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2018 Summer Fish Operations Plan

1. INTRODUCTION

The 2018 Summer Fish Operations Plan (2018 Summer FOP) describes the U.S. Army Corps of Engineers' (Corps) planned operations for fish passage at its four lower Snake River and four lower Columbia River dams during the 2018 summer fish migration season, generally June 16 through August 31. The 2018 Summer FOP is consistent with the 2014 NOAA Fisheries FCRPS Supplemental Biological Opinion (2014 Supplemental BiOp)¹ including the regional forum process for adaptive management and in-season management,^{2,3} the Corps' Record of Consultation and Statement of Decision (ROCASOD) adopting actions recommended in the 2014 Supplemental BiOp, and the Columbia Basin Fish Accords (Accords). Other project operations and water management actions not specifically addressed in this document will be consistent with the 2014 Supplemental BiOp and other guiding operative documents, including the 2018 Water Management Plan (WMP), seasonal WMP updates, and the 2018 Fish Passage Plan (FPP).

In addition to discussing project-specific fish passage spill operations (Table 2), the 2018 Summer FOP identifies factors that the Corps, the U.S. Bureau of Reclamation, and the Bonneville Power Administration (BPA) (collectively referred to as the "Action Agencies") must address in the context of operating this complex system of fourteen multiple purpose projects. The 2018 Summer FOP includes a discussion of how the Corps manages fish passage spill and total dissolved gas (TDG), identifies Planned and Routine Operational Adjustments that influence fish passage spill, addresses adaptive management and in-season management processes for fish passage spill and other fish operations including the juvenile fish transportation program, and describes the Corps' monthly implementation reports.

¹ The 2014 Supplemental BiOp states: "*Specific spill levels will be provided for juvenile fish passage at each project, not to exceed established TDG levels (either 110 percent TDG standard, or as modified by State water quality waivers, currently up to 115 percent TDG in the dam forebay and up to 120 percent TDG in the project tailwater....*"

² The 2014 Supplemental BiOp considered the Action Agencies' 2014-2018 Implementation Plan (2014-2018 IP) and incorporates the 2008 NOAA BiOp and Reasonable and Prudent Alternative (RPA), and the 2010 Supplemental BiOp.

³ The Corps, in coordination with the other Action Agencies and NOAA Fisheries, utilizes the Regional Implementation Oversight Group (RIOG) and technical teams including the Technical Management Team (TMT) and Fish Passage Operations & Maintenance (FPOM), to coordinate with state, tribal and other federal experts for recommendations for implementing operations consistent with the 2014 Supplemental BiOp.

2. MANAGEMENT OF SPILL FOR FISH PASSAGE AND TDG

2.1. State Water Quality Standards for TDG

The Corps will manage spill for fish passage in summer 2018 according to the project spill levels identified in Table 2 and consistent with the State of Washington and the State of Oregon's TDG water quality standards (WQS).^{4, 5} Both states have accommodated levels of TDG above 110% for fish passage spill operations for ESA-listed juvenile salmonids at the Corps' projects on the lower Snake and lower Columbia rivers as follows:

Washington Criteria Adjustment:

- TDG must not exceed an average of 115% as measured in the forebays of the next downstream dams and must not exceed an average of 120% as measured in the tailraces of each dam (these averages are measured as an average of the 12 highest consecutive hourly readings in any one day, relative to atmospheric pressure); and
- A maximum TDG one-hour average of 125% must not be exceeded during spillage for fish passage.

Oregon Standard Modification:

- Spill must be reduced when the average TDG concentration of the 12 highest hourly measurements per calendar day exceeds 120% of saturation in the tailraces of McNary, John Day, The Dalles, and Bonneville dams' monitoring stations.
- Spill must be reduced when instantaneous TDG levels exceed 125% of saturation for any 2 hours during the 12 highest hourly measurements per calendar day in the tailraces of McNary, John Day, The Dalles, and Bonneville dams' monitoring stations.

These limits are referred to as "gas caps." The Corps will operate its fish passage projects in accordance with the project spill levels identified in Table 2 and in a manner that is consistent with the State TDG standards described above, including applying the different state calculation methodologies. When the standards vary or conflict, the Corps will apply the more stringent standard.

