
Date: June 22, 2006

To: Environmental Quality Commission

From: Stephanie Hallock, Director

Subject: Agenda Item E, Informational Item: Columbia River 2005 Spill Season Total Dissolved Gas Waiver Report, June 22-23, 2006, EQC Meeting

Purpose of Item The purpose of this item is to inform the Environmental Quality Commission (EQC) about existing EQC waivers of the Oregon water quality standard for total dissolved gas. The waivers, granted to the U.S. Army Corp of Engineers (ACOE) and the U.S. Fish and Wildlife Service (USFW), allow increased water spill over dams for fish passage. This agenda item will report total dissolved gas levels during the 2005 spill season, as required annually under terms of the waivers. No EQC action is currently required; however, the U.S. Army Corp of Engineers and the U.S. Fish and Wildlife Service are expected to petition the EQC for a joint waiver when the current waivers expire in 2007.

Background The volume of water spilling through dams on the Columbia River is intentionally increased for certain periods each year (spill season) to assist out-migrating threatened and endangered salmon. Without the spills, salmon are unable to pass the dams to complete their life cycle.

The increased water spill affects the amount of total dissolved gas in the water. Total dissolved gas is the result of small air bubbles dissolving in water, as plunging spill water pulls the air bubbles to depth downstream of the spilling dam. Increases in total dissolved gas can harm fish by creating a condition akin to the “bends” (or decompression sickness) in humans. At very high levels, total dissolved gas results in bubbles in eyes and body tissues and can be lethal. The controlled dam spills commonly result in total dissolved gas levels that are higher than allowed under water quality standards. The state standard for total dissolved gas is:

- 105 percent of saturation (relative to atmospheric pressure at the point of sample) in waters that hatcheries discharge to and other waters of less than two feet in depth.
- 110 percent of saturation in other waters.

The EQC has granted waivers of the total dissolved gas water quality

standard to the U.S. Army Corp of Engineers (ACOE) and U.S. Fish and Wildlife Service (USFW) since 1994, allowing increased spill at the Bonneville, The Dalles, John Day, and McNary dams. By waiving the standards, the EQC has balanced risks posed by high levels of total dissolved gas with the benefits of spill for fish passage. The EQC granted the multi-year waivers based on the low incidence of acute gas bubble trauma detected with extensive biological monitoring. A condition of the waivers is that DEQ present this report to the EQC each year summarizing the effects of the dam spills.

The ACOE and USFW waivers allow total dissolved gas levels to rise to:

- 120 percent of saturation in the tailwater (the area downstream of the spilling dam), maximum 12-hour daily average.
- 115 percent of saturation in the forebay (the holding bay behind the dam), maximum 12-hour daily average.

Additional terms of the waivers include:

- Total dissolved gas may not exceed 125 percent of saturation for more than two hours in every 24 hours.
- During the spill season, when total dissolved gas exceeds 110 percent, fish must be monitored for evidence of gas bubble trauma.
- The U.S Fish and Wildlife Service waiver allows increased spill for an unspecified ten day period in March to assist migrating Spring Creek Hatchery Chinook through the Bonneville Dam.
- The U.S. Army Corp of Engineers waiver allows increased spill from April 1 through August 31 at the Bonneville, The Dalles, John Day, and McNary dams on the lower Columbia River
- Both waivers expire at the close of the 2007 spill season.

In 2002, Oregon and Washington completed the Lower Columbia River Total Maximum Daily Load (TMDL) for total dissolved gas. Current total dissolved gas waivers require that the U.S. Army Corps of Engineers, which operates the dams, report periodically on their progress toward implementing the TMDL. To facilitate TMDL implementation, the states, Army Corps of Engineers, and the federal and state fish agencies meet monthly and collaborate to facilitate fish

passage through Lower Columbia River dams.

