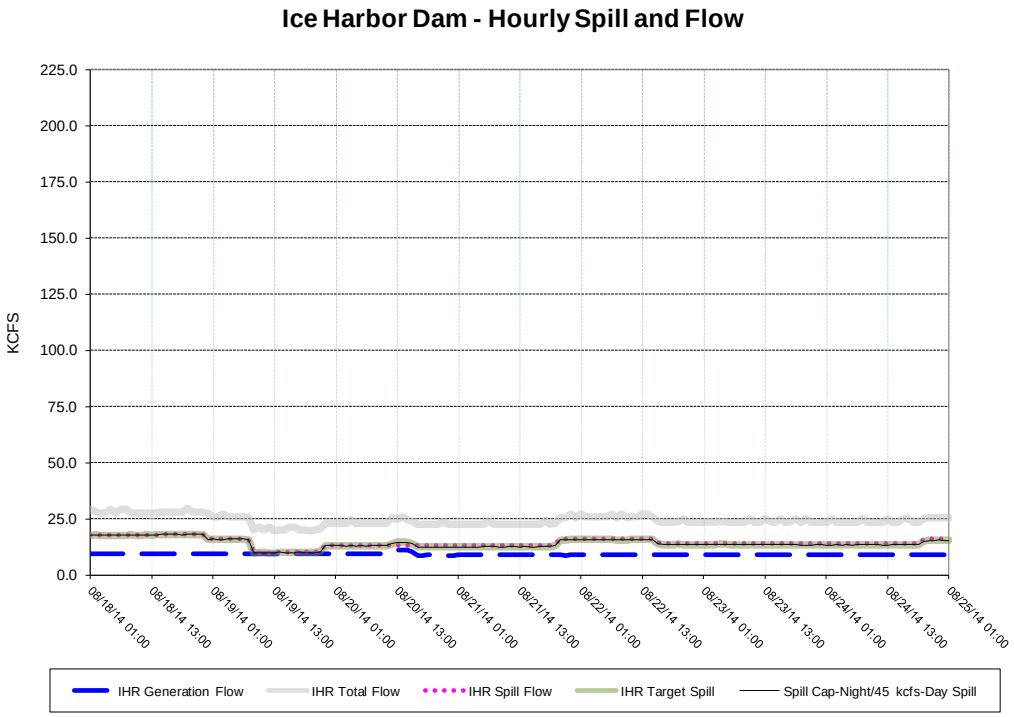
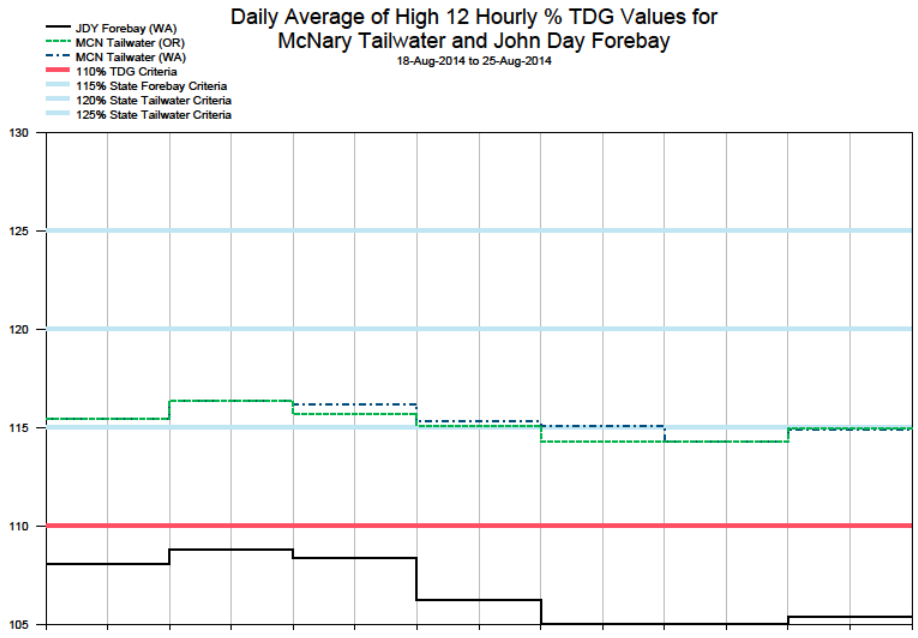

Ice Harbor Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/18/14 01:00
08/18/14 13:00
08/19/14 01:00
08/19/14 13:00
08/20/14 01:00
08/20/14 13:00
08/21/14 01:00
08/21/14 13:00
08/22/14 01:00
08/22/14 13:00
08/23/14 01:00
08/23/14 13:00
08/24/14 01:00
08/24/14 13:00
08/25/14 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
Spill Cap-Night/45 kcfs-Day Spill

Figure 21


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
18-Aug-2014 to 25-Aug-2014
JDY Forebay (WA)
MCN Tailwater (OR)
MCN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

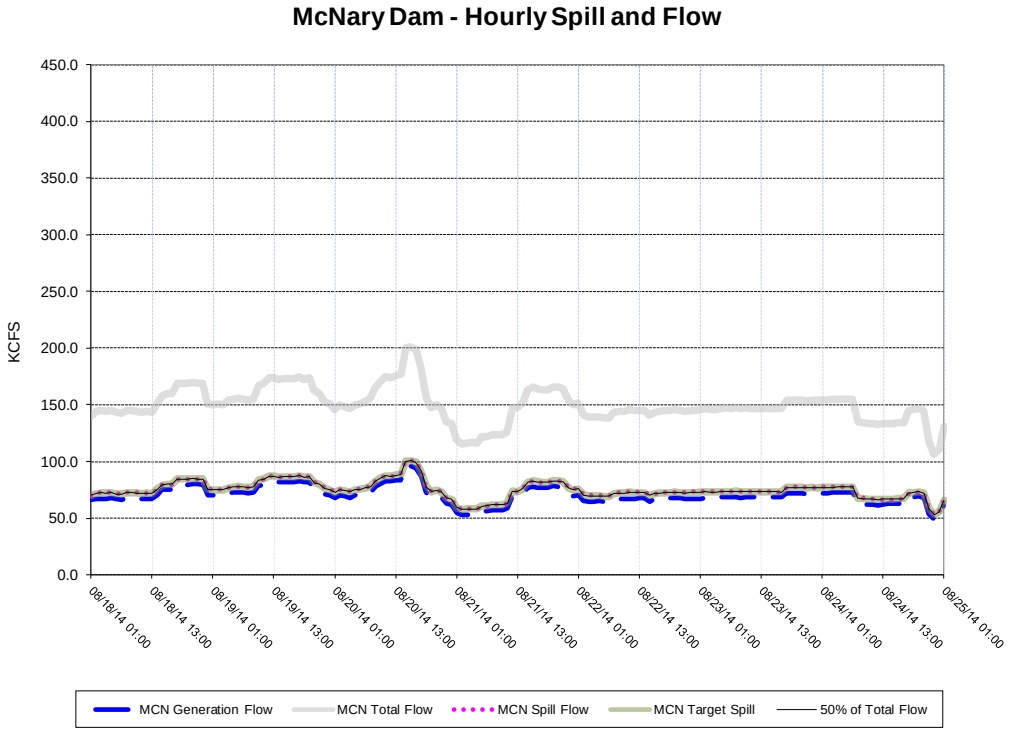
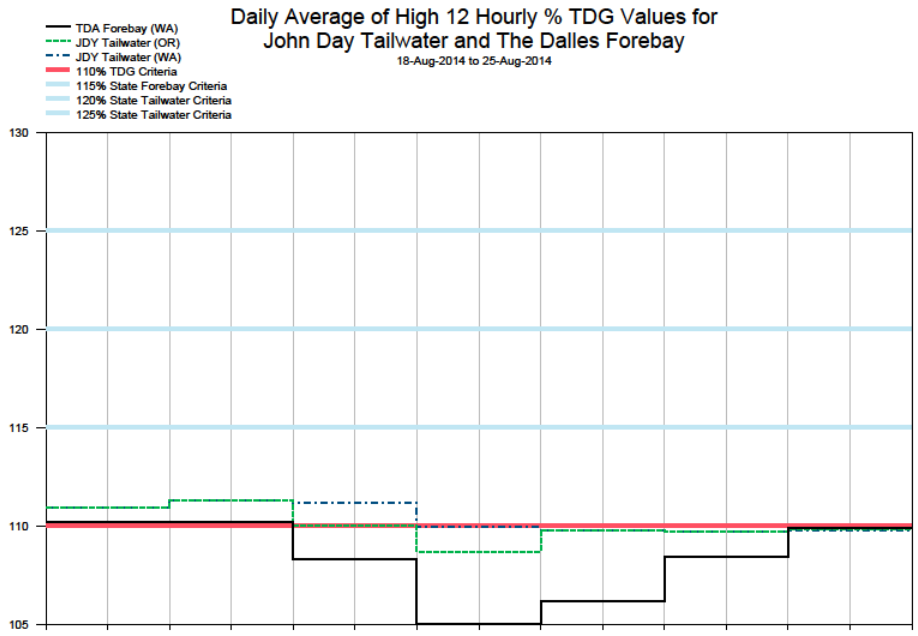