2.2. Spill Caps

The Corps' Reservoir Control Center (RCC) is responsible for daily management of spill operations responsive to changing conditions to manage TDG consistent with the project spill levels in Table 2 and in a manner that is consistent with all applicable State standards. To accomplish this, the RCC sets "spill caps" for each of the Corps' lower Columbia and lower

⁴ WASH. ADMIN. CODE §173-201A-200(1)(f) provides the maximum TDG criteria for each of the aquatic life use categories and displays Table 200 (1)(f) that states: "Total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection." The code also addresses exceptions and adjustments, including a provision allowing for an adjustment of the TDG criteria to aid fish passage over hydroelectric dams when consistent with an approved gas abatement plan.

⁵ OR. ADMIN. R. 340-041-0031 provides in part: "the concentration of TDG relative to atmospheric pressure at the point of sample collection may not exceed 110 percent of saturation." OR. ADMIN. R. 340-041-104(3) identifies findings the Environmental Quality Commission must make for the purpose of allowing increased spill for salmon migration. See http://pweb.crohms.org/tmt/wqnew/state_tdg_waivers/or/2015_5yr.pdf

Snake River projects on a daily basis throughout the fish passage spill season to ensure that the maximum spill level at each project is estimated to meet, but not exceed, the gas cap in the tailrace and the downstream forebay. There may be instances when flow conditions in the river result in target spill exceeding the state water quality standards. In summer 2018, the RCC will establish target the spill levels identified in Table 2 or the spill cap, whichever is lower. The spill caps for all lower Snake and lower Columbia River fish passage projects are the upper limit for voluntary fish passage spill.

There may also be instances in which fish passage projects may spill more than the target spill level defined in Table 2 due to high river flow that exceeds powerhouse hydraulic capacity. The fish passage projects may also spill more than the target spill level due to a lack of power demand (load). The Corps will attempt to manage excess TDG on a system-wide basis under lack of power demand conditions by incrementally increasing spill at projects throughout the system in the order of priority defined in the Spill Priority List. For this purpose, the RCC also defines spill levels to approximately achieve TDG levels in project tailraces of 122%, 125%, 127%, 130%, and 135%. The order of priority is coordinated with regional sovereigns in the TMT to allocate spill to projects to best manage system TDG while also considering how best to protect fish and other aquatic biota.

To calculate spill caps, the Corps evaluates observed and forecasted variables that influence TDG levels, including: (1) environmental conditions (e.g., total river flow, wind, ambient temperature, barometric pressure, incoming TDG from upstream, and travel time from the upstream project tailrace to the next downstream project forebay⁶); and (2) project operations (e.g. spill level, spill pattern, tailwater elevation, proportion of flow through the turbines, and project configuration). These data are used as input variables into the System TDG (SYSTDG) model in order to estimate TDG levels several days into the future. The Corps runs SYSTDG as a real-time operations tool, when appropriate, to forecast TDG levels at the Corps' projects. As warranted, the Corps will cross-check projected spill caps with SYSTDG results and consider observed data to make appropriate spill cap adjustments.

3. SPILLWAY OPERATIONS AND SPILL LEVEL PRECISION

The Corps plans to achieve the target spill levels identified in Table 2 to the extent feasible; however, actual hourly spill levels at each dam may vary slightly depending on the precision of the spillbay gate settings, real-time fluctuations in flow and/or project head, or automatic load following. At each project, spill is distributed across the spillway according to patterns defined in the project-specific chapters of the FPP⁷ to provide favorable fish passage conditions. Spillbay gates are opened to the settings identified in the FPP spill pattern table that correspond to the spill level that is closest to, but may be slightly higher or lower than, the target spill level.

Due to these limitations in spill level precision, the observed hourly average spill level may range up to ± 2 kcfs from the target spill level (or ± 3 kcfs at The Dalles and Bonneville dams, as described in the project-specific sections below). At projects where the target spill level is a

⁶ Water travel time between projects varies depending on flow and can range from 1-5 days on the lower Snake River and from 1-3 days on the lower Columbia River.

⁷ The FPP is coordinated annually with regional sovereigns through the FPOM.

proportion of total outflow, the hourly spill level is calculated to be within $\pm 1\%$ of the target spill percentage (except at The Dalles and Little Goose dams when spill may vary more than $\pm 1\%$ at certain flow ranges, as described in FPP Chapters 3 and 8, respectively). In the event that the hourly percentages are not within $\pm 1\%$ of the target spill, project operators and schedulers will adjust spill levels later in the day with the objective of ending the day with a daily average spill percentage that achieves the target.

