

## Appendix B

### COLUMBIA RIVER SYSTEM OPERATIONS: 2024-2033

#### SPRING SPILL OPERATIONS

	Operation (2024–2033)	Implementation Comments
<b>Season</b>	<b>4/3 to 6/20</b>	
Lower Granite (LWG)	125% TDG Gas Cap (or 40% when adult passage delays are detected) <sup>20</sup>	See adult delay protocol below.
Little Goose (LGS)	125% TDG gas cap spill for 24 hours (to adult criteria), no flexible spill, <sup>21</sup> 125% TDG gas cap spill for 16 hours, 30% for 8 hours	Maintain similar implementation language from 2023 FOP with operational flexibility of target timeframes to reduce spill for adult passage during lack of load conditions.  LGS operations at 30% for 8 hours during daytime hours will be prioritized if adult delays occur at LWG or LMN and lack of load conditions exist (like 2023 FOP).
Lower Monumental (LMN)	125% TDG Gas Cap (or 40% when adult passage delays are detected)	See adult delay protocol below.
Ice Harbor (IHR)	125% TDG gas cap spill for 24 hours	Like operations implemented in 2023.
<b>Season</b>	<b>4/10 to 6/15</b>	
McNary (MCN)	125% TDG gas cap spill for 24 hours  Maintain current minimum generation range of 50-60 kcfs for transmission services; powerhouse outflows may increase up to 80 kcfs for reserves (without a spill variance)	Increased powerhouse generation allowances will allow for additional generation to be brought on-line for the purpose of providing real-time operators greater access to reserve capacity prior to requiring variance tracking or declarations of power system emergency. As needed, these ranges will be utilized under low flow conditions (e.g., minimum generation and spill the rest) and when flexibility elsewhere has been maximized.

<sup>20</sup> The agencies will use the current Columbia River DART’s Reach Distribution and Delay for PIT Tag Adult Returns tool (“DART tool”) to identify adult delays and passage issues.

<sup>21</sup> LGS Adult Criteria: Within 1 business day of when the earliest of the following conditions occurs: (1) a cumulative total of 25 adult spring Chinook salmon (not including jacks) pass Lower Monumental Dam; or (2) a cumulative total of 50 adult spring Chinook salmon (not including jacks) pass Ice Harbor Dam; or (3) April 24, 2024. See 2023 FOP.

John Day (JDA)	Spill during daytime hours 40% and increased spill up to 125% TDG gas cap spill during nighttime hours (following 2023 FPP JDA-5 table where nighttime hours defined and generally between 2200 and 0600)	Increased powerhouse generation allowances will allow for additional generation to be brought on-line for the purpose of providing real-time operators greater access to reserve capacity prior to requiring variance tracking or declarations of power system emergency. As needed, these ranges will be utilized under low flow conditions (e.g., minimum generation and spill the rest) and when flexibility elsewhere has been maximized.
	<p>Daytime hourly spill target of 40% river flows with <math>\pm 5\%</math> variance of river flows for balancing reserves, consistent with current spill variance tolerance calculations</p> <p>The Corps sets JDA spill caps to maximize spill, up to 125% TDG in the tailwater of JDA and TDA and to maintain TDA spill at 40%</p> <p>Maintain current minimum generation range of 50-60 kcfs for transmission services; powerhouse outflows may increase up to 80 kcfs for reserves (without a spill variance)</p>	
The Dalles (TDA)	<p>40% for 24 hours</p> <p>Allocation of reserves may result in spill above 40% of river flows; maintain current minimum generation range of 50-60 kcfs for Transmission services</p>	Like operations implemented in 2023.
Bonneville (BON)	<p>125% TDG gas cap spill for 24 hours (150 kcfs cap)</p> <p>Maintain current minimum generation range of 30-40 kcfs for Transmission services; powerhouse outflows may increase up to 60 kcfs for reserves (without a spill variance)</p>	Increased powerhouse generation allowances will allow for additional generation to be brought on-line for the purpose of providing real-time operators greater access to reserve capacity prior to requiring variance tracking or declarations of power system emergency. As needed, these ranges will be utilized under low flow conditions (e.g., minimum generation and spill the rest) and when flexibility elsewhere has been maximized.

**Reserves:** Spill reductions to maintain reliability will continue to be implemented as described in the Fish Passage Plan and when powerhouse flows exceed the ranges proposed above by the USG at each of the lower Columbia River projects, spill variances will be reported.

