SYSTEM OPERATIONAL REQUEST: #2008-1

The following State, Federal, and Tribal Salmon Managers have participated in the preparation and support this SOR: Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, the Shoshone-Bannock Tribes, the Columbia River Inter-Tribal Fish Commission, and the Nez Perce Tribe[1].

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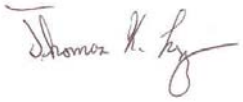

FROM: **Tom Lorz, Vice Chairperson, Salmon Managers**

DATE: **February 26, 2008**

SUBJECT: Spill 100 Kcfs at Bonneville Dam for four days following the March Spring Creek Hatchery Release.

SPECIFICATIONS: Spring Creek National Fish Hatchery is scheduled to release 7.5 million tule fall Chinook beginning on March 5, 2008.

1. Begin operation of the corner collector on March 5, 2008;
2. Beginning March 5, monitor sub-samples at the Hamilton Island Juvenile Monitoring Facility (JMF). When sub-sampling at the JMF indicates large numbers of subyearling Chinook have reached Bonneville Dam, contact COE Reservoir Control Center to begin the spill operation, but begin spill no later than 1800 hours on March 6, 2008;
3. Operate the Bonneville Project to maintain a minimum 15.5 foot tailwater elevation beginning with the initiation of spill on March 5 or 6;
4. Spill at 100Kcfs during daytime hours and 100 Kcfs during nighttime hours (the same levels as included in the 2007 Operation Agreement for spring spill) for a four day period from the initiation of spill (96 hours);
5. No operation of unscreened units at Bonneville Powerhouse II and follow the turbine operating priority in the Fish Passage Plan.
6. Operate Powerhouse II as first priority. Fully load PH II before operating PH I.

[1] CRITFC and the Nez Perce Tribe support the biological justification for the Spring Creek spill and the benefits provided. However, CRITFC and the Nez Perce Tribe refrain from joining in this specific system operation request for 2008 and will address the matter directly with the action agencies.

7. Operate turbine units toward the low end of the 1% range of peak efficiency.
8. Minimum Gap Runner (MGR) units will operate at PH1 on a first on/last off basis when that powerhouse operates. FPP unit operating priorities will be used.
9. Operate juvenile and adult facilities according to criteria.
10. Reduce spill if the total dissolved gas concentration measurements exceed the 12-hour average 120% total dissolved gas limit, measured at the Bonneville Dam TDG tailrace monitor, as prescribed under the dissolved gas waiver from the state of Oregon and the Washington adjusted TDG standards.
11. Maintain a maximum level of 105% TDG (factored for depth compensation) at the chum salmon redds at the Ives Island complex and on the Oregon shore at Multnomah Falls.
12. The Action Agencies should use the flexibility in the system to implement this SOR without jeopardizing the April 10th rule curve elevations called for by the Biological Opinion.

JUSTIFICATION:

Spring Creek National Fish Hatchery (Spring Creek NFH), located upstream of Bonneville Dam on the Columbia River, annually produces tule fall Chinook (*Oncorhynchus tshawytscha*) that are released in the spring of each year as subyearlings. Half of the total production of 15 million fish is released in March, prior to the onset of the Biological Opinion spill program for ESA-listed salmonids (early April). Historically, the March release of juvenile fish at Spring Creek NFH has produced 44% of the returning adults. Although Spring Creek NFH Chinook salmon are listed under the Endangered Species Act (ESA) as part of the Lower Columbia River Chinook ESU, they are deemed not necessary for recovery and therefore are available for harvest. The 7.5 million fish that are released in March are very important to United States/Canada treaty and domestic West Coast fisheries because these fish make up a significant portion of the Chinook caught in West Coast Vancouver Island (WCVI) fisheries, near shore fisheries off the Washington and northern Oregon coast, and local fisheries in the Columbia River. Historically, Spring Creek NFH fish contributed up to 9% of the Chinook catch in the WCVI fisheries and up to 40% of the Chinook catch off of the Washington and northern Oregon coasts, based on post season estimates for 2000-2006 (LaVoy, 2008). Spring Creek NFH has contributed as many as 65,600 fish to treaty Indian fisheries (1976) and 41,500 fish to non-treaty commercial fisheries (1977) in the Columbia River (PFMC, 1996). More recently, the 2002-2004 average catch of Spring Creek NFH origin fall Chinook in the fall season treaty Indian fisheries above Bonneville Dam was 40,000 Chinook, while non-treaty in-river commercial and sports fisheries averaged about 9,000 Chinook (PFMC 2006).

Spring Creek NFH tule salmon are important components of Columbia River treaty Indian and non Indian sport and commercial fisheries and provide a significant benefit for West Coast fisheries, outside the Columbia River, including Canada and Alaska. Every additional adult salmon available for tribal harvest is critical from a tribal use and cultural perspective. Tribal members are dependent on these salmon for ceremonial and subsistence uses. These salmon comprise a critical portion of sustenance for tribal members.