4. MODIFICATIONS TO PLANNED OPERATIONS AND IN-SEASON MANAGEMENT

For planning purposes, the operations described in the 2018 Summer FOP assume average runoff conditions. Actual runoff varies in magnitude and timing, and observed river flow may be higher or lower than average at any time such that modifications to the planned operations may be required. To accommodate these varying runoff conditions and other routinely observed conditions as they arise, the Corps, in conjunction with the other Action Agencies and NOAA Fisheries, coordinates with regional sovereigns on these conditions and other planned operations through the review of the FOP prior to summer spill operations (see section 4.1). The Corps responds in real-time to these routine conditions and planned operations by implementing adjustments as conditions require without additional coordination.

For unanticipated and unplanned conditions that are not pre-coordinated, the Corps will respond as necessary to address the condition, and when possible, will use the existing regional coordination process to adaptively manage and make necessary in-season adjustments in spill and other fish operations (e.g., spill levels, spill caps, spill patterns, juvenile fish transportation, and minimum operating pool or “MOP” operations).

4.1. Conditions that May Require Adjustments to Planned Operations

Under certain conditions or circumstances, the Corps may be required to adjust spill higher or lower than the target spill level at one or more projects.

Planned and Routine Operational Adjustments:⁸

1. High flow conditions that exceed powerhouse hydraulic capacity and require spilling more than the target spill level.
2. Low flow conditions that require adjustments in spill level while maintaining project minimum generation requirements (see section 4.3.1. below).
3. Lack of power demand (load) resulting in increased spill.
4. Scheduled turbine unit and/or transmission outages that reduce powerhouse hydraulic capacity and require spilling more than the target spill level.*
5. Standard operations for transmission reliability (see section 4.4.1. below).*

⁸ Planned and Routine Operational Adjustments are spill adjustments due to: (1) conditions that occur routinely every year (e.g., high or low flow); or (2) planned operations (e.g., scheduled maintenance, transit of fish transport barge in the tailrace). These are considered pre-coordinated through regional sovereign review of the FOP and the FPP, and are implemented by the Action Agencies as conditions require and without additional coordination through the regional forum processes. These adjustments are included in the monthly FOP Implementation Report in the hourly spill and flow charts (plots), and conditions with an (*) are reported in the “Pre-Coordinated Operations” Table. The FPP Appendix A identifies actions with pre-coordinated dates.

6. Navigation safety concerns (see section 4.6. below).*

Non-routine or Unplanned Operational Adjustments:⁹

1. Contingency operations for transmission reliability (see section 4.4.2 below).
2. Fish emergencies (e.g., high river temperatures that exceed levels safe for fish).
3. Conditions related to project safety (e.g., erosion), health and human safety, navigation, or other unforeseen events that require spilling more or less than the target spill level.
4. Other circumstances including human or programming error, unscheduled maintenance or outage, operational limitations (e.g., physical limitations of gate settings and spill patterns outside of the level of precision defined in section 3 above, forebay elevations), and other unanticipated events or emergencies.
5. In-season adjustments following adaptive management coordination through the existing regional coordination process (see section 4).

4.2. TMT Emergency Protocols

The Corps and the other Action Agencies will operate the fourteen Columbia River System (or FCRPS) projects in emergency situations in accordance with the 2018 WMP Emergency Protocol (WMP Appendix 1). This protocol identifies the process the Action Agencies, in coordination with NOAA Fisheries, will use in the event of an emergency concerning project operations that impact planned fish protection measures. The emergency protocols also address the process for coordination with regional sovereigns. The most recent version of the Emergency Protocols is located at:

<http://pweb.crohms.org/tmt/documents/wmp/2018/Final/emerproto/>

4.3. Low Flow Operations

4.3.1. Minimum Generation

All lower Snake and lower Columbia River dams have a minimum generation requirement that has been established to support power system reliability (see section 4.4). In Table 1, the Corps has identified minimum generation powerhouse outflow values derived from the turbine unit operating ranges defined in the project-specific chapters of the 2018 FPP and actual generation records. Values in Table 1 are approximations that account for varying head or other small adjustments in turbine unit operation that may result in variations from the reported minimum generation flow and spill amount. Conditions that may result in minor variations include:

1. Varying pool elevation: as reservoirs fluctuate within the operating range, flow rates through the generating unit change.

