**OFFICIAL COORDINATION REQUEST FOR**

**NON-ROUTINE OPERATIONS AND MAINTENANCE**

**COORDINATION TITLE- 24BON010 MOC B2FGE Post Construction Evaluation 2024**

**COORDINATION DATE- 20April2024**

**PROJECT- Bonneville Lock & Dam**

**RESPONSE DATE- 11April2024**

**Description of the problem**

The Corps’ Bonneville Powerhouse 2 Fish Guidance Efficiency (B2FGE) Program completed structural modifications to gatewells of units 11-18, at Bonneville Lock & Dam in November 2023. See SRWG 2024 Implementation Plan (PNNL, 2024) and Research Summary SPE-P-24-1 for more background information on the B2FGE Program.

The Corps plans on implementing the B2FGE study during the spring and summer of 2024. Testing results will provide meaningful data to assist in informing the evaluation of nearly 20 years of regional forum coordination on operations and project modifications to improve conditions for juvenile salmonids at Powerhouse Two (PH2). With every year comes unique circumstances ranging from extremes in water years (e.g. low vs high water year) to unplanned events/outages/etc. Despite the unplanned outages of 9 out 10 units at Powerhouse One (PH1) as noted in recent coordination, the Corps plans on conducting the B2FGE study because hydraulic conditions at BON and operating conditions at PH2 will meet the study design objectives to evaluate modifications of PH2 units associated with this test.

The study will use biological fish condition monitoring at the Juvenile Monitoring Facility (JMF) collected for the Smolt Monitoring Program (SMP) to compare the distributions of descaling and mortality of juvenile migrants at the middle and upper 1% peak efficiency turbine operating range for spring (20 April -05 June) and summer (08 June – 20 July), 2024. These study ranges cover the approximate dates at which the SMP sample changes from being mostly dominated by yearling Chinook to subyearling Chinook salmon (<https://www.cbr.washington.edu/dart/query/smolt_hrt>).

A randomized block study design will be used to expose juvenile fish to the designated treatments (middle vs. upper 1% operations) to help differentiate the influence of factors not directly related to the treatment comparisons (e.g., river flow, temperature, fish size/species/number, etc.) that vary throughout the season from the influence of operational treatments of interest. The block-treatment study design will result in ten 24-hour SMP samples during mid 1% peak efficiency range operations and ten 24-hour SMP samples during upper 1% peak efficiency range operations during spring and nine 24-hour SMP samples during both mid and upper 1% range operations in summer. All fish sampled in the JMF during each treatment and season will be combined to produce spring middle 1% descaling and mortality rates, spring upper 1% descaling and mortality rates, summer middle 1% descaling and mortality rates, and summer upper 1% descaling and mortality rates. Descaling and mortality rates will be compared between middle and upper 1% operations separately for spring and summer.

In addition to the study outlined above, an impingement study to evaluate potential fish impingement on the Vertical Barrier Screens (VBSs) of a single unit will occur on selected dates through the spring and summer test periods. This study involves the use of acoustic underwater cameras (sonars) and spot checks using the STS/VBS video inspection truck. The sonars will be deployed in gatewells 15A (modified) and 15C (unmodified) during specified operations in the middle and upper 1% peak efficiency range. Acoustic camera sampling will occur over a 24hr period (≈0700 to 0700) once per week during the study periods. Unit 15 is the unit of choice for this evaluation due to the extensive research of flow conditions and fish passage that has been conducted historically at Unit 15. However, if a Unit 15 outage occurs during the impingement evaluation, Unit 16 will be the next in priority for this evaluation. In addition, to ensure Units 15 (or 16) are operating at the time of the scheduled impingement evaluations, the turbine unit priority order will need to be adjusted on impingement evaluation days.

The mobile imaging sonars will be deployed using a portable A-frame crane with electric winch attached to a weighted aluminum frame. The frame will be lowered to the desired elevation near 58 ft msl (16 ft deep) and oriented to sample along the VBS face. The sonar location within the gatewell will be similar for 15A, 15C, 16A, and 16C throughout the spring and summer sampling periods and oriented to sample the bottom northern portion of the VBS, which corresponds to the regions of highest through-screen velocity as measured by Alden (2022).