McNary Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/18/14 01:00
08/18/14 13:00
08/19/14 01:00
08/19/14 13:00
08/20/14 01:00
08/20/14 13:00
08/21/14 01:00
08/21/14 13:00
08/22/14 01:00
08/22/14 13:00
08/23/14 01:00
08/23/14 13:00
08/24/14 01:00
08/24/14 13:00
08/25/14 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
50% of Total Flow

Figure 22


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
18-Aug-2014 to 25-Aug-2014
TDA Forebay (WA)
JDY Tailwater (OR)
JDY Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

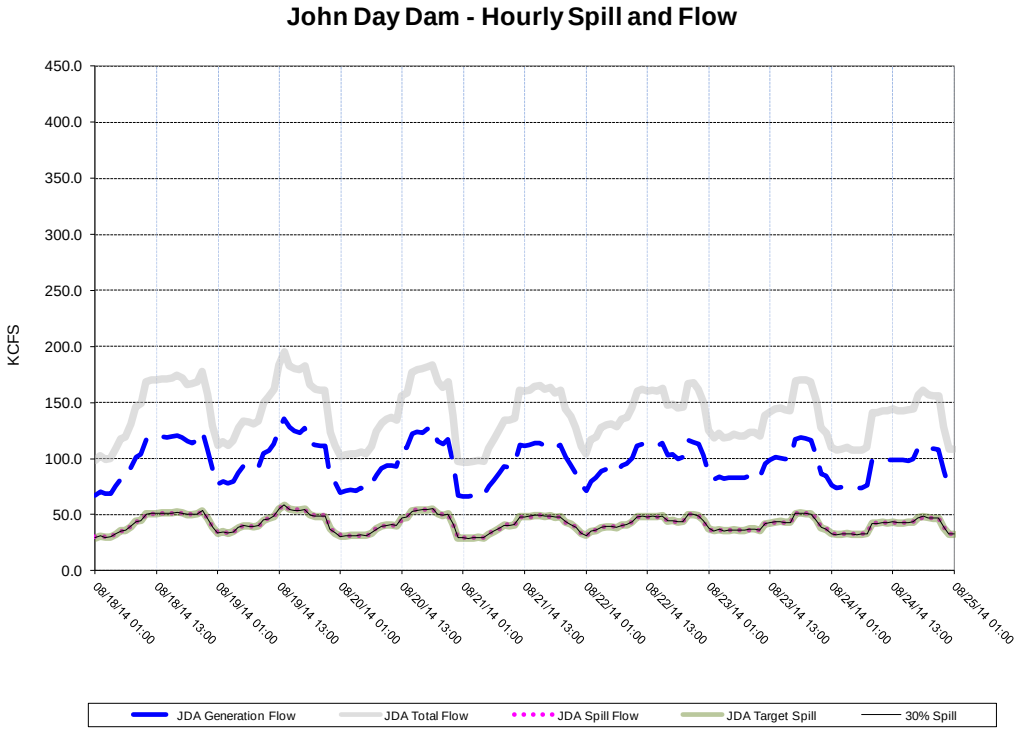
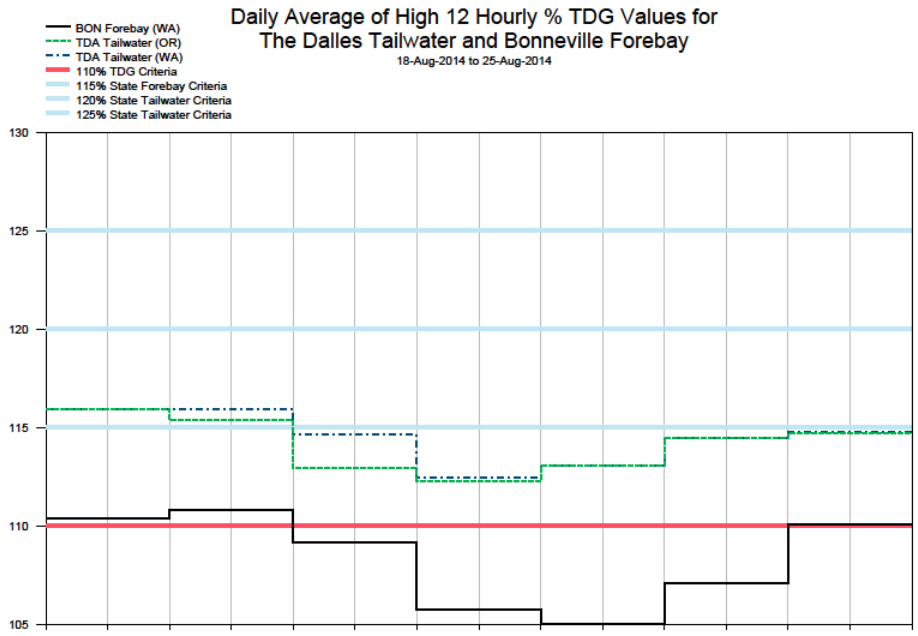

John Day Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/18/14 01:00
08/18/14 13:00
08/19/14 01:00
08/19/14 13:00
08/20/14 01:00
08/20/14 13:00
08/21/14 01:00
08/21/14 13:00
08/22/14 01:00
08/22/14 13:00
08/23/14 01:00
08/23/14 13:00
08/24/14 01:00
08/24/14 13:00
08/25/14 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% Spill

Figure 23


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
18-Aug-2014 to 25-Aug-2014
BON Forebay (WA)
TDA Tailwater (OR)
TDA Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

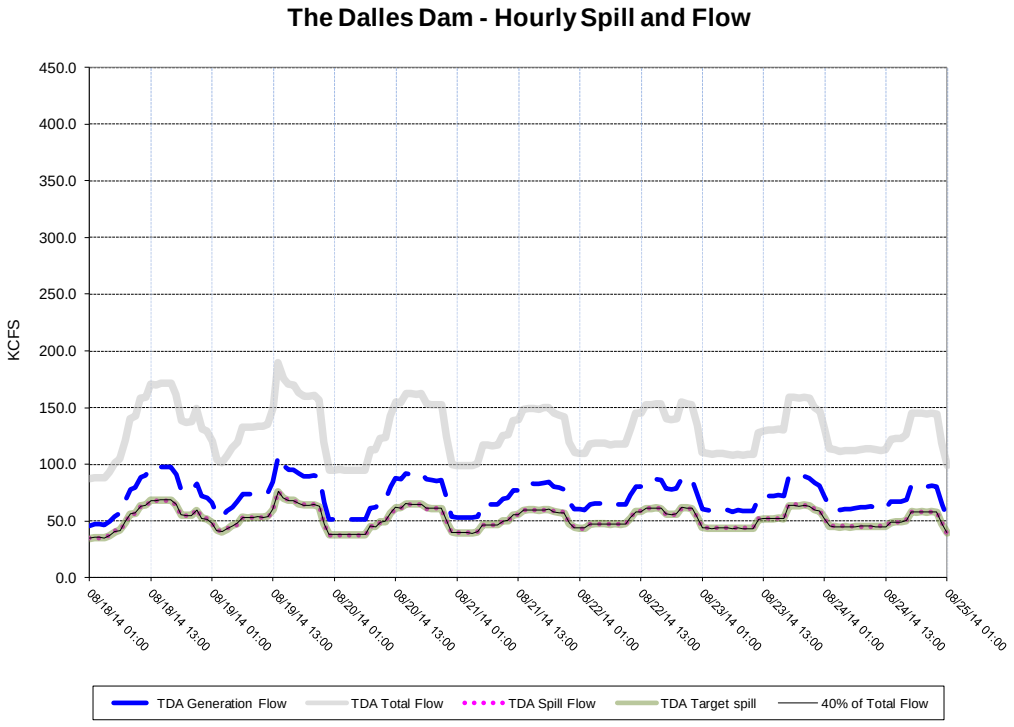
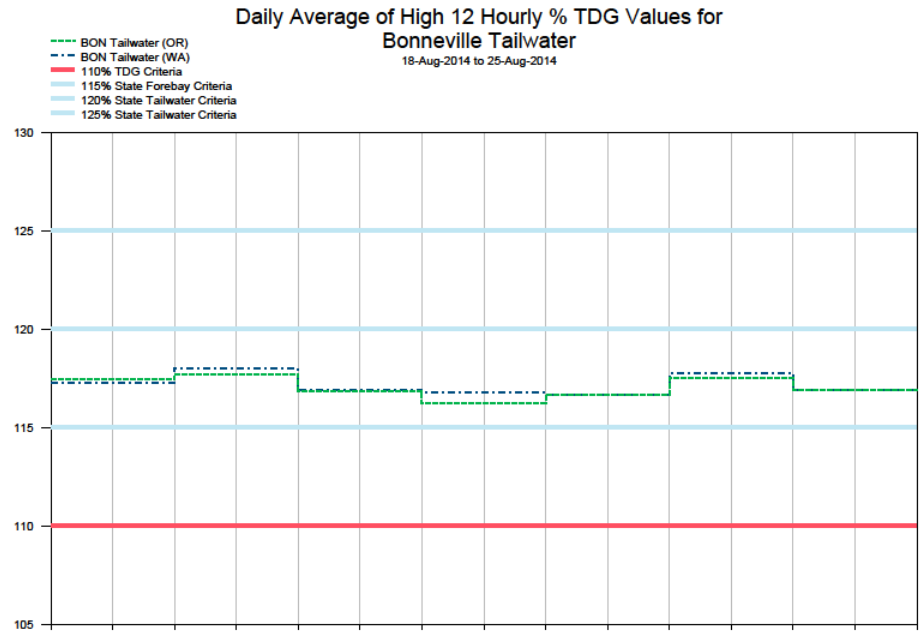