⁹ Non-routine or Unplanned Operational Adjustments are implemented by the Action Agencies as conditions require and/or as coordinated with regional sovereigns through the in-season adaptive management process. Adjustments that affect spill levels are reported in the FOP Implementation Report Variance Table (and, when warranted, a description may also be included in the Operational Adjustments section). When an adjustment does not affect spill levels, information is provided in the Operational Adjustments section. Adjustments that continue into the next month are reported in the Pre-Coordinated Operations Table.

2. Generating unit governor “dead band”: the governor controls the number of megawatts the unit should generate, but cannot precisely control a unit flow; variations may be 1-2% of unit flow. These variations can affect minimum generation ranges included in Table 1.
3. System disturbances: once a generator is online and connected to the grid, it responds to changes in system voltage and frequency. These changes may cause the unit to increase or decrease flow and generation slightly within an hour. Individual units operate differently from each other and often have unit specific constraints.
4. Generation control systems regulate megawatt (MW) generation only; not flow through individual turbine units.

All of the lower Snake River powerhouses may be required to keep one generating unit online at all times for power system reliability under low river flow conditions, which may result in a reduction of spill at that project if there is insufficient flow in the river. Generally, units 1–3 are the first priority units for operation during the fish passage season for adult fish attraction flow to the fish ladders, but unit priority is also based on availability. During low river flow conditions, the Corps will operate the lower Snake River projects to the unit priority specified in the FPP and minimum generation ranges identified in Table 1.

There may be situations when river flow is insufficient to maintain minimum generation within the ranges identified in Table 1 and spill to the target spill levels identified in Table 2 every hour. Under these conditions, the lower Snake River projects will operate one turbine unit (according to unit priority operating criteria at each project) at minimum generation and spill the remainder of outflow. The lower Columbia River projects will also operate at minimum generation and pass the remaining outflow as spill down to minimum spill levels. Additionally, inflow provided by non-Federal projects upstream is often variable and uncertain, and in combination with low flow conditions, may result in instances where forebay elevations go outside of the normal MOP ranges for lower Snake River projects as provided for in the 2014 Supplemental BiOp.

Table 1. Minimum generation flow ranges for turbine units at Corps hydropower projects on the lower Snake and lower Columbia rivers.¹⁰

Project	Turbine Unit	Minimum Generation Flow Range ^a (kcfs)
Lower Granite	1, 3	11.8 – 12.9
	2 ^b	17.5 – 18.5
	4, 5, 6	13.7 – 14.8
Little Goose	1, 2, 3	11.3 – 11.8
	4, 5, 6	13.8 – 14.4
Lower Monumental	1	11.1 – 12.3
	2 ^b	11.8 – 13.9
	3 ^b	17.4 - 19.7
	4 ^b	17.9 – 19.0
	5, 6	14.1 – 14.9
Ice Harbor	1	8.4 – 10.1
	2 ^c	TBD
	3 ^b	11.4 – 12.5
	4, 6	9.4 – 10.6
	5 ^b	13.1 – 14.1
McNary	N/A	50 – 60
John Day	N/A	50 – 60
The Dalles	N/A	50 – 60
Bonneville	N/A	30 – 40

- a. “Minimum Generation” is the minimum number of megawatts (MW) that must be generated at each project in order to support power system reliability. This table defines the resulting flow range (kcfs) through turbines, which is a function of power output (MW), turbine efficiency, and project head.
- b. Lower Granite Unit 2, Lower Monumental Units 2, 3, and 4, and Ice Harbor Units 3 and 5 are restricted due to runner blades that are fixed at a set angle (non-adjustable).
- c. Ice Harbor Unit 2 is being rebuilt with a runner design that reduces impacts to fish, scheduled for completion in summer 2018. At that time, testing will be performed to determine the operating range.

4.3.2. Navigation Lock Operation During Low Flow

At projects where the target spill level is a percentage of total outflow, emptying the navigation lock during low flow conditions may temporarily result in a reduced percentage of outflow that is reported as spill. During this time, the spill level remains constant, but the spill reported as a percent of total outflow may be temporarily reduced below the target percentage. This occurs because the volume of water needed to empty the navigation lock during periods of low flow is a greater percentage of the total project outflow than during periods of higher flow.