**SUMMER SPILL OPERATIONS**

	<b>Operation (2024–2033)</b>	<b>Implementation Comments</b>
<b>Season</b>	<b>6/21 to 7/31</b> <b>8/1 to 8/31</b>	
Lower Granite (LWG)	18 kcfs SW flow (as river flow allows)	Reducing summer spill flows on August 1 from 18 kcfs to SW flow (as river flow allows)
Little Goose (LGS)	30% SW flow or 7 kcfs spill	Reducing summer spill flows on August 1 from 30% to SW flow (or 7 kcfs spill)
Lower Monumental (LMN)	17 kcfs SW flow or 8 kcfs spill	Reducing summer spill flows on August 1 from 17 kcfs to SW flow (or 8 kcfs spill)
Ice Harbor (IHR)	30% SW flow or 9 kcfs spill	Reducing summer spill flows on August 1 from 30% to SW flow (or 9 kcfs spill)
<b>Season</b>	<b>6/16 to 7/31</b> <b>8/1 to 8/31</b>	
McNary (MCN)	57% 20 kcfs	Reducing summer spill flows on 8/1 57% to 20 kcfs  Like spring operations, increased powerhouse generation allowances will allow for additional generation to be brought on-line for the purpose of providing real-time operators greater access to reserve capacity prior to requiring variance tracking or declarations of power system emergency. As needed, these ranges will be utilized under low flow conditions (e.g., minimum generation and spill the rest) and when flexibility elsewhere has been maximized.  USG will release 57% of river flows based on previous days average flow to minimize gate changes until spill gate/crane repairs are complete.
John Day (JDA)	Daytime spill hourly target average of 35% river flows with $\pm 5\%$ variance of river flows for balancing reserves, consistent with current spill variance tolerance calculations  20 kcfs	Reducing summer spill flows on 8/1 35% to 20 kcfs.  Hourly spill of 35% with range of $\pm 5\%$ for reserves (without spill variance).

The Dalles (TDA)	40% 30%	Reducing summer spill flows on August 1 40% to 30%. Provide a target spill of 40% (or 30% in late summer) with range of $\pm 5\%$ for reserves.
Bonneville (BON)	95 kcfs 50 kcfs	Reducing summer spill flows on August 1 from 95 kcfs to 50 kcfs.

**FALL/WINTER SPILL OPERATIONS**

	<b>Operation (2024–2033)</b>	<b>Implementation Comments</b>
<b>Season</b>	<b>9/1 to 11/15, 3/1 to 3/20</b> <b>3/21 to 4/2</b>	
Lower Granite (LWG)	Surface weir (SW) spill 7 days per week, for 4 hours (9/1 to 11/15, 3/1 to 3/20) SW spill 24 hours (3/21 to 4/2)	
Little Goose (LGS)	SW spill 7 days per week, for 4 hours (9/1 to 11/15, 3/1 to 3/20) SW spill 24 hours (3/21 to 4/2)	
Lower Monumental (LMN)	SW spill 7 days per week, for 4 hours (9/1 to 11/15, 3/1 to 3/20) SW spill 24 hours (3/21 to 4/2)	
Ice Harbor (IHR)	SW spill 7 days per week, for 4 hours (9/1 to 11/15, 3/1 to 3/20) SW spill 24 hours (3/21 to 4/2)	
<b>Season</b>	<b>9/1 to 11/15, 3/1 to 3/20</b> <b>3/21 to 4/9</b>	
McNary (MCN)	1 SW spill 7 days per week, for 4 hours (9/1 to 11/15, 3/1 to 3/20) 1 SW spill 24 hours (3/21 to 4/9)	
John Day (JDA)	No surface spill in fall-winter, except for 1 SW spill 24 hours (3/21 to 4/9 <i>only</i> )	Overshoot monitoring at JDA should continue to inform potential adaptive management. Not implementable to open and close SW daily.

The Dalles (TDA)	ITS 24/7 spill of ~3-5 kcfs spill from 3/1 to 12/15; continue adult ladder spill	
Bonneville (BON)	B2CC (like 2023 coordinated spring operation); ITS full year for 24 hours	Codify recent changes to BON made through regional processes; addressing surface passage 24/7 for 365, including work with regional sovereigns to address issues and concerns on B2CC.

**Additional Information/Explanation** — No change to fall-winter operations at JDA, TDA or BON.

### RESERVOIR ELEVATIONS

	Operation (2024–2033)	Implementation Comments
<b>Season</b>	<b>4/3 to 8/14 (LGS, LMN, IHR)</b> <b>4/3 to 8/31 (LWG)</b>	<b>No change to operations at LGS, LMN, and IHR</b>
Lower Granite (LWG)	733-734.5'	Will operate at MOP with a 1.5 foot forebay operating range and a 1.0 foot range to the extent possible (referred to operationally as a “soft constraint”).
Little Goose (LGS)	633-634.5'	See LWG explanation
Lower Monumental (LMN)	537-538.5'	See LWG explanation
Ice Harbor (IHR)	437-438.5'	See LWG explanation
<b>Season</b>	<b>4/3 to 8/14</b>	<b>No change to operations at MCN, JDA, TDA and BON.</b>
McNary (MCN)	337-340'	

John Day (JDA)	262-266.5 (3/1-3/14) 262.5-266.5 (3/15-4/9) 264.5-266.5 (4/10-6/1) 262.5-266.5 (6/2-6/14) 262.5-264.5 (6/15-8/31)	
The Dalles (TDA)	157-160'	
Bonneville (BON)	71.5-76.5'	