The Dalles Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/18/14 01:00
08/18/14 13:00
08/19/14 01:00
08/19/14 13:00
08/20/14 01:00
08/20/14 13:00
08/21/14 01:00
08/21/14 13:00
08/22/14 01:00
08/22/14 13:00
08/23/14 01:00
08/23/14 13:00
08/24/14 01:00
08/24/14 13:00
08/25/14 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

Figure 24


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
18-Aug-2014 to 25-Aug-2014
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

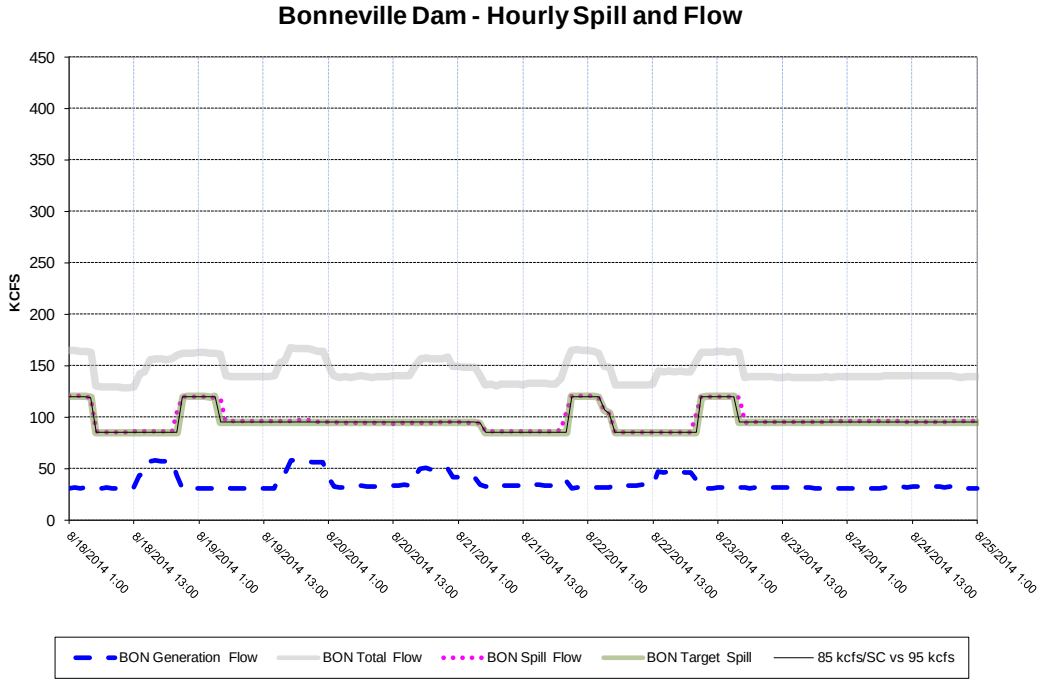
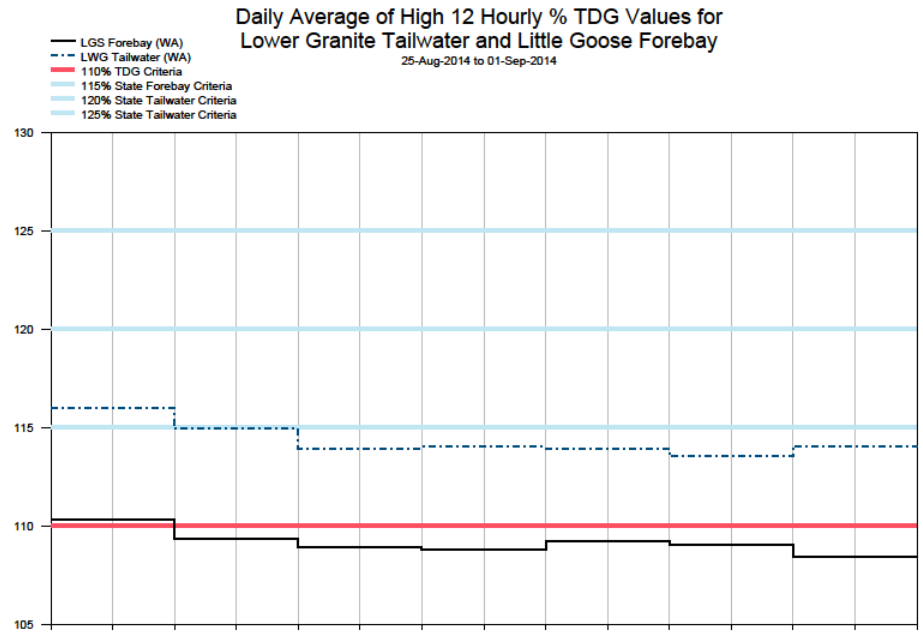

Bonneville Dam - Hourly Spill and Flow
KCFS
450
400
350
300
250
200
150
100
50
0
8/18/2014 1:00
8/18/2014 13:00
8/19/2014 1:00
8/19/2014 13:00
8/20/2014 1:00
8/20/2014 13:00
8/21/2014 1:00
8/21/2014 13:00
8/22/2014 1:00
8/22/2014 13:00
8/23/2014 1:00
8/23/2014 13:00
8/24/2014 1:00
8/24/2014 13:00
8/25/2014 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
85 kcfs/SC vs 95 kcfs

Figure 25


Daily Average of High 12 Hourly % TDG Values for
Lower Granite Tailwater and Little Goose Forebay
25-Aug-2014 to 01-Sep-2014
LGS Forebay (WA)
LWG Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

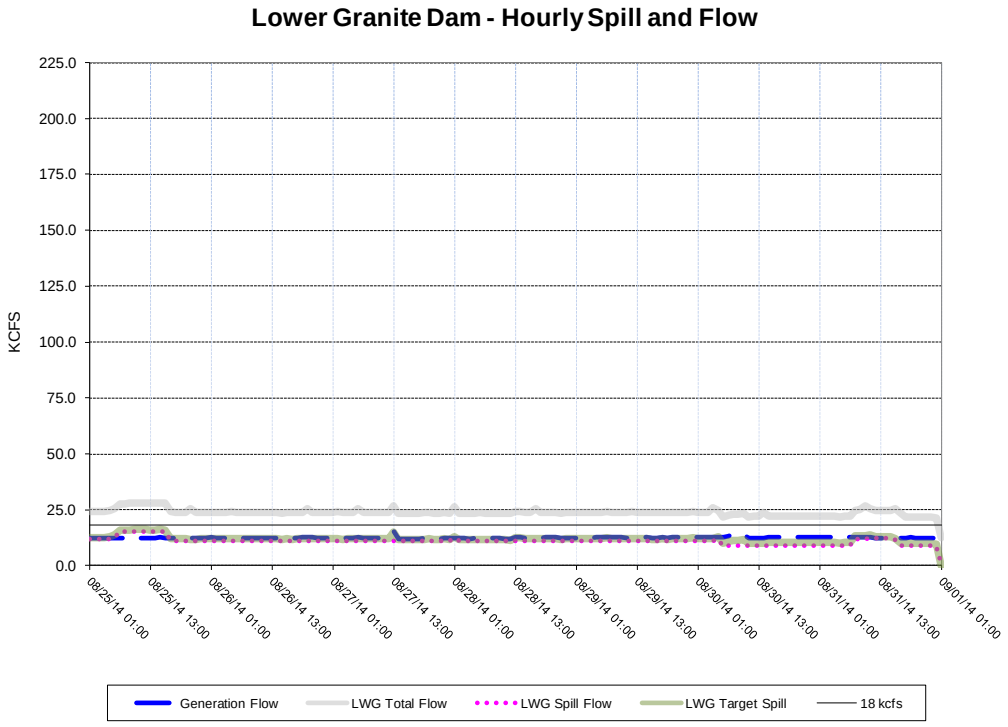
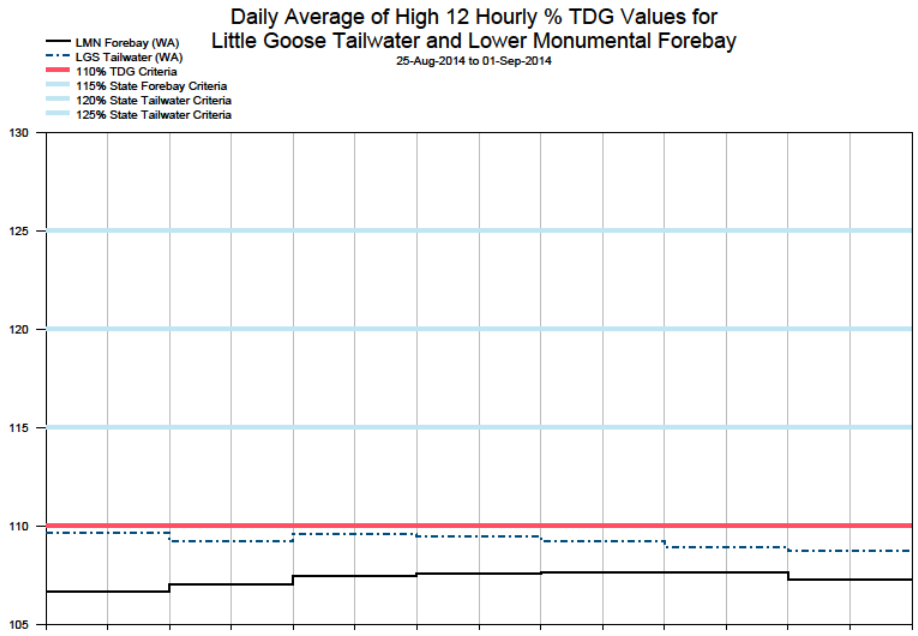