4.3.3. Low Flow Operations at Little Goose

At Little Goose Dam, when daily average flow in the lower Snake River is ≤ 32 kcfs, achieving 30% spill would require switching powerhouse operations between operating two units at the low end of the $\pm 1\%$ of best efficiency range to operating one unit at the high end of the $\pm 1\%$ of

¹⁰ The table is accurate as of April 2018 but may change in-season as coordinated through FPOM (see the FPP).

best efficiency range. This operation, in combination with constant inflow from Lower Granite Dam, often makes it difficult to achieve the FOP prescribed spill level downstream at Lower Monumental Dam and to also maintain MOP operations. In years past, through coordination with TMT during low flow periods, Little Goose spill operations changed from 30% to a constant spill level of approximately 7-11 kcfs to smooth out Little Goose outflow, meet Lower Monumental FOP specified spill levels, and maintain the MOP elevation at Little Goose. A similar operation will be implemented in 2018, if necessary, depending on river flow.

4.4. Operations for Transmission System Reliability

In managing fish passage spill operations, the Corps and BPA plan to allocate generation and spill at the eight Corps projects on the lower Columbia and Snake rivers in accordance with the 2018 Summer FOP. Periodically, to ensure the reliability of the transmission system when system conditions warrant, it is necessary to increase or decrease the amount of water flowing through a project's turbines and spillways at one or more of these projects.

Consistent with past practice, if any of the transmission system conditions listed below are present and can be alleviated by temporarily modifying generation levels at one or more federal projects, the Action Agencies will adjust generation and spill levels to avoid the transmission system impact. These events could result in actual spill being temporarily higher or lower than the target fish passage spill level. Such events may occur coincident with the transmission system event or in subsequent hour(s) should the event impact water balance at a specific hydro project or river reach. The Corps and BPA will work to restore conditions to support target spill operations as soon as practicable. These actions are taken to minimize the likelihood and/or scope of a transmission system emergency and will be reported in the monthly FOP Implementation Report (see section 8 below).

4.4.1. Standard Operations for Transmission Reliability

Consistent with past practice, the Action Agencies manage the fourteen Columbia River System projects to be prepared to provide electric reliability support as follows:

1. Ensuring sufficient range of generation capability is available to provide the BPA balancing authority¹¹ area with contingency reserves required by North American Electric Reliability Corporation (NERC) and Western Electricity Coordination Council (WECC) reliability standards.¹²
2. Ensuring generation is available to increase or decrease in order to balance load and generation within the BPA balancing authority area to support reliability.

¹¹ A balancing authority is the responsible entity that maintains load-interchange-generation balance within a Balancing Authority Area, and supports interconnection frequency in real time. Balancing authority area is the collection of generation, transmission, and loads within the metered boundaries of the designated balancing authority. The balancing authority maintains load-resource balance within this area.

¹² The Federal Energy Regulatory Commission has certified the NERC as the Electric Reliability Organization responsible for establishing and enforcing national reliability standards. NERC has delegated some of its authority to the WECC as the regional entity responsible for monitoring reliability standards compliance and enforcement in the Western Interconnection.

3. Ensuring enough generating units are online and have sufficient capability to increase or decrease generation to meet the BPA balancing authority area frequency response obligations, consistent with reliability standard requirements.
4. Ensuring that there is generation operating at projects in specific locations sufficient for arming for Remedial Action Schemes (RAS).¹³ RAS schemes allow the transmission system to automatically respond to unplanned events on the power system by immediately dropping or reducing generation at those specified locations.
5. Maintaining minimum generation levels (see Table 1) at generators in specific locations to maintain correct voltage levels on the power system to ensure reliability.
6. Maintaining enough generation units online in diverse locations on the electrical grid to ensure system stability through rotating inertia.

4.4.2. Contingency Operations for Transmission Reliability

If the routine reliability tools described above are insufficient to resolve the transmission condition, the Action Agencies will implement the preemptive actions detailed in the Power System Emergency Action Plan (Attachment 1 to the TMT Emergency Protocols referenced in section 4.2 above) if time permits. Where necessary, the fourteen Columbia River System projects will be called upon to relieve the following conditions:

1. Increasing or decreasing generation at projects (redispatch) in specific geographic locations to relieve heavily loaded transmission lines if required by system conditions. This includes adjusting generation that flows over specific transmission facilities in order to keep flows over those paths within the requirements of NERC and WECC reliability standards.
2. Increasing or decreasing generation to ensure transmission system stability and/or reliable load service in local areas under specific system conditions (for example, increasing generation at Ice Harbor Dam to support transmission stability, including providing load service to the Tri-Cities area of Washington, when system conditions require).
3. Responding to unanticipated significant events, including NERC Energy Emergency Alerts or other system emergencies, consistent with the Power System Emergency Action Plan included as Attachment 1 to the TMT Emergency Protocols.
4. Other unanticipated significant events (e.g. powerhouse fires, earthquakes, etc.).