Spill waivers serve as an interim allowance for compliance with the TMDL in the short term. Meeting the load allocations in the TMDL will occur in two phases. Phase one will involve improving water quality and implementing operational changes, while ensuring that salmon passage is fully protected—in part through the use of waivers for spill at dams. Phase two will involve structural changes to dams to achieve the water quality standard for total dissolved gas, eventually eliminating the need for waivers. Phase two will begin in 2010 and proceed through 2020.

Key Issues

U.S. Army Corps of Engineers 2005 spill season report

- Columbia River flows, basin precipitation and reservoir storage for the 2005 water year were below average.
- Columbia River spill ranged from 50 thousand cubic feet per second (Kcfs) to 195 Kcfs.
- On the Lower Columbia River, there were a total of 50 exceedances of the gas waiver limits during the 2005 spill season. Of those:
 - 46 exceedances were in the forebay (upstream of the spilling dam).
 - Four exceedances were in the tailwater (downstream of the spilling dam).
- The highest tailwater exceedance occurred at John Day dam at a level of 120.6%.
- The highest forebay exceedance occurred at McNary dam at a level of 119.5%.
- Sampling of juvenile salmon and trout for gas bubble disease was conducted at Bonneville and McNary dams two days per week. A total of 7,648 juvenile fish were examined with two individuals (0.0003 percent) exhibiting minor signs of gas bubble disease.

U.S. Fish and Wildlife Service 2005 spill season report

- USFW released 7.35 million Chinook on Wednesday, March 2, 2005. The goal was to pass more than 90 percent of the Chinook

during the spill operation period.

- USFW monitored water quality at mainstem Columbia River gauges below Bonneville Dam (Warrendale and Camas/Washougal) and at critical salmon spawning locations during the March 3 - 5 spill period.
- Spill volume at Bonneville Dam varied from 0-2.3 thousand cubic-feet-per-second (Kcfs).
- Total dissolved gas levels recorded downstream of the dam monitoring station (Warrendale) did not exceed the 120 percent waiver limit (107.9 percent actual).
- Total dissolved gas levels recorded at the Camas/Washougal monitoring station did not exceed the 115 percent waiver limit (109.2 percent actual).
- No biological monitoring for gas bubble trauma was conducted in 2005 because the total dissolved gas levels did not exceed 110 percent.
- The total dissolved gas levels measured by USFW for shallow spawning sites near Multnomah Falls and Ives Island exceeded the 105 percent total dissolved gas standard for shallow water. Due to the elevated total dissolved gas levels, the spill operation was terminated after two of the planned four days of operation for Spring Creek Chinook passage.
- Approximately 61 percent of the Spring Creek fall Chinook passed Bonneville Dam during the March spill period.

**EQC
Involvement**

U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service 2006 total dissolved gas and spills report will be available January 1, 2007. In 2007, when both waivers expire, ACOE and USFW are expected to petition the EQC for a joint waiver. DEQ seeks EQC feedback regarding the usefulness of spill season reports and whether the Commission desires additional information regarding dam spills, or an on-site inspection of a dam, in preparation for EQC action on the waivers in 2007.

Attachments

- A. EQC order approving U.S Army Corps of Engineer request for a variance to the state total dissolved gas water quality standard.

- B. EQC order approving U.S. Fish and Wildlife Service request for a variance to the state total dissolved gas water quality standard.
- C. Oregon Administrative Rule relating to the total dissolved gas water quality standard.
- D. U.S Army Corps of Engineers total dissolved gas TMDL implementation summary.

Available Upon Request

- 1. U.S. Army Corps of Engineers 2005 Dissolved Gas and Water Temperature Monitoring Report
- 2. U.S. Fish and Wildlife Gas Supersaturation Monitoring Report during corner collector operation and spill at Bonneville Dam March 2-5, 2005
- 3. Total Maximum Daily Load (TMDL) for the Lower Columbia River Total Dissolved Gas, September 2002.

Approved:

Section: _____

Division: _____

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