Lower Granite Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/25/14 01:00
08/25/14 13:00
08/26/14 01:00
08/26/14 13:00
08/27/14 01:00
08/27/14 13:00
08/28/14 01:00
08/28/14 13:00
08/29/14 01:00
08/29/14 13:00
08/30/14 01:00
08/30/14 13:00
08/31/14 01:00
08/31/14 13:00
09/01/14 01:00
Generation Flow
LWG Total Flow
LWG Spill Flow
LWG Target Spill
18 kcfs

Figure 26


Daily Average of High 12 Hourly % TDG Values for
Little Goose Tailwater and Lower Monumental Forebay
25-Aug-2014 to 01-Sep-2014
LMN Forebay (WA)
LGS Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

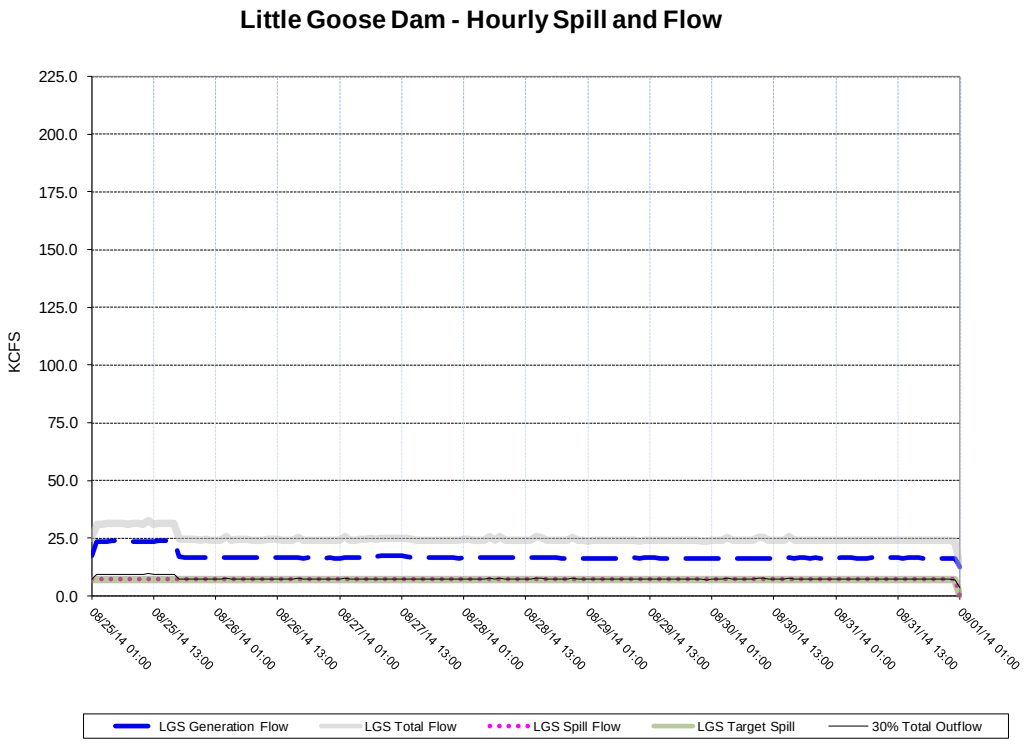
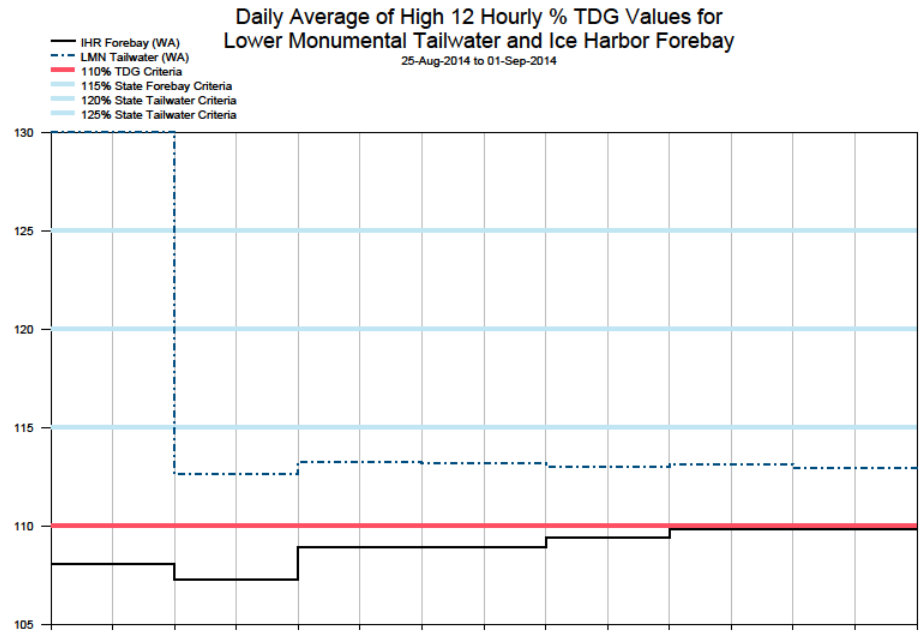

Little Goose Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/25/14 01:00
08/25/14 13:00
08/26/14 01:00
08/26/14 13:00
08/27/14 01:00
08/27/14 13:00
08/28/14 01:00
08/28/14 13:00
08/29/14 01:00
08/29/14 13:00
08/30/14 01:00
08/30/14 13:00
08/31/14 01:00
08/31/14 13:00
09/01/14 01:00
LGS Generation Flow
LGS Total Flow
LGS Spill Flow
LGS Target Spill
30% Total Outflow

Figure 27


Daily Average of High 12 Hourly % TDG Values for
Lower Monumental Tailwater and Ice Harbor Forebay
25-Aug-2014 to 01-Sep-2014
IHR Forebay (WA)
LMN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