Fish hatchery programs for Columbia River production has been reduced significantly due to Congressional reduction or flat funding for Mitchell Act programs. Releases of the tule fall

Chinook have decreased from an average of 71.6 million in the 1980s to 57.5 million in the 1990s, to an average of 38.4 million since 2000. This is a reduction of 46% since the 1980 brood at both state and federal fish hatcheries and has caused the closure of some facilities. The State of Oregon has drastically reduced its production of tule fall Chinook salmon in the Columbia River system going from an average of 25.0 million releases during the 1980s to an average of 5.7 million since 2000. Spring Creek NFH, is now the only facility producing tule fall Chinook above Bonneville Dam. Nearly all of the remaining Columbia River tule production is released from hatcheries in the State of Washington below Bonneville Dam. These reductions and hatchery closures make maximizing survival and production at Spring Creek NFH even more important for maintaining and improving fisheries in the Pacific Ocean and Columbia River, especially in years of low ocean productivity. The contribution of Spring Creek Hatchery fish to the overall production is much more significant currently, contributing an average of 40% (2000-2006 broods) to the overall tule production, compared to a 26% contribution during the 1980s and 1990s.

Spill is generally accepted as the safest route for fish passage at the Federal Columbia River Power System (FCRPS) facilities in terms of both immediate and delayed survival effects and is our preferred operation for fish passage at Bonneville Dam for the Spring Creek NFH March release. In July 2007, based on the importance of Spring Creek Hatchery Fall Chinook survival through Bonneville Dam, the Oregon Environmental Quality Commission renewed the State of Oregon's dissolved gas waiver to permit March spill at the dam. The Action Agencies historically provided spill at Bonneville Dam coinciding with the timing of the Spring Creek National Fish Hatchery (Spring Creek NFH) releases in March to provide a non-turbine/bypass passage route and improve their survival past Bonneville Dam. The duration and volume of spill at Bonneville Dam for the Spring Creek March releases has varied over time. Since 1992, there have been three general categories of the duration and volume of spill allowed at Bonneville Dam during the March releases. During 1992-2000, spill duration and volume averaged 178 hours (7.4 days) and 1200 KAF. During 2001-2004, average spill duration and volume were reduced to 59 hours (2.5 days) and 177 KAF. During 2005, 2006, and 2007, the Action Agencies did not provide spill for the March releases. However, beginning in 2004, the Bonneville Dam corner collector was operated during the March releases, providing a non-turbine/bypass passage route through the dam. During the 2004-2007 March releases, the corner collector was operated, on average, for 85 hours using 35 KAF. This average corner collector volume is 3.2% of the average volume allowed using spill during 1992-2000.

In 2002, the USACE released the Bonneville Decision Document (USACE 2002), stating that "the purpose of the Bonneville Decision Document is to determine the appropriate measures that should be implemented to improve juvenile survival at Bonneville Dam." The use of spill to improve survival passage survival has been recognized by the USACE, who wrote that "increased spill has been used as an interim measure along with flow and transportation improvements to improve the survival of all listed stocks as well as non-listed fish" (USACE 2002). As stated, the survival benefits of spill do not only apply to ESA-listed stocks, but non-listed stocks as well. "The improvements made at Bonneville are aimed at enhancing and improving all stocks that travel to and descend through Bonneville" (USACE 2002).

One strategy that has been implemented at Bonneville Dam has been to maximize the proportion of fish that pass through non-turbine routes, as measured by maximizing Fish Passage Efficiency (FPE). "FPE and FGE are an indication of the effectiveness of measures to divert juveniles around the turbines, which are considered to have a higher mortality rate, compared to the bypass systems and spillway" (USACE 2002). Maximizing FPE has been a reported goal of the USACE. The FPE studies conducted by Ploskey et al. (2006) were implemented to "support the Portland District's goal of maximizing fish-passage efficiency" (Ploskey et al. 2005, 2006). Maximizing FPE was also a goal of the 2000 NMFS Biological Opinion: "the U.S. Army Corps of Engineers – Portland District is striving to meet the goal, set in the 2000 Biological Opinion on the Federal Columbia River Power System (NMFS 2000), of maximizing juvenile salmonid fish passage efficiency (FPE, the proportion of all fish passing the Project by non-turbine routes)" (Ploskey et al. 2006).