These actions will be implemented consistent with the TMT Emergency Protocols (see section 4.2 above).

4.5. Turbine Unit Testing for Maintenance

Turbine units may be operationally tested prior to maintenance and prior to return to service for up to 60 minutes by running the unit at speed no load, various loads within the $\pm 1\%$ of peak efficiency range, and, if necessary, up to full load, to allow for measurements and testing. Testing of a unit under maintenance is in addition to a unit operating at minimum generation required for power system reliability. Testing may deviate from unit operating priorities

¹³ Remedial Action Schemes are sets of automatic control circuits that switch various types of power system components on or off in response to disturbances on the interconnected transmission system.

specified in FPP Chapters 2-9 and may use water that would otherwise be used for spill if the unit operating for reliability is at the bottom of the $\pm 1\%$ of best efficiency range. Water will be used from the powerhouse outflow allocation if possible, and water diverted from spill for operational testing will be minimized. The Corps coordinates this testing with the region through the FPOM, in accordance with Chapters 2-9 of the FPP. Unit outages for required maintenance are described in FPP Appendix A to the extent practicable. Maintenance dates are subject to change.

4.6. Navigation Safety

Short-term adjustments in spill or MOP may be required at any of the fish passage projects to address navigation safety concerns.¹⁴ This may include changes in spill patterns, reductions in spill, short-term spill curtailment, or operating the forebay above MOP. For instance, some flow conditions may require a 2-foot forebay operating range at Ice Harbor in order to provide conditions for navigation safety at the Ice Harbor forebay navigation lock exit. These adjustments may be necessary for both commercial traffic and fish barges.

Additionally, during low flow conditions, adjustments in spill and/or MOP have been necessary at several fish passage projects for navigation safety. For example, unsteady or low flow at Little Goose and Ice Harbor dams (approximately 50 kcfs or less) may impact forebay elevations and cause inadequate navigation depths at the upstream navigation lock entrances in the Lower Granite and Lower Monumental tailraces, respectively. As addressed in the 2014-2018 IP, adjustments to forebay elevations at Little Goose and Ice Harbor of up to 1.0 foot above the MOP range may be necessary to accommodate safe entrance to the upstream navigation locks at Lower Granite and Lower Monumental dams.

High spill levels may create unsafe hydraulic conditions for commercial, non-commercial, and fish transport barges entering and exiting the tailrace and/or while moored at the fish loading facility. Under these conditions, spill may be reduced temporarily as necessary to maintain safe navigation conditions for commercial, non-commercial, or fish transportation barges, which may result in temporarily filling the pool above the MOP range, depending on river flow.

Due to sediment deposition in the confluence area of the Snake and Clearwater rivers near Lewiston, Idaho, the Action Agencies began implementing a “variable MOP” operation at Lower Granite Dam in April 2018 to provide the required federal navigation channel depth of 14 feet. This operation will remain in place through the time period covered by the 2018 Summer FOP. At high flows (≥ 120 kcfs), the required navigation channel depth is able to be maintained with Lower Granite operating in the MOP range of 733-734 feet. However, at flows below 120 kcfs,

¹⁴ The Corps conducts annual surveys to assess sedimentation in the reservoirs and under certain conditions. To ensure safe navigation, there may be a need to operate the pools above the MOP range.

the Lower Granite forebay must be operated higher in order to maintain the navigation channel depth, as follows:

- Inflow 80-119 kcfs = Lower Granite forebay operating range 734-735 feet (MOP+1);
- Inflow 50-79 kcfs = Lower Granite forebay operating range 734.5-735.5 feet (MOP+1.5);
- Inflow below 50 kcfs = Lower Granite forebay operating range 735-736 feet (MOP+2).

5. JUVENILE FISH TRANSPORTATION PROGRAM

The 2014 Supplemental BiOp calls for an annual review of the previous year's fish survival information, recent transport rates, and available smolt-to-adult return rates (SARs) for both in-river and transported smolts for discussion with the RIOG to inform transport/spill operations for the subsequent year. The best available information will be considered in the Corps' implementation of the juvenile fish transportation program at the lower Snake River collector projects in 2018. Should regional sovereigns recommend adjustments in transportation that differ from those stated herein, the Corps will use the existing regional adaptive management process to make a determination on recommended operational changes. Detailed descriptions of project and transport facility operations to implement the juvenile fish transportation program are contained in the FPP Appendix B.