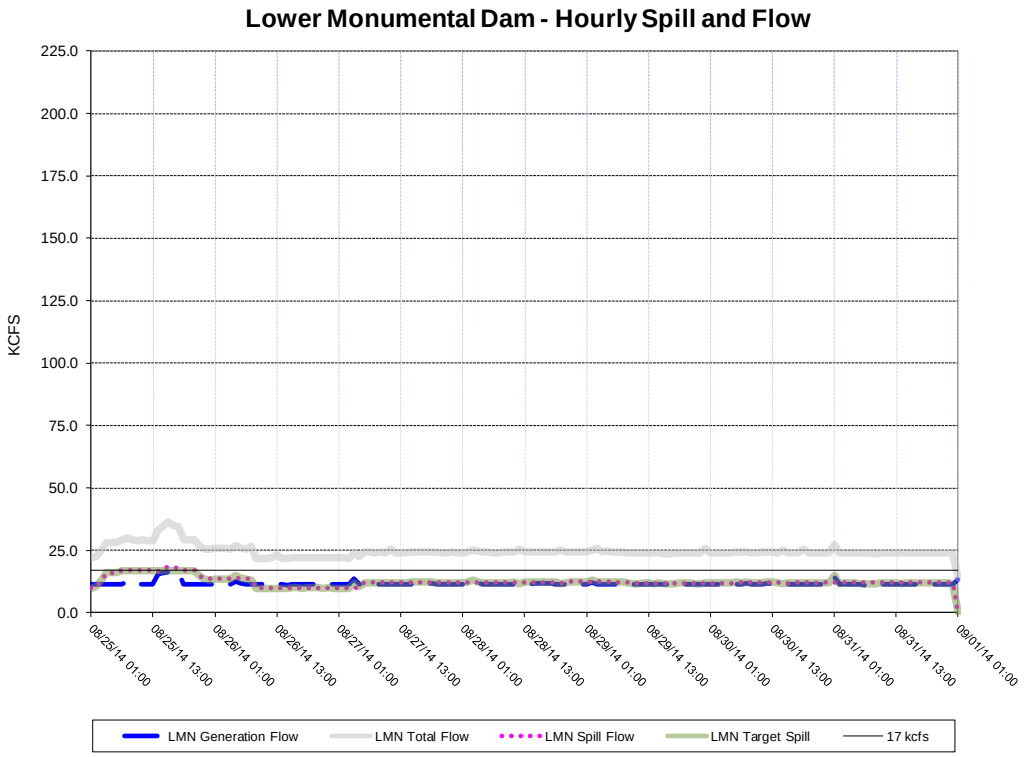
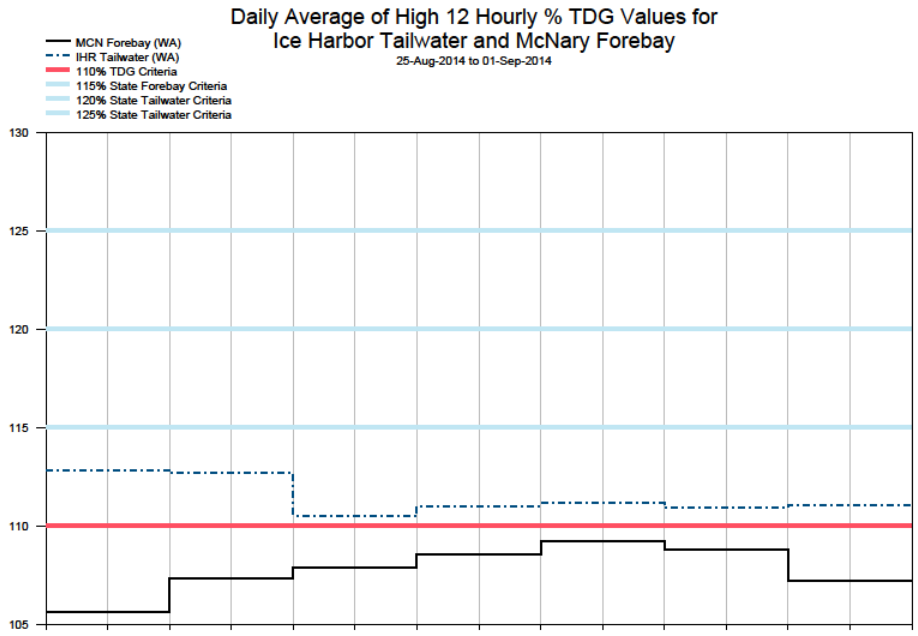

Lower Monumental Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/25/14 01:00
08/25/14 13:00
08/26/14 01:00
08/26/14 13:00
08/27/14 01:00
08/27/14 13:00
08/28/14 01:00
08/28/14 13:00
08/29/14 01:00
08/29/14 13:00
08/30/14 01:00
08/30/14 13:00
08/31/14 01:00
08/31/14 13:00
09/01/14 01:00
LMN Generation Flow
LMN Total Flow
LMN Spill Flow
LMN Target Spill
17 kcfs

Figure 28


Daily Average of High 12 Hourly % TDG Values for
Ice Harbor Tailwater and McNary Forebay
25-Aug-2014 to 01-Sep-2014
MCN Forebay (WA)
IHR Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

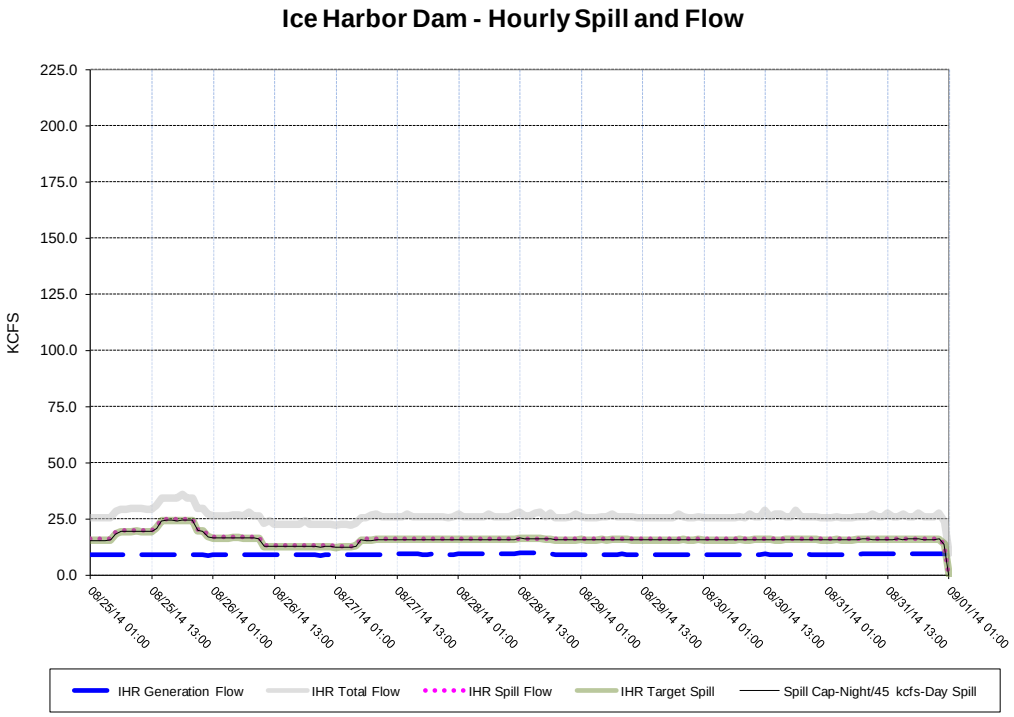
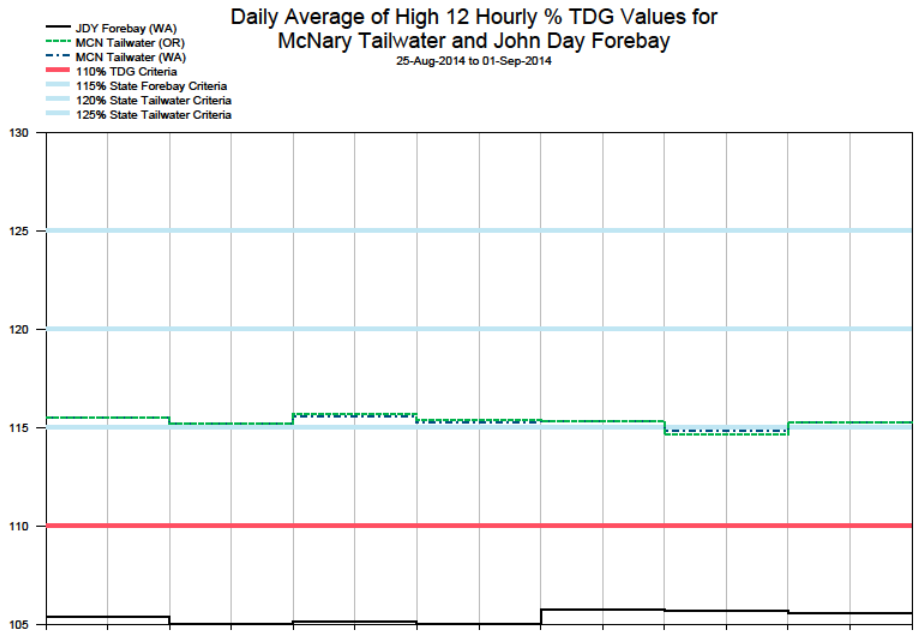

Ice Harbor Dam - Hourly Spill and Flow
KCFS
225.0
200.0
175.0
150.0
125.0
100.0
75.0
50.0
25.0
0.0
08/25/14 01:00
08/25/14 13:00
08/26/14 01:00
08/26/14 13:00
08/27/14 01:00
08/27/14 13:00
08/28/14 01:00
08/28/14 13:00
08/29/14 01:00
08/29/14 13:00
08/30/14 01:00
08/30/14 13:00
08/31/14 01:00
08/31/14 13:00
09/01/14 01:00
IHR Generation Flow
IHR Total Flow
IHR Spill Flow
IHR Target Spill
Spill Cap-Night/45 kcfs-Day Spill

Figure 29


Daily Average of High 12 Hourly % TDG Values for
McNary Tailwater and John Day Forebay
25-Aug-2014 to 01-Sep-2014
JDY Forebay (WA)
MCN Tailwater (OR)
MCN Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