Spill is a necessary operation for maximizing FPE, and without spill FPE will be relatively low. With only the corner collector operating, FPE was only 45% for Spring Creek subyearlings (Ploskey et al. 2005). But with a 25 kcfs spill operation, FPE increased to 54% (Ploskey et al. 2005). With higher (e.g., BiOp) levels of spill in conjunction with the corner collector, high FPE for subyearling Chinook has been measured. With summer-migrating subyearlings, "project FPE of nearly 80% can be attained for subyearling Chinook salmon under a BIOP spill condition in conjunction with the operation of the B2 corner collector" (Evans et al. 2006). It is important to note that the 25 kcfs spill operation implemented in 2004 for Spring Creek is thought to be detrimental to survival. "Spill at Bonneville at or below 50K is known to create poor egress conditions and increase chances for predation" (USACE 2002).

Data collected to-date suggests that survival to adulthood for fish passing through the corner collector is not as high as for those passing in spill. In March 2004, the U.S. Fish and Wildlife Service (FWS) released over 220,000 sub-yearling fall Chinook from Spring Creek NFH with coded wire tags (CWT) to evaluate smolt-to-adult return rates (SAR) back to the hatchery under two operations at Bonneville Dam. Tagged fish were released in two groups: one group released during four days of spill operation at Bonneville Dam and one group released during four days of corner collector operation at Bonneville Dam. Results from this single year of study showed that the overall *SAR* was 0.118% for the fish released during the spill operation and 0.100% for fish released during the corner collector operation. The overall *SAR* for fish released during the spill operation was 18% higher than the *SAR* for fish released during the corner collector operation, however this difference was not statistically significant. Using Bayesian statistical methods, FWS estimated an 80% probability that the *SAR* for the spill operation release was higher than the *SAR* for the corner collector operation release. Applying the results from the 2004 March release operations to the March releases over 2005-2007, FWS estimated that a foregone loss of 15,200 adults (range 2,400-38,900) may have occurred due to corner collector-only operations during 2005-2007. Given this information and the importance of this stock to regional fisheries, the most prudent operation at Bonneville Dam is to provide spill for fish passage.

Four days of spill can achieve 90-95% passage of this stock. Typically, the fish begin to arrive at Bonneville Dam 24h following their release. Using spill flow and TDG data from June21-August 31 of 2006 and 2007 suggests that 100 Kcfs spill at BON would result in approximately 117% TDG at CCIW.

In order to achieve 105% TDG at the redd established when the tailrace was at 11.5 feet, you would need 4 feet of depth compensation over the redds (assuming a 3% decrease per foot of depth comp). Therefore, a 15.5 ft tailwater elevation is needed for four days to spill 100 Kcfs.

Based on 2007 hourly data from April 1 to August 31st, the relationship between total outflow at BON and BON TW is as follows: Total Outflows = (16.064*BON TW)-65.398. Solving the equation with a 15.5 ft tailwater yields a flow of 183.6 Kcfs. The 2-2-08 STP has flows of approximately 141 Kcfs from March 5 through 8. Consequently, flow must be increased by about 42.6 Kcfs for four days in order to spill 100 Kcfs.

Storage at JDA between full (268 ft) and MIP (262 ft) is 306.4 Kaf or 154 Ksfd. Using the storage in John Day pool would provide an extra 38.6 Kcfs for four days providing flows of 179.6 Kcfs, just 4 Kcfs short needed 183.6 Kcfs.

There are several alternatives that could be considered to provide the additional 4 Kcfs flow including:

1. Reduce the current draft of GCL. GCL is currently at 1261.4 feet, which is already below the end of March FC (1267.2 ft). The estimated April 10th at GCL this year is approx. 1255 feet. It appears that GCL is presently being drafted at a rate that is more than needed to meet chum flows at BON (BON TW has averaged 14 feet over the last week). Consequently, the draft at GCL could be minimized to only provide enough water to meet 11.5 feet at BON, and maintain the water to the reservoir. This would leave more water to release in March and would easily be enough to provide the extra 4 Kcfs needed to provide 100 Kcfs spill.
2. Use TDA storage, 31.8 Kaf or 16 Ksfd or 4 Kcfs for four days exists between elevation 160 ft and 157 ft at TDA.
3. Use BON storage, 21.2 Kaf or 10.7 Ksfd or 2.7 Kcfs for four days exists between elevation 76.5 ft and 71 ft at BON.

From our observations it appears possible to use system flexibility and storage to increase flows to approximately 184 Kcfs during the 4 days when spill would be provided for the regionally important Spring Creek NFH tule fall Chinook release. ESA listed chum salmon below Bonneville Dam would be protected under this plan.

The March release from Spring Creek represents a substantial fraction of the total number of subyearlings annually passing Bonneville Dam. Based on the 2007 Passage Index data, 26% of all subyearlings passing Bonneville in 2007 passed during the seven days associated with the March release from Spring Creek. As a result, failing to provide spill operations during the Spring Creek March release reduces the FPE for a substantial portion of the total run of listed and non-listed subyearlings passing Bonneville Dam. Operations that knowingly reduce FPE are inconsistent with the USACE and NMFS goal of maximizing FPE (USACE 2002, Ploskey et al. 2006).

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