**MISCELLANEOUS**

Miscellaneous	USG Operation (2024–2033)
Zero Generation.	Continue 2023 Operations

**Adult Migration Delay Protocol for Spring Spill Operations at Lower Granite and Lower Monumental projects**

Lower Granite and/or Lower Monumental daytime spill levels will be decreased to 40% for 8 hours per day when adult delay or passage issues are observed at both/either of these projects. An adult delay or passage issue occurs when the following three criteria are met: (1) *fewer than* 50% of the daily cohort of PIT tagged adult spring/summer Snake River Chinook detected at the downstream project (i.e., Ice Harbor or Little Goose dams) arrive at the upstream project (i.e., Lower Monumental or Lower Granite dams) within 3 days and this pattern persists for 3 consecutive days,<sup>22</sup> (2) a running 3-day minimum of 7 PIT tagged adult spring/summer Snake River Chinook salmon are detected at the downstream projects,<sup>23</sup> and (3) if the upstream dam’s average outflow was below 160 kcfs each day of the delay.

If all three criteria are met, the Corps will implement a 40% daytime spill operation (adult daytime spill operation) and continue for 3 consecutive days. Information on the three criteria

<sup>22</sup> The return to 125% TDG spill 24/7 will be triggered if 50 percent or more of the running 3-day cohort for the most recent day (e.g., day 3 of adult daytime spill) is detected at the upstream dam. The agencies will use Columbia River DART’s Reach Distribution and Delay for PIT Tag Adult Returns tool for this purpose.

<sup>23</sup>The agencies will use the current Columbia River DART’s Reach Distribution and Delay for PIT Tag Adult Returns tool (“Running 3-day DART tool”) to determine if criteria one and two have been met. See top panel, in- season graphics of Cumulative Arrival Percent by Days in Route to Lower Granite or Lower Monumental dams. [https://www.cbr.washington.edu/dart/query/pitadult\\_reachdist](https://www.cbr.washington.edu/dart/query/pitadult_reachdist)

would be available on day 4 and the adult daytime spill operation would begin the following business day (day 5) with a targeted start time between 0400-0800 if feasible.

Assuming *greater than* 50% of the daily cohort of PIT tagged adults arrive at the upstream project by day 3 (information available on day 4),<sup>19</sup> then standard operations (125% TDG spill 24/7) would be reinstated the following business day (day 5). If greater than 50% of the daily cohort does NOT arrive at the upstream project by day 3 and project average flow was below 160 kcfs, adult daytime spill operations would continue an additional day, and would be evaluated again the following day as previously described. This would continue until the adult delay or passage issue has been resolved and the standard operations can be reinstated as described.

The Technical Management Team may consider in-season deviations from these criteria if unforeseen factors are reasonably expected to cause substantial delay (e.g., lack of load conditions, priority turbine unit outages, etc) and the Fish Passage Operations and Maintenance Committee may consider refinements to these triggers following each spring spill season.

**Additional Information and Studies**—Operations are supplemented with the following studies, which helps inform the risks inherent in modifying operations in ways that have not previously occurred (or been studied):

- Develop, fund, and implement adult active tag study(ies) no later than 2025 to evaluate the causal mechanism and inform adaptive management of adult passage delays under changing spill and flow conditions (e.g., passage delays, depths at fishway entrances, etc.). Study designs will be collaboratively developed in the Studies Review Work Group (SRWG) regional forum.
- Develop, fund, and implement active tag study(ies), no later than 2025, to evaluate juvenile migration through different passage routes under changing spill and flow conditions. Study designs will be collaboratively developed in the Studies Review Work Group (SRWG) regional forum.
- Develop, fund, and implement studies to improve PIT tag detection capabilities to evaluate long-term efficiency of operations at the LSR and LCR projects. These studies and proposals will focus on (1) designing and installing a spillway detector in one of the surface passage route spillbays at McNary Dam; (2) designing and installing a system to detect fish passing via the spillway at Bonneville Dam; and (3) designing and implementing efforts to improve PIT tag detections in the estuary. Study designs will be collaboratively developed in the Studies Review Work Group (SRWG) regional forum.
- Develop, fund, and implement, no later than 2025, collaboratively developed studies to evaluate depth and downstream profile of TDG/GBT impacts, including estimating population-level impacts for non-salmonid resident species (sculpin, lamprey ammocoetes, native mussels).



- Conduct ERDC modeling of alternative/modified McNary spill patterns prior to start of spring spill operations of 2025.
  - Washington and Oregon water quality agencies, under their existing delegated authority from EPA and consistent with Clean Water Act monitoring requirements, will continue to regulate total dissolved gas levels in the lower Snake and Columbia rivers. If the USG identifies additional concerns with TDG impacts to native aquatic species, the USG will continue to notify and coordinate with the Six Sovereigns, F&W managers, and the state water quality agencies to identify actions, including monitoring methodologies, sampling locations, and triggers for changes to lower Columbia and LSR dam operations, necessary to protect these aquatic species.
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