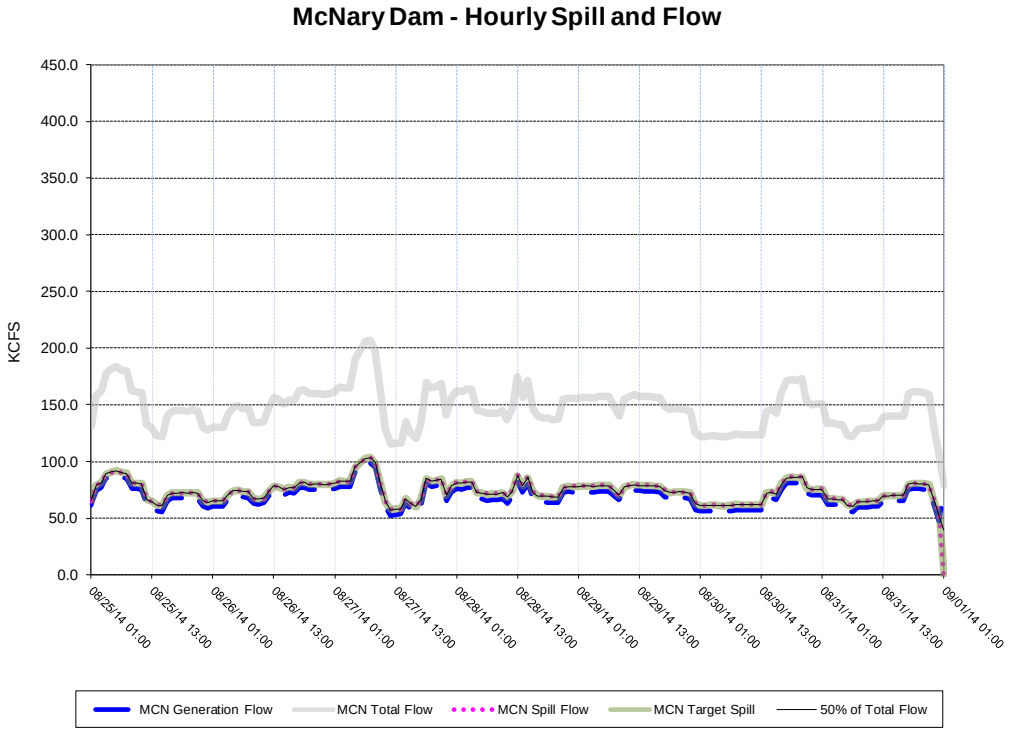
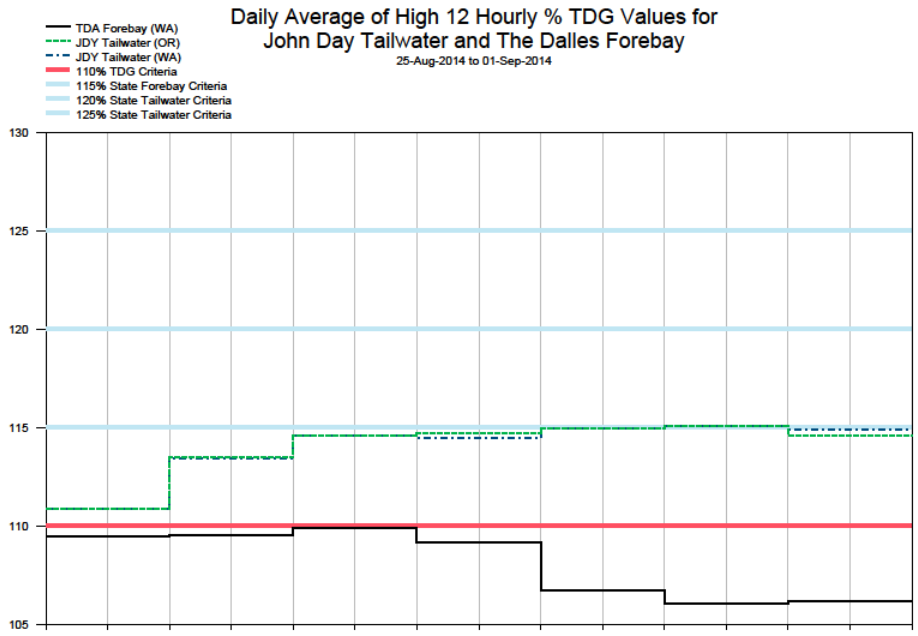

McNary Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/25/14 01:00
08/25/14 13:00
08/26/14 01:00
08/26/14 13:00
08/27/14 01:00
08/27/14 13:00
08/28/14 01:00
08/28/14 13:00
08/29/14 01:00
08/29/14 13:00
08/30/14 01:00
08/30/14 13:00
08/31/14 01:00
08/31/14 13:00
09/01/14 01:00
MCN Generation Flow
MCN Total Flow
MCN Spill Flow
MCN Target Spill
50% of Total Flow

Figure 30


Daily Average of High 12 Hourly % TDG Values for
John Day Tailwater and The Dalles Forebay
25-Aug-2014 to 01-Sep-2014
TDA Forebay (WA)
JDY Tailwater (OR)
JDY Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

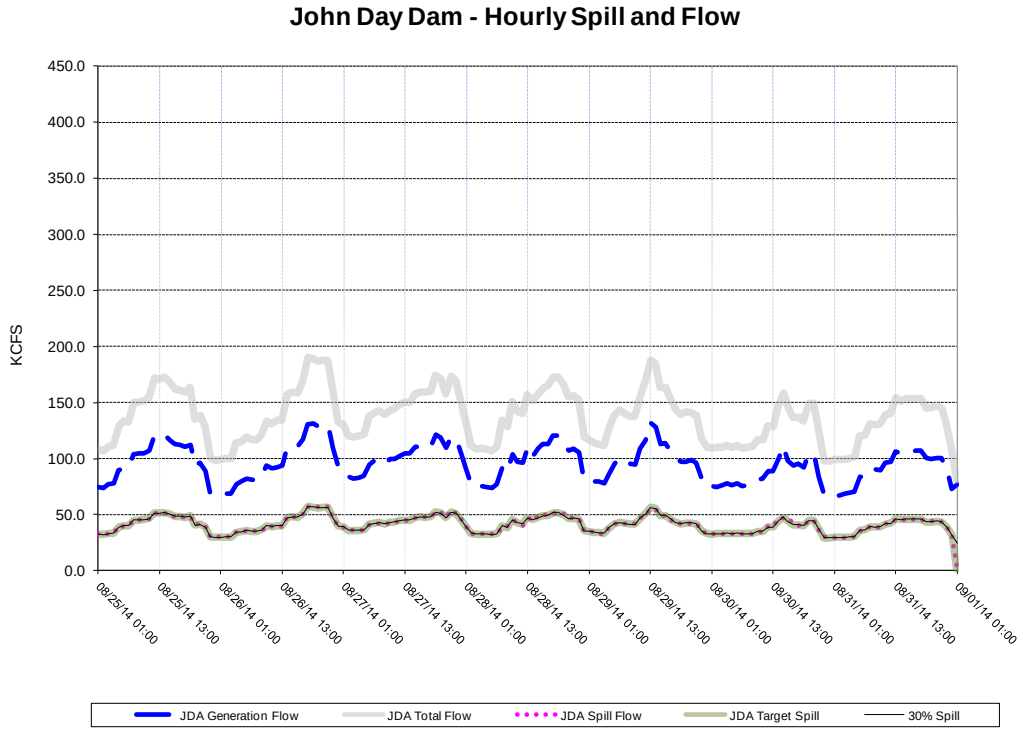
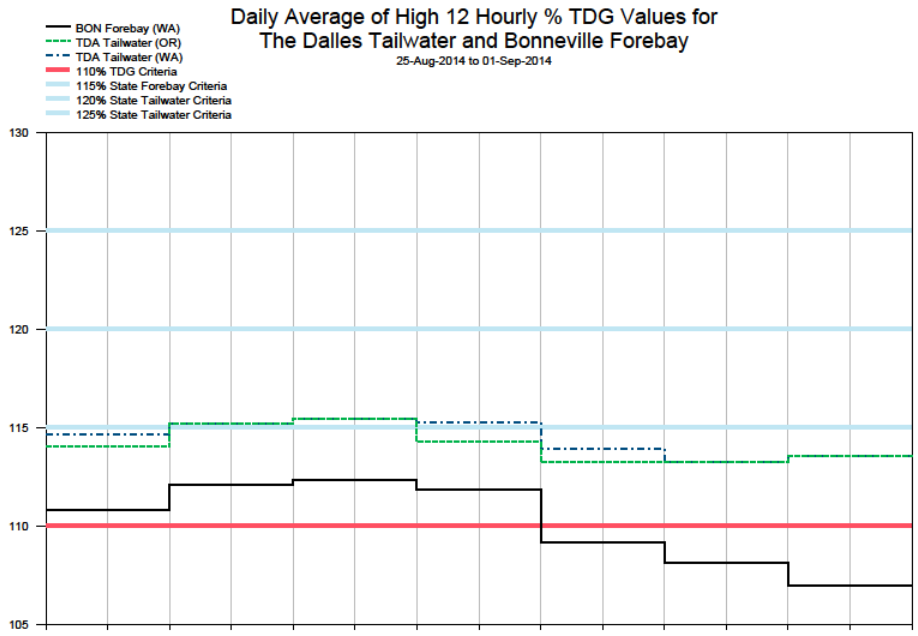

