

MEMORANDUM THRU CHIEF, CENWP-OD

FOR CENWP-OD-D (Operations Manager)

Subject: Spillway Operations at The Dalles

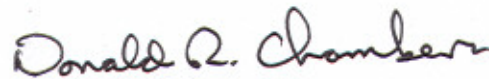
1. Relatively high seasonal Columbia River flow may require the use of red-tagged spillway gates. This memorandum provides recommendations for when red tagged bays should be operated and the sequence in which they should be opened. Currently, spillway gates 10 through 23 are red tagged because of concerns related to trunnion friction. In addition, spillway gates 10, 11 and 13 are further red tagged due to wire rope condition and spillway gate 20 is red tagged due to delamination of the trunnion anchor. In 2005/2006 the wire ropes on gates 1 through 9 were replaced and each gate was greased and exercised through its full operating range. Gates 1 through 9 are fully operational.
2. The goal during the original design work on the spillway, stilling basin and spillway shelf was to keep the depth average velocity on the basalt at 20 fps or less. This was achieved by spilling uniformly over all 23 bays. Thus as the spill volume increased the total river and tailwater elevation increased keeping the depth average velocity at 20 fps or less. With the construction of the 6/7 spillwall in 2003 new spill patterns were developed that concentrated the spill in the northern 6 bays. This increased the depth average velocity on the spillway shelf to a value closer to 25 fps with some instances where the depth average velocity reached 30 fps. Erosion has occurred on the spillway shelf but not at a rate that has been alarming or raised any dam safety concerns.
3. Given the condition of the spillway gates and risk of failing a gate on demand, the decision was made to maximize the spill through bays 1-9 during periods of high river flow. Erosion will occur but the consequences can be mitigated whereas the consequences and mitigation of a failed tainter gate or tainter gate component are less certain.
4. The 2008 spring runoff season has provided some high flows but all indications are the project can safely pass these flows through the project without opening a red tagged bay. However, if the powerhouse is shut down for any reason, red tagged bays will need to be opened at a total river discharge of approximately 375 Kcfs. For this condition, when red tagged bays need to be opened, they should be opened incrementally to a maximum of 6 feet prior to the next gate being operated. The priority sequence of opening is: Bay 16, Bay 17, Bay 18, and Bay 19. These bays will be open to the maximum allowable as discussed in paragraph 4. If additional bays are needed the order is: Bay 14, Bay 12 and Bay 21.
5. The 1:25 spillway model at ERDC was used to identify when sheet flow would be expected at the vertical end sill. Sheet flow at the end sill is considered to be a hydraulically un-acceptable condition and therefore is the limiting criteria for maximum flow through the spillway gates.

The model suggested that the maximum flow through a single bay was 55 Kcfs to 65 Kcfs at a forebay elevation of 168 feet. Since the forebay elevation cannot exceed elevation 160, the unacceptable hydraulic condition does not limit the spill per bay. Thus, spill per bay will be limited to the maximum gate opening while maintaining a controlled flow condition. The original model reports suggest that the maximum gate opening is 28 feet with a forebay elevation of 160 feet. If the forebay elevation is less than 160 feet, the maximum gate opening will be less. (The spillway gates are currently equipped with limit switches that reduce the maximum gate opening that can be executed from the control room. To override the limit switch the gate has to be operated from the spillway deck. Thus the operator will be able to verify that flow is being controlled by the gate and uncontrolled flow has not been initiated.)

6. Table 1 is the revised spill table to account for red tagged bays. Between spill volumes of 24 Kcfs and 180 Kcfs fish passage criteria is being met, however, it is not clear how greater flows per bay will impact total dissolved gas. Table 2 provides estimated depth average velocities assuming 0 Kcfs, 100 Kcfs, 150 Kcfs, 200 Kcfs and 250 Kcfs through the powerhouse. Depth average velocities of 30 fps should not be exceeded unless an emergency is declared and gate openings can approach the uncontrolled level. Table 3 identifies the maximum powerhouse load necessary to pass different spill volumes.

7. If spill through gates 1 through 9 is expected to exceed the fish passage criteria of 180 Kcfs, or if depth average velocities of 30 fps are anticipated to be exceeded for more than 4 hours, project staff are requested to contact Laurie Ebner at 503-250-3404. A multi-beam hydrosurvey of the basalt shelf and a dive survey to measure undercutting should be performed at the end of the 2008 spill season.

Encl



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