5.1. Lower Snake River Dams – Transport Operation and Timing

Fish collection for transport began on April 23, with the first barge leaving Lower Granite Dam on April 24. Starting on or about August 15 (depending on numbers of subyearling Chinook collected for transport), fish will be collected at Lower Granite, Little Goose, and Lower Monumental and transported by truck for release below Bonneville Dam. Transport operations are anticipated to continue through approximately September 30 at Lower Monumental and through October 31 at Lower Granite and Little Goose. Transport may be stopped earlier at any of the projects due to columnaris disease or at Lower Monumental due to low fish abundance as specified in FPP Appendix B.

6. 2018 SUMMER FISH PASSAGE SPILL OPERATIONS

Summer spill operations will occur June 21–August 31 at the four lower Snake River projects, and June 16–August 31 at the four lower Columbia River projects. The Corps will initiate spill at 0001 hours, or shortly after midnight, at each of the projects on the start date. Target spill levels for summer 2018 at each project are defined in Table 2.

Table 2. Summary of 2018 summer target spill levels at lower Snake and lower Columbia River projects.

PROJECT	2018 SUMMER SPILL¹ (24 hrs/day except as noted at Ice Harbor and Bonneville)
Lower Granite	18 kcfs
Little Goose	30%
Lower Monumental	17 kcfs
Ice Harbor	June 21-July 13: 30% vs. Day 45 kcfs/Night Gas Cap ² July 13-August 31: Day 45 kcfs/Night Gas Cap ²
McNary	50%
John Day	June 16-July 20: 30% vs. 40% July 20-August 31: 30%
The Dalles	40%
Bonneville	Day 85 kcfs/Night 121 kcfs ³ vs. 95 kcfs

1. Spill may be temporarily reduced below the FOP target summer spill level at any project if necessary to ensure navigation safety or transmission reliability, or to avoid exceeding State TDG standards.

2. Ice Harbor Night Hours = 2100-0800; Day Hours = 0800-2100.

3. Bonneville Day/Night hours defined in the 2018 FPP Chapter 2.

7. PROJECT-SPECIFIC OPERATIONS

The following sections describe 2018 summer spill operations for each project. The Corps will implement established spill patterns for all projects as described in the 2018 FPP.

7.1. Lower Granite Dam

7.1.1. Summer Spill June 21–August 31: 18 kcfs, 24 hours/day.

7.1.2. Operational Considerations: None known for summer 2018.

7.2. Little Goose Dam

7.2.1. Summer Spill June 21–August 31: 30%, 24 hours/day.

7.2.2. Operational Considerations:

- Daily average flows in the lower Snake River of ≤ 32 kcfs can result in incompatible operations with Lower Monumental Dam and cause spill level fluctuations. Alternative Little Goose operations to resolve this issue are described in the Low Flow Operations for Little Goose Section 4.3.3 above and will be coordinated through the FPOM/TMT.

7.3. Lower Monumental Dam

7.3.1. Summer Spill June 21–August 31: 17 kcfs, 24 hours/day.

7.3.2. Operational Considerations:

- Transit of the juvenile fish barge across the Lower Monumental tailrace, docking, and departure from the loading facility, may require a reduction in spill below the target spill level for safety concerns. The towboat captain may request spill be reduced or eliminated during transit. During juvenile fish loading operations, spill is typically reduced to 15 kcfs, but can be reduced further if necessary for safety reasons. Barge loading duration can be up to 3.5 hours. Reducing spill may cause the Lower Monumental pool to briefly fill above MOP.¹⁵

7.4. Ice Harbor Dam

7.4.1. Summer Spill June 21–August 31: Target spill will alternate between two-day treatments of 30%, 24 hours per day and 45 kcfs day/Gas Cap night until July 13 at 0800 hours, then 45 kcfs day/Gas Cap night through August 31 (see section 2.1).

7.4.2. Operational Considerations:

- Spill operation treatments may be rearranged within a week throughout the season. If rearrangement of treatments occurs, the total number of each spill treatment for the summer season will not change. The flexibility to rearrange treatments during periods of higher power demand may alleviate the need to declare a power emergency.