Sonar samples will be supplemented by conducting spot checks of impingement using the optical video cameras on the STS/VBS video monitoring truck during standard STS/VBS inspections performed by project staff. A digital video recorder will be attached to the truck feed to record and document the spot check results in the gatewells.

**Type of outage required**

No outages are required to support the study.

**Impact on facility operation** (FPP deviations)

See below for specified FPP deviations.

**Impact on unit priority**

Section 4.1 Turbine Unit Priority Order

Impingement test operations will result in PH2 units being operated out of unit priority order as defined in FPP Table BON-13.

 Normal FPP PH2 Unit Priority - 11, 18, 12, 17, 13, 14, 15, 16

 *During specified impingement evaluations* - 11, 18, 15, 16, 14, 12, 17, 13

**Impact on forebay/tailwater operation**

Forebay operation: To allow B2 units to operate within the upper 1% peak efficiency treatment flow range during periods when overall project head is near 57’ or greater, a lower forebay operating range (71.5’ – 73.0’) may be needed within the normal forebay operating range. This operating range is because BON PH2 units have a generator limit that restricts turbine output at higher project heads. These values are represented in FPP Table BON-15.

No impacts on tailwater operation.

**Impact on spill**

PH 2 units under the test schedule operation blocks of middle and upper 1% peak efficiency range may be out of criteria as defined in FPP Section 4.2.1.2.b / Table BON-14 Sequential Steps to Pass Increasing Flow per Temporary PH2 Operating Range Guidelines in section 4.2.1.2.b. Refer to **Table 1** for potential impacts on spill during B2FGE testing.

**Table 1. Potential Impacts on Spill during B2FGE Test Periods**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Total Q (kcfs) \*** | **FPP PH2 Operation** | **FPP/FOP Spill** **Operation** | **Test** **Mid-Point** | **Test** **Upper 1%** |
| Up to 293  | Mid-Point | FOP (150) | No effect | Spill < 150(-3k/unit) |
| 293 - 317 | Upper 1% | FOP (150) | Forced spill > 150(+3k/unit) | No effect |
| 317 - 347 | Upper 1% | Forced > 150, up to 180 | More forced spill(+3k/unit) | No effect |
| Above 347 \*\* | Mid-Point \*\* | Forced > 180 \*\* | No effect | Less forced spill(-3k/unit) |

\* Assumes all 8 PH2 units are available + 1 PH1 unit at BOP + 12 kcfs misc flow (B2CC, ladders, etc).

\*\* Only applies during the “juvenile trigger”. If the “adult trigger” is in effect, all flow above 317k will be additional forced spill.

**Dates of impacts/repairs**

Spring: 20 April – June 05, and Summer: 08 June – 20 July 2024.

**Length of time for repairs**

A detailed operation schedule with middle and upper 1% flow ranges defined at specific times and dates will be provided to Bonneville Dam Operations and an RCC teletype will be issued.

**Analysis of potential impacts to fish**

1. **10-year average passage by run during the period of impact for adults and juvenile listed species, as appropriate for the proposed action and time of year;**

Figure 1. 10-year average (2014-2023) adult fish passage counts during the period of impact at Bonneville Lock & Dam for the B2FGE post-construction evaluation occurring between April 20 – July 20th. Data obtained from Columbia River DART.

Figure 2. 10-year average (2014-2023) cumulative juvenile fish passage index for yearling Chinook (CH1), subyearling Chinook (CH0), and Steelhead at Bonneville Lock & Dam from the Smolt Monitoring Program. Data obtained from Fish Passage Center.

