APPENDIX N

Use of Additional Flow Capacity to Achieve Benefits Other Than Sturgeon Spawning and Incubation Flows

Appendix N USE OF ADDITIONAL FLOW CAPACITY TO ACHIEVE BENEFITS OTHER THAN STURGEON SPAWNING AND INCUBATION FLOWS

The USFWS Biological Opinion of 2000 (Reasonable and Prudent Alternative 8.2) requested implementation of additional flow capacity from Libby Dam to provide higher base flows for sturgeon spawning and incubation in the Kootenai River. It also mentioned the benefit of greater flexibility in refilling of Lake Koocanusa. If in fact the reservoir can fill sooner in the season, then benefits to recreation, and to reservoir fish and other organisms, may result from the longer period at full pool.

The perceived mechanism by which this flexibility would work is that earlier refill could occur while reservoir inflows are still dropping between 34,500 cfs (assumed augmented outflow capability) and 24,500 cfs (roughly current powerhouse capacity) instead of only after inflows have dropped below current powerhouse capacity. If refill happens sooner than inflows drop below outflow capacity, then forced spill results, with potential adverse consequences related to high dissolved gas levels, and/or reduced capability to control flooding.

The mechanism and benefits associated with earlier refill flexibility were expressed further in an email from Robert Hallock, U.S. Fish and Wildlife Service (USFWS), to Jeff Laufle, U.S. Army Corps of Engineers (Corps), 24 Feb 2005. Items from Mr. Hallock's e-mail are individually summarized below (*in italics*), with each item followed by the Corps' assessment.

1. *Earlier reservoir refill should be possible given the flexibility to release larger amounts of water. This would have recreational and biological benefits for the reservoir.*

Actually, most of the time, a greater powerhouse capacity would make no difference in terms of peak reservoir elevation or timing of refill. When Libby Dam provides fish flows, operations for fish govern the regulation decisions and Libby does not refill in most years, so having additional flow capacity as the reservoir is refilling becomes moot. Analysis of the hydroregulation modeling that forms the basis for Kootenai River evaluations in this EIS reveals only six years within the 52-year period of record when the reservoir would be regulated differently due to additional outflow capacity. Those years were: 1955, 1977, 1988, 1993, 1995, and 1998.

In tier 1 years when no sturgeon flow is provided, there is a refill improvement when the "fill and spill" threshold is assumed to be 34,500 cfs instead of 24,500 cfs. In computer modeling for 1988 and 1993, Libby got to full pool about a week earlier. In 1977, Libby model results showed Libby reaching its highest elevation on the same day either way, but the maximum elevation was 1.3 feet higher.

In a few years (1955, 1995, 1998) Libby could reach full pool earlier (about 2 weeks earlier), but in the modeling it came at the expense of a very unnatural regulation, where there was a dramatic increase in outflow as the reservoir reached full pool.

Thus, while the Corps can take advantage of whatever flexibility is available in real-time operations, early refill is not something that can be counted on as a "normal" benefit of additional flow capacity.

2. *With additional outflow capacity, the likelihood of refill should be increased, giving better assurance of meeting flow needs for fish downstream.*

There might be a slight chance of improved refill probability in some years (see response to comment 1), and downstream fish would benefit, though the benefit to salmon would vary with the amount of refill. Modification of the storage reservation diagrams, however, would entail totally revamping flood control based on the 35,000 cfs capacity, which would be outside the scope of this EIS.

3. *"With improved water supply conditions for fish habitat, increased recreational opportunities and associated commercialization opportunities would occur in both the U.S. and Canada."*

Depending on the actual shape of the downstream flow, river recreation might benefit, but there are limits—see the recreation analysis in this EIS. If reservoir recreation is the focus of this comment, then earlier refill as described in the response to comment 1 might improve economic opportunities in relatively rare years. However, drawdown for salmon would probably not allow the reservoir to stay full for long, especially if we are attempting to avoid a "double peak" in river flows.