7.5. McNary Dam

7.5.1. Summer Spill June 16–August 31: 50%, 24 hours/day, without spillway weirs (removed for summer in early June).

7.5.2. Operational Considerations: None known for summer 2018.

7.6. John Day Dam

7.6.1. Summer Spill June 16–August 31: 30% vs. 40%, 24 hours/day from June 16 through July 20. Spill levels will alternate in a four-day block with two-day treatments (30% or 40% spill). Spill treatment changes will occur at 2100 hours. A single-treatment operation of 30%, 24 hours/day will begin July 20 and continue through August 31.

¹⁵ Reducing spill for long durations could pose problems staying within MOP at Ice Harbor Dam, the downstream project.

7.6.2. Operational Considerations:

- Spill operation treatments may be rearranged within a week throughout the season. If rearrangement of treatment occurs, the total number of each spill treatment for the summer season will not change. The flexibility to rearrange treatments during periods of higher power demand may alleviate the need to declare a power emergency.

7.7. The Dalles

7.7.1. Summer Spill June 16–August 31: 40%, 24 hours/day.

7.7.2. Operational Considerations:

- If total river flow is between 92 and 161 kcfs, the spill percentage could range from 38.6% to 41.4%. Actual hourly average spill levels at The Dalles may range up to ± 3 kcfs according to the spill pattern tables in FPP Chapter 3.
- At no time is spill recommended on the south side of the spillway (Bays 9-23) as this creates poor tailrace egress conditions for spillway-passed fish.
- Spillbays 9, 10, 11, 13, 16, 18, 19, and 23 are operationally restricted due to wire rope, structural and concrete erosion concerns.
- Spill gate changes will be limited to one change per hour to minimize wear and tear on gates and wire ropes.

7.8. Bonneville Dam

7.8.1. Summer Spill June 16–August 31: 85 kcfs day/121 kcfs night vs. 95 kcfs, 24 hours/day. Spill levels will alternate in a four-day block with two-day treatments. Hours for day and night spill operations are defined in FPP Chapter 2.

7.8.2. Operational Considerations:

- Minimum spill level is 50 kcfs; however, as in past years, to provide acceptable juvenile fish egress conditions in the tailrace under extreme low flow conditions, lower spill levels may be considered and coordinated through the TMT and/or FPOM.
- Actual hourly average spill levels at Bonneville Dam may range up to ± 3 kcfs according to spill pattern tables in FPP Chapter 2.

8. FOP IMPLEMENTATION REPORTING

The Corps posts monthly FOP Implementation Reports on the following website:

http://pweb.crohms.org/tmt/documents/FOP_Implementation_Reports/. The updates will include monthly project plots containing the following information:

- 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;

- adjusted spill: the hourly spill level that can be achieved taking into consideration that spill may vary as a function of total river flow, forebay elevation and generator capacity, and is subject to routine operational adjustments that limit the ability to spill to the target spill (see section 4.1 above);
- 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.

The reports will also provide information on substantial issues that arise as a result of the spill program (e.g. Little Goose adult passage issues), and will address any emergency situations, including spill adjustments for contingency operations for transmission reliability.

The Corps will continue to provide the following data to the public regarding project flow, spill rate, TDG level, and water temperature.

- Hourly flow, generation, and spill quantity data for the lower Snake and Columbia River dams are posted to the following website:
 - <http://www.nwd-wc.usace.army.mil/report/projdata.htm> (web reports with the most recent 8 days of hourly project data and the current month of daily project data).
 - <http://pweb.crohms.org/tmt/wq/historical/> (links to historic hourly project data files in csv-format organized by month back to 2004 including temperature and TDG information).
- Water Quality: Water quality data are received via satellite from FMS in the Columbia and Snake rivers every hour, and placed on a Corps public website upon receipt. Hourly TDG and water temperature data are posted to the following websites:
 - <http://pweb.crohms.org/report/total.html> (web reports with hourly TDG, project outflow and spill for the previous 3 days).
 - http://www.nwd-wc.usace.army.mil/ftppub/water_quality/tdg/ (links to historic hourly water quality data files for each FMS including barometric and total gas pressure, TDG and project outflow and spill in csv-format organized by month back to 2005).
 - Using the hourly TDG readings for each station in the lower Snake and Columbia rivers, the Corps will calculate both the highest 12-hour average TDG levels (Oregon method) and the highest consecutive 12-hour average TDG levels (Washington method) on a daily basis. These averages are reported at: http://www.nwd-wc.usace.army.mil/ftppub/water_quality/12hr/
- Spill cap information will be posted to the following site each day: <http://pweb.crohms.org/tmt/documents/ops/spill/caps/>.