1. **Statement about the current year’s run (e.g., higher or lower than 10-year average);**
	* Based on WDFW’s 2024 adult forecasts obtained from: https://wdfw.wa.gov/sites/default/files/2024-01/2024-spring-summer-forecasts.pdf
	* Compared to the 10-yr avg BON passage obtained from DART at https://www.cbr.washington.edu/dart/query/adult\_daily

2024 Spring Chinook upriver total (121,000) are forecasted to be higher than the 10-yr avg of 112,443.

2024 Summer Chinook (53,000) are forecasted to be lower than the 10-yr avg of 94,886.

2024 Total Columbia Sockeye (401,700) are forecasted to be higher than the 10-yr avg of 315,420.

2024 Total Upriver Steelhead (126,200) are forecasted to be lower than the 10-yr avg of 162,989.

1. **Estimated exposure to impact by species and age class (i.e., number or percentage of run exposed to an impact by the action);**
* The study period of 20 April through 20 July covers roughly the 25-yr median of the 80% range of historic run timing for predominant juvenile outmigration at BON.
* No adult impacts expected.
1. **Type of impact by species and age class (increased delay, exposure to predation, exposure to a route of higher injury/mortality rate, exposure to higher TDG, etc.);**

No impacts expected.

**Summary statement - expected impacts on:**

 **Downstream migrants**

The purpose of this study is to determine if the structural improvements completed in the gatewells A&B of B2 units have resulted in acceptable fish passage conditions at the middle and upper 1% peak efficiency range, therefore, at this time it is unknown if there are negative impacts to downstream migrants when implementing the test schedule.

For the impingement evaluation, sonar equipment will be deployed in a single unit’s gatewells (slots A&C) for 24 hours, once per week during the study periods. The sonar platform can be seen in **Figure 3**. The sonar platform will be deployed in the middle of the gatewell slot, roughly 16 feet below the water surface near el. +58’ which is near the central region of the VBS. Fish that enter the gatewells during the 24-hr impingement evaluation may encounter the sonar mounting platform. However, fish should be able to swim away from the equipment as velocities near el.+58’ are relatively small in magnitude (Alden 2022) at this elevation while the unit was running at 18.2kcfs, which is greater flow condition than what this study is proposing.



Figure 3. Photograph of sonar mounting platform. Photo from of PNNL (2024).

**Upstream migrants (including Bull Trout and Lamprey)**

No impacts to adult salmonids, bull trout, or lamprey ladder entry or migration since Powerhouse 2 remains the priority powerhouse and both end units (11 & 18) remain at the top of the unit priority list to aid in attraction to the adult ladder monolith entrances in the Powerhouse 2 tailrace. Lamprey nighttime operations that begin 01 June (FPP Section 2.4.2.13.vi) will not be impacted by the B2FGE test schedule.

**References:**

Harnish, R., Ham, K., & Mueller, R. (2024). *Study Design and Implementation Plan for Bonneville Dam Powerhouse 2 Gatewell Improvement Post Construction Evaluation Draft Report*. Pacific Northwest National Laboratory Prepared for United States Department of Energy under Contract DE-AC05-76RL01830.

Columbia River DART, Columbia Basin Research, University of Washington. (2024). Adult Passage Counts Graphics & Text. Available from https://www.cbr.washington.edu/dart/query/adult\_graph\_text

Fish Passage Center, FPC (2024). FPC Smolt Monitoring Program Data. Cumulative Passage Index with Average Run Timing for Past Years. Available from https://www.fpc.org/smolt/smolt\_queries/Q\_smolt\_cumulativepassindex\_dataquery.php

Washington Dept. of Fish and Wildlife (2024). WDFW. 2024 Forecast and Model Runs. Columbia River forecasts accessed at https://wdfw.wa.gov/fishing/management/north-falcon/forecasts

**Comments from agencies**

**Final coordination results**

**After Action update** (After action statement stating what the effect of the action was on listed species. This statement could simply state that the MOC analysis was correct and the action went as expected, or it could explain how the actual action changed the expected effect (e.g., you didn’t need to close that AWS valve after all, so there was no impact of the action). List any actual mortality noted as a result of the action)

Please email or call with questions or concerns.

Thank you,

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