4. *Greater release capacity should provide better flood control.*

There was only one year to consider for this comment, because with the current powerhouse capacity, simulations showed only one year when the river at Bonners Ferry got above flood stage. When this year was simulated again assuming an increased powerhouse capacity, it made no difference (the river stage at Bonners Ferry was still the same). It happens that 1961 is a year where runoff conditions below the dam are very high at the same time water managers would like to be preserving flood control space in the reservoir. Therefore, it is difficult to draw a solid conclusion about whether increased flow capacity would provide flood control benefits. In theory, a higher powerhouse capacity could afford greater flexibility in maintaining flood control space in the final stages of refill, depending on runoff conditions below the dam. However, the project is already equipped with spillways and sluice gates to provide additional release capacity beyond powerhouse capacity.

5. *Greater release capacity could mitigate against uncontrolled spill and associated adverse consequences, especially if installation of more generators, or other improvements to address dissolved gas generation, were employed.*

The purpose and need for the EIS is to address the change in flood control operations and the effects associated with additional downstream flows. We have arrived at no mechanism to provide 10,000 cfs above current powerhouse capacity at Libby within Montana dissolved gas standards, so this is premature for this EIS.

6. *Adding generators would require new transformers, providing redundancy in case of equipment failure, which in turn might reduce risk of large spill events and help ensure needed fish flows.*

Again, we have not determined a mechanism to provide the additional 10,000 cfs out of Libby consistent with the State of Montana's water quality standard. It is outside the scope of this EIS to speculate on that mechanism. Also, refill was missed by only 2 feet in the 2002 spill event, if that event is part of the logic regarding spill and refill failure in the comment.

7. *Greater spring flows could help scour gravel clean downstream, providing biological benefits.*

(See response to #8) Recent information from the USGS indicates that the ability to scour sediment in the Kootenai/y River below Bonners Ferry may be very limited if it exists at all. Because of the Kootenay Lake backwater effect, the ability to increase velocities to levels that would mobilize and clear fine sediments is questionable, and possibly even more so in British Columbia than in Idaho.

8. *Scour might help to restore channel capacity that has been reduced by sediment accumulation.*

Analysis indicates that suspended sediment transport with additional flow capacity would be about 15% higher than that without increased release capacity. This equates to less than 0.1 foot per year of riverbed erosion if the erosion is limited to a 10 mile reach of the river (Kootenai River Sand Transport, Corps 2004).

9. *Revisiting VARQ and the variable December 31 reservoir draft level in the context of the additional release capacity could aid in reservoir refill in low-runoff years.*

We have evaluated VARQ and fish flows using 10,000 cfs above Libby powerhouse capacity. However, reformulating VARQ and the December 31 variable draft limit to 10,000 cfs above powerhouse capacity would entail totally revamping flood control, which is outside the scope of this EIS. This effort may be appropriate in the future as we get closer to a mechanism to achieve the additional outflow capacity.

10. *VARQ could increase average annual power revenues by $5 million (according to Bonneville Power Administration), which could offset costs of installing additional generator installation and transmission improvements to achieve the additional 10,000-cfs capacity.*

We are investigating the possible costs and benefits for a variety of mechanisms to achieve additional outflow capacity, but have reached no conclusions. In addition, the Corps' power analysis shows a small net average loss in system generation from VARQ versus Standard Flood Control.

11. *"Higher flows that help scour the channel in the braided reach [at Bonners Ferry] are important to maintaining a channel with sufficient depth to encourage white sturgeon to migrate into this reach where substrate and higher velocities are more appropriate for spawning and recruitment."*

It is not clear that depth in the braided reach presents a barrier to sturgeon migration under the current flow regime. Existing channel depths in the braided reach appear to be sufficient for sturgeon migration, but, for unknown reasons, sturgeon don't appear to move upstream of Bonners Ferry. Also, hydraulic conditions in the braided reach are different than they were in the 19th century. While Libby Dam did reduce sediment transport capacity in the braided reach, it also reduced the inflowing sediment load. It may be that operations for flood control will necessarily limit discharges such that scouring will not occur in the braided reach. The investigations necessary to define the magnitude of hydraulic and sediment transport changes, or to determine the discharges required to induce scour in the braided reach, have not been conducted.