**USACE Portland District (NWP) FFDRWG Update Form**  
**June 8, 2016**

**PROJECT INFORMATION**

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| Project Title | Bonneville Second Powerhouse JBS Orifice Improvements |
| SCT Reference Number |  |
| Project Manager (PM) | George Medina (NWP, 503-808-4753) |
| Technical Lead (TL) | Karen Kuhn (NWP, 503-808-4429) |
| Biologist/Coordination | Jon Rerecich (NWP, 503-808-4779) |

**PROJECT DESCRIPTION**

An engineering investigation was initiated to provide a recommended design to improve Bonneville Second Powerhouse juvenile fish passage for the downstream migrant (DSM) system from the gatewell to the primary dewatering system. Study goals were focused on improvements to reduce injury and delay to migrating fish species that include:

* Improving the ability for the project operators to detect debris plugs at the orifice;
* Reducing the likelihood of fish impingement due to alignment of orifice flow; and
* Improving gatewell egress times with improved lighting.

Because of its ability to meet all study goals at a reasonable estimated cost, EDR Alternative 4 was selected as the recommended alternative. Alternative 4 would reduce the orifice ring size to from 12 5/8 inches to its original design diameter of 12 inches and open additional orifices, as needed, to maintain channel design flow and velocities. In addition, both Alternative 11 (minimizes overall tube length) and Alternative 12 (uses lighted orifice ring) would be included.

**PROGRESS AND KEY ISSUES**

NOAA provided review comments through the FFDRWG process and did not support reducing the orifice ring size. This was due to a possible biological risk to adult fish that pass through the orifices. A reduction to a 12 inch orifice ring, with the ability to operate more orifices, was linked to the FGE program and the ongoing investigation to reduce gatewell residence time. Continued discussion through FFDRWG resulted in many members reluctant to reduce orifice ring size. The PDT took this concern and the EDR suggested a phased approach to implementing alternatives and reducing orifice ring size was the lowest and last priority alternative for implementation. It would be contingent on the performance of the other alternatives following their implementation. The EDR also recommended activities that included research and development including:

“*Incorporate observations and conclusions from scheduled testing of the gatewell turbulence reduction device in the B2 FGE program in FY13. Continue to collect information if other alternatives are tested in the B2 FGE program.”*

This project was originally tied to the B2FGE program working on a parallel track. Hydraulic and biological testing through the B2FGE program in 2008, 2009, 2013, 2014, and 2015 has lead to a much better understanding of the mechanisms of mortality in the JBS. The primary sources have been identified and include undesirable gatewell hydraulic conditions and excessive through screen velocities on the two uppermost panels of the VBS during turbine operations in the upper 1% range. An alternative has been tested with full powerhouse implementation scheduled for fall and winter of 2016/2017.

Based on FGE test data and condition data collected through the Smolt Monitoring Program, there appears to be little biological benefit for making adjustments to minimize overall orifice pipe length (Alt. 11) and installing an orifice light ring to improve gatewell egress times (Alt. 12) and those items are not being pursued. However, improving the ability for the project personnel to detect debris plugs at the orifice continues to be a FFDRWG concern.

The B2 DSM PLC program operation continuous orifice flush cycle for debris removal takes approximately 3.8 hours to complete for 40 orifices. The cycle then repeats until it is stopped. The other mode of operation is in manual allowing individual control of the slide gate and can be done from a computer touch screen in the control room or at the PLC cabinet in the electrical building on elevation +90 of the intake deck. Another method for manual operation is at the orifice in the DSM channel.

There has been interest expressed to investigate the inspection benefit with installation of a local manual control switch to eliminate manually overriding the solenoid valves at the orifice during the inspection and this was included as a recommendation in the EDR. NOAA provided comments during 90% EDR review including – *“Improved orifice inspection could be achieved by improving the view the current light tubes give of the back side of the orifice. We already use these light tubes to view the orifice for plugs but the light fixture is difficult to move out of the way and the light tube lens is difficult to see through. An improved observation system should be combined with an improved air flush system (something easier and more positive to use than the current valves) to allow a better, albeit temporary, orifice jet condition for viewing.”*

Maintenance of the orifices and flush system is critical for its optimal operation and performance. Due to the frequency of auto flushing, daily system inspections by personnel, very infrequent observations of orifice debris plugging over many years, the structural crew’s ability to maintain removal of debris in gatewells when it is at or near criteria, devoting engineering resources to implement a modification is recommended to be conducted primarily through O&M.

The COE reported at the December 2015 FFDRWG that other LED light sources with higher luminance values had been investigated by the project through O&M and there were no plans for the PDT to move forward with the EDR recommendations for structural improvements or lighting improvements. Fish managers stated closing out the report is not sufficient and something needs to be done that will allow easier monitoring. NOAA and FFDRWG would like to discuss some close-out ideas as there is an issue that needs to be addressed. A request was made to continue the investigation with the potential for inexpensive alternatives to facilitate lighting of orifices and proper inspection.

**CURRENT SCHEDULE**

**FFDRWG REVIEW NEEDED AT MEETING? (If YES, list discussion topics below)**

ATR review status and wrapping up report – Funding has been provided to complete the report by summer incorporating the latest information and ideas to close out the project with alternatives to facilitate improved inspection capability with lighting modifications.

Brainstorming ideas is underway with BON project and FFDRWG to improve observation of the base of the jet through the tube. These concept ideas may be included in the report with a recommendation for the preferred alternative to achieve the first EDR stated goal - "Improving the ability for the project operators to detect debris plugs at the orifice"

Kuhn and Rerecich met with BON biologists on 5/10 to view DSM and brainstorm ideas for improving inspection capability and reliability of the system. Items discussed to increase reliability and performance that may be included in the report as a Recommendation –

1. Existing Air system maintenance for manual and auto cycle.

2. Increase frequency of orifice auto-flush from 4 hour cycle to 2 hour cycle.

3. Increase frequency of changing out clean lenses. Increase from once per year to twice per year by adding a mid-season change out. Cleaning lenses vs. replacement with new being evaluated.

4. New higher luminance and cooler LED lights to reduce water scale buildup.

5. New light hardware to allow unobstructed movement of light for observation of the base of the jet.

6. Clean light tubes i.e. “chimney sweep” to improve view of the base of the jet.

7. Increase tube length. Prototype would allow a test of improved inspection capability by reducing water scale buildup. May not provide much benefit if lenses on exiting tubes are changed out more frequently (3) with light hardware mods (5).

8. Orifice ring inspection plan and schedule to observe from the gatewell to monitor condition.