John Day Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/25/14 01:00
08/25/14 13:00
08/26/14 01:00
08/26/14 13:00
08/27/14 01:00
08/27/14 13:00
08/28/14 01:00
08/28/14 13:00
08/29/14 01:00
08/29/14 13:00
08/30/14 01:00
08/30/14 13:00
08/31/14 01:00
08/31/14 13:00
09/01/14 01:00
JDA Generation Flow
JDA Total Flow
JDA Spill Flow
JDA Target Spill
30% Spill

Figure 31


Daily Average of High 12 Hourly % TDG Values for
The Dalles Tailwater and Bonneville Forebay
25-Aug-2014 to 01-Sep-2014
BON Forebay (WA)
TDA Tailwater (OR)
TDA Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

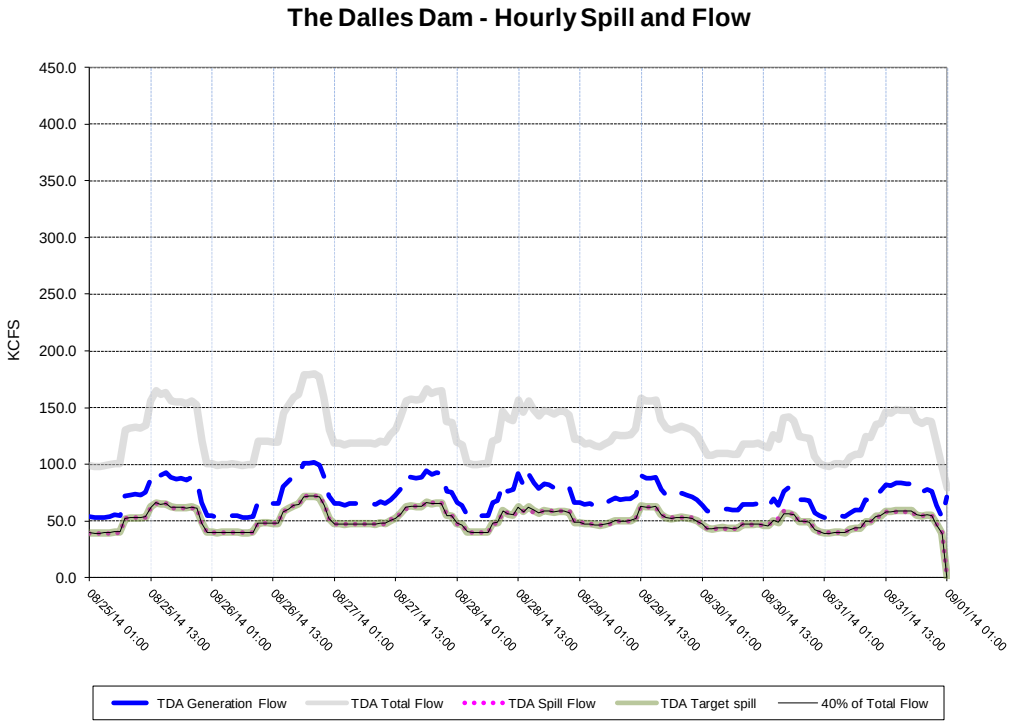
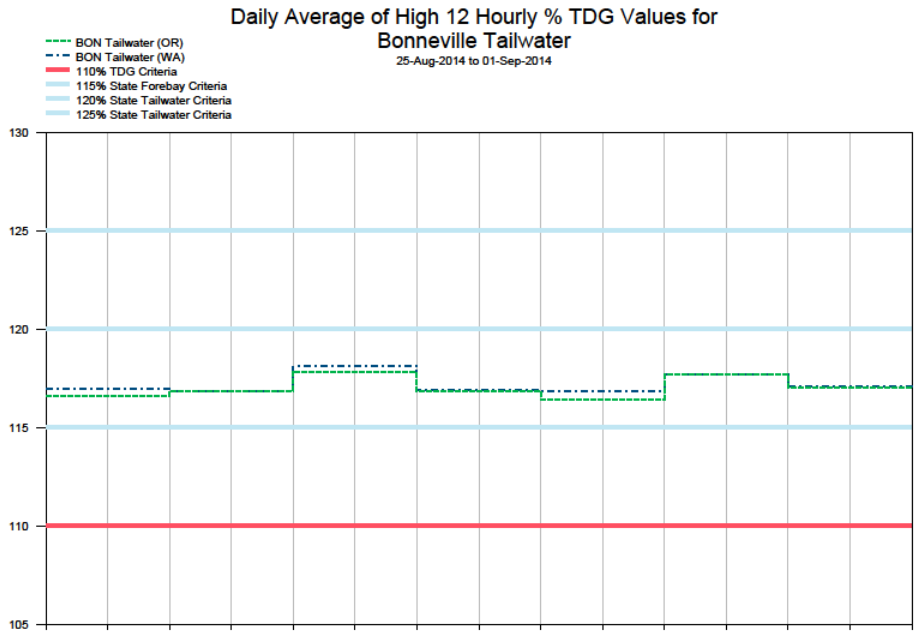

The Dalles Dam - Hourly Spill and Flow
KCFS
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
08/25/14 01:00
08/25/14 13:00
08/26/14 01:00
08/26/14 13:00
08/27/14 01:00
08/27/14 13:00
08/28/14 01:00
08/28/14 13:00
08/29/14 01:00
08/29/14 13:00
08/30/14 01:00
08/30/14 13:00
08/31/14 01:00
08/31/14 13:00
09/01/14 01:00
TDA Generation Flow
TDA Total Flow
TDA Spill Flow
TDA Target spill
40% of Total Flow

Figure 32


Daily Average of High 12 Hourly % TDG Values for
Bonneville Tailwater
25-Aug-2014 to 01-Sep-2014
BON Tailwater (OR)
BON Tailwater (WA)
110% TDG Criteria
115% State Forebay Criteria
120% State Tailwater Criteria
125% State Tailwater Criteria
130
125
120
115
110
105

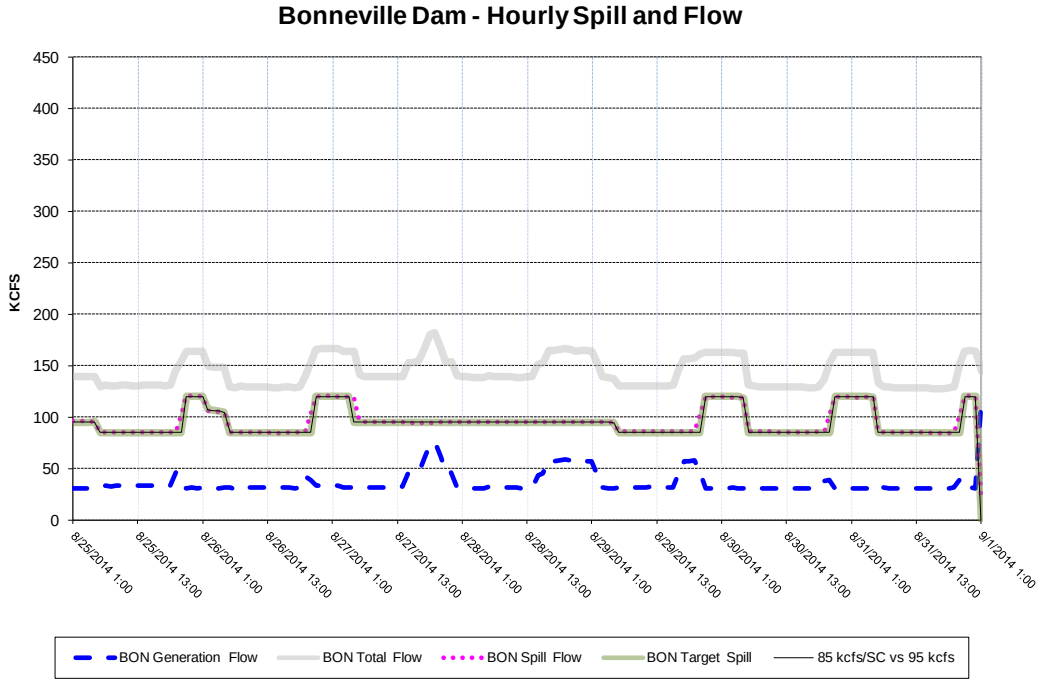

Bonneville Dam - Hourly Spill and Flow
KCFS
450
400
350
300
250
200
150
100
50
0
8/25/2014 1:00
8/25/2014 13:00
8/26/2014 1:00
8/26/2014 13:00
8/27/2014 1:00
8/27/2014 13:00
8/28/2014 1:00
8/28/2014 13:00
8/29/2014 1:00
8/29/2014 13:00
8/30/2014 1:00
8/30/2014 13:00
8/31/2014 1:00
8/31/2014 13:00
9/1/2014 1:00
BON Generation Flow
BON Total Flow
BON Spill Flow
BON Target Spill
85 kcfs/SC vs 95 kcfs

Table 2
Average Percent TDG Values For August 4 – August 31

Date	FIXED MONITORING STATIONS																			
	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW		JDY	JHAW		TDA	TDDO		BON	CCIW	
Method:	WA	WA	WA	WA	WA	WA	WA	WA	WA	OR	WA	WA	OR	WA	WA	OR	WA	WA	OR	WA
Gas Cap %	115	120	115	120	115	120	115	120	115	120	120	115	120	120	115	120	120	115	120	120
8/4/2014	103.8	116.3	114.1	113.1	113.1	115.9	113.7	113.7	110.5	116.1	~~115.8~~	112.0	~~114.6~~	114.9	112.4	116.8	~~116.8~~	111.1	117.2	~~117.1~~
8/5/2014	103.8	119.3	113.6	110.6	112.8	115.5	113.5	113.3	110.5	116.1	~~116.1~~	112.0	114.2	~~114.2~~	112.2	~~114.9~~	116.4	111.0	~~116.7~~	117.1
8/6/2014	103.3	119.5	113.6	110.2	112.1	115.4	112.6	112.1	109.5	116.1	~~116.0~~	110.5	115.0	~~115.0~~	108.4	~~113.2~~	114.0	107.8	~~117.2~~	117.2
8/7/2014	101.8	119.1	113.2	110.2	112.0	116.0	112.4	114.0	109.6	116.9	~~116.9~~	109.0	~~114.8~~	114.8	106.8	114.0	~~114.0~~	105.9	~~117.6~~	117.9
8/8/2014	101.7	117.7	113.0	110.1	111.5	115.6	112.4	113.6	108.8	~~116.3~~	116.8	108.1	~~114.1~~	114.3	106.7	~~113.6~~	113.9	105.5	117.1	~~117.0~~
8/9/2014	101.2	116.6	112.7	110.5	109.4	115.6	112.6	114.2	107.7	116.1	~~116.1~~	106.2	~~113.6~~	113.7	106.6	113.9	~~113.9~~	106.5	~~116.5~~	116.7
8/10/2014	101.0	116.5	111.9	110.3	108.7	114.9	111.6	113.7	107.8	116.3	~~116.3~~	105.8	~~113.5~~	113.5	109.0	115.5	~~115.5~~	109.1	117.3	~~117.0~~
8/11/2014	101.2	118.8	112.6	110.5	109.1	117.7	112.1	113.4	108.7	116.7	~~116.6~~	106.9	113.4	~~113.4~~	109.7	116.3	~~116.3~~	112.0	~~118.1~~	118.4
8/12/2014	101.2	118.5	113.9	114.6	109.8	117.2	112.4	113.8	108.8	116.8	~~116.6~~	107.2	~~113.1~~	113.1	110.1	~~115.3~~	116.2	113.1	117.6	~~117.6~~
8/13/2014	100.9	118.4	113.1	114.3	109.7	115.6	112.6	113.6	108.1	~~116.4~~	116.4	106.3	~~111.5~~	112.4	108.3	~~114.4~~	114.9	112.3	~~116.8~~	117.4
8/14/2014	101.4	118.4	113.0	110.9	109.5	114.7	112.5	113.5	108.0	115.8	~~115.8~~	106.3	~~110.5~~	110.7	107.2	114.1	~~114.1~~	109.4	~~117.1~~	117.4
8/15/2014	101.8	118.9	112.3	110.8	109.5	115.7	112.4	114.0	107.4	115.7	~~115.5~~	107.3	109.8	~~109.8~~	108.4	114.3	~~114.2~~	108.5	117.2	~~117.2~~
8/16/2014	101.8	118.3	113.7	110.9	108.9	113.5	112.4	111.9	106.7	~~114.6~~	115.1	107.3	~~108.4~~	108.9	108.6	~~114.7~~	114.7	109.2	117.2	~~117.2~~
8/17/2014	101.8	118.9	113.8	110.8	110.0	113.7	111.7	112.0	107.0	114.8	~~114.8~~	107.2	110.2	~~110.2~~	109.0	114.8	~~114.8~~	109.2	~~116.9~~	117.2
8/18/2014	101.5	115.2	113.1	110.7	110.1	113.4	111.4	113.5	108.9	115.5	~~115.5~~	108.2	110.9	~~110.9~~	110.2	~~115.9~~	115.9	110.5	117.7	~~117.5~~
8/19/2014	101.5	114.2	113.7	111.0	110.5	113.3	111.6	113.1	109.4	116.4	~~116.4~~	108.8	~~111.3~~	111.3	110.1	~~115.4~~	115.8	110.8	~~117.8~~	118.3
8/20/2014	101.5	113.5	114.3	110.7	110.4	112.6	111.5	111.6	109.1	~~115.7~~	116.0	108.2	~~110.0~~	111.0	108.0	~~112.8~~	114.5	109.0	~~117.1~~	117.1
8/21/2014	99.8	113.0	114.0	111.0	108.9	115.4	110.6	110.9	107.6	115.1	~~115.1~~	106.1	~~108.6~~	109.7	104.8	~~112.3~~	112.3	105.7	~~116.6~~	117.0
8/22/2014	99.9	112.2	112.2	110.8	108.1	114.5	109.9	110.9	106.7	~~114.2~~	115.0	104.9	109.8	~~109.7~~	106.2	113.1	~~113.1~~	104.7	116.9	~~116.9~~
8/23/2014	99.5	112.6	111.6	109.9	107.1	112.4	109.8	110.8	104.7	~~114.3~~	114.3	104.6	109.7	~~109.6~~	108.4	114.6	~~114.6~~	107.4	~~117.6~~	117.9
8/24/2014	100.9	115.1	110.3	109.8	106.6	112.6	108.5	110.5	105.5	114.9	~~114.9~~	105.3	~~109.8~~	109.8	109.9	~~114.7~~	114.7	110.2	117.1	~~117.1~~
8/25/2014	100.2	116.0	110.2	109.5	106.7	113.1	108.0	112.8	105.6	115.5	~~115.5~~	105.3	~~110.8~~	110.8	109.3	~~114.0~~	114.7	111.0	~~116.9~~	117.1
8/26/2014	98.9	114.7	109.3	109.2	107.0	112.6	107.3	112.6	107.4	~~115.2~~	115.2	104.8	113.9	~~113.8~~	109.5	~~115.3~~	115.3	112.2	117.1	~~117.1~~
8/27/2014	98.2	113.9	108.9	109.6	107.5	113.2	108.9	110.5	107.8	115.6	~~115.5~~	105.1	114.6	~~114.5~~	109.9	115.4	~~115.4~~	112.3	~~118.0~~	118.3
8/28/2014	99.2	114.0	108.8	109.4	107.5	113.1	108.9	111.0	108.6	115.3	~~115.3~~	104.5	114.8	~~114.6~~	108.9	~~114.2~~	115.1	111.6	~~117.1~~	117.2
8/29/2014	101.6	113.9	109.2	109.2	107.6	113.0	109.4	111.1	109.2	115.3	~~115.3~~	105.7	114.9	~~114.9~~	106.6	~~113.2~~	113.8	109.2	~~116.7~~	117.1
8/30/2014	102.1	113.4	109.0	108.9	107.6	113.1	109.8	110.9	108.7	~~114.6~~	114.6	105.6	115.1	~~115.0~~	106.0	113.2	~~113.2~~	108.1	117.9	~~117.9~~
8/31/2014	102.1	114.0	108.4	108.6	107.2	112.9	109.8	111.0	107.1	115.3	~~115.3~~	105.5	~~114.6~~	114.7	106.1	113.5	~~113.5~~	107.0	~~117.2~~	117.3

Total Dissolved Gas Monitoring Stations

Code	Station Name
LWG	Lower Granite Forebay
LGNW	Lower Granite Tailwater
LGSA	Little Goose Forebay
LGSW	Little Goose Tailwater
LMNA	Lower Monumental Forebay
LMNW	Lower Monumental Tailwater
IHRA	Ice Harbor Forebay
IDSW	Ice Harbor Tailwater
MCNA	McNary Forebay
MCPW	McNary Tailwater
JDY	John Day Forebay
JHAW	John Day Tailwater
TDA	The Dalles Forebay
TDDO	The Dalles Tailwater
BON	Bonneville Forebay
CCIW	Bonneville Tailwater (Cascade Island)