

## Public Notice:

# Proposed Modification to Total Dissolved Gas Water Quality Standard for Mainstem Columbia River

## Requests for Comments and Public Hearing



State of Oregon  
Department of  
Environmental  
Quality

The Oregon Department of Environmental Quality invites the public to provide written comments on the Oregon Environmental Quality Commission's proposed modification to the total dissolved gas water quality standard for the mainstem Columbia River.

Written comments due:  
5 p.m. Friday, Dec. 6, 2019

Written and electronic comments must be received by the due date to be considered and included in the official record. Additionally, comments presented to the Oregon Environmental Quality Commission at their November meeting and DEQ Public Hearing will be included in the public record.

### Where can I get more information and provide comments?

DEQ accepts comments during public hearings and by mail, fax and e-mail.

### Hearing details

The EQC will receive comments at a public hearing during their Nov. 14-15, 2019, meeting in Portland, as Item I of that meeting's agenda: <https://www.oregon.gov/deq/about-us/eqc/Pages/20191114.aspx>

DEQ will additionally be holding a public hearing. You can learn more about the proposed modification, ask any questions you may have and provide verbal or written comments on the proposed modification.

**When:** 6 p.m.  
Wednesday, Dec. 4, 2019

**Where:** Oregon DEQ  
3rd Floor Conference Room  
700 NE Multnomah St.  
Portland, OR 97232

### Submit comments by mail or email to:

Paula Calvert, Columbia River Coordinator  
700 NE Multnomah St., Suite 600  
Portland, OR 97232

Fax: 503-229-6037

Email: [calvert.paula@deq.state.or.us](mailto:calvert.paula@deq.state.or.us)

### How can I review documents?

The following documents about this proposed standard modification are available:

- [U.S. Army Corps of Engineers' standard modification request](#)
- [2019-2021 Spill Operation Agreement](#)
- [Proposed water quality standard modification](#)

These documents and information on public comment period can be accessed online at: <https://www.oregon.gov/deq/wq/tmdls/Pages/TMDLs-Columbia-River.aspx>

To request a copy of the proposed standard modification and related documents, contact Paula Calvert at 503-229-5101, or toll-free at 800-452-4011.

### What are DEQ's responsibilities?

DEQ is a regulatory agency that helps protect and preserve Oregon's environment. One way DEQ does this is by requiring authorizations for certain activities, such as issuing limited use modifications to water quality standards.

### Who is the applicant?

U.S. Army Corps of Engineers.

### What facilities are affected?

The lower four Columbia River hydropower dams: Bonneville Dam, The Dalles Dam, John Day Dam and McNary Dam.

### What is proposed?

EQC proposes to issue a modification to Oregon's 110 percent total dissolved gas water quality standard based on the Corps' request for a modification, which will help to fulfill the principle and objectives of the 2019-2021 Spill Operation Agreement, also known as the flexible spill agreement, for which the State of Oregon and the Corps are a signatories. A goal of the

### Watershed Management Section

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flexible spill agreement is to increase the proportion of juvenile salmonids passing the four lower Columbia dams via water spilling over the dams during times of low power demand.

This modification is for the purpose of increasing the amount of voluntary spill of water at the four lower Columbia River dams to assist in the passage of out-migrating threatened and endangered salmonids (salmon and trout). DEQ is inviting public comment on the proposed water quality standard modification. During the comment period the public is invited to make comments related to specific conditions within the proposed standard modification.

Spilling water over dams increases the level of total dissolved gas in the river. Water plunging from a spill captures air and carries it to a depth where the pressure forces the gas into solution. Total dissolved gas levels above 110 percent of saturation can cause gas bubble trauma in fish. Gas bubble trauma is caused by gas bubbles forming in the cardiovascular system of aquatic species. These bubbles block the flow of blood and respiratory gas exchange.

Since 1996, the EQC has approved total dissolved gas standard modifications for 120 percent for spill to assist juvenile salmonid migration. The proposed standard modification has separate conditions for allowing up to 125 percent total dissolved gas during the spring season and up to 120 percent during the summer spill season.

For spring spill, April through mid-June, the proposed standard modification will allow 125 percent total dissolved gas limit in the tailrace. The proposed limit will be calculated as the average of the 12 highest hourly readings in a calendar day. As a safety measure, DEQ included a 126 percent total dissolved gas maximum calculated as the average of the two highest hourly total dissolved gas measures in a calendar day. In addition to previously required physical and biological monitoring, non-salmonid monitoring for effects of elevated total dissolved gas exposure is required for 125 and 126 percent total dissolved gas standard modifications.

For summer spill, mid-June through August, the proposed standard modification will continue the 120 percent total dissolved gas limit in the tailrace calculated as the average of the 12 highest hourly readings in a calendar day. The maximum total dissolved gas is 125 percent calculated as the average of the two highest

hourly total dissolved gas readings in a calendar day.

The spring 125 percent and summer 120 percent proposed limits are in accordance with the National Marine Fisheries Service 2019 Columbia River System Biological Opinion to provide spill for juvenile salmonids in the spring and summer.

The proposed standard modification will require biological monitoring to occur. The Fish Passage Center will continue biological monitoring at McNary and Bonneville dams according to the procedure described in its 2009 document, "GBT Monitoring Program Protocol for Juvenile Salmonids."

The proposed standard modification will be limited to the historic April 10 to Aug. 31 fish passage spill period. If spill is necessary outside this period for the purpose of the Spring Creek Hatchery fish release, benefit of Endangered Species Act listed fish, maintenance activities, or biological or physical studies, then the Corps must notify DEQ of this need in writing one week prior to the spill; DEQ will make a determination of approval at that time.

**Modification expiration:** A two-year modification is proposed to the 110 percent total dissolved gas standard, 2020 through 2021, which aligns with time span stated in the flexible spill agreement.

#### **Who is affected?**

Federal, state, tribal and local agencies involved in fisheries, energy or water management for the Columbia River, including industries, citizens and environmental organizations concerned with water and energy management or with recovery of salmonid stocks.

#### **What legal requirements apply?**

Oregon Administrative Rule (OAR) 340-041-0104(3) gives the Oregon Environmental Quality Commission the authority to issue this standard modification.

#### **What happens next?**

After the public comment period ends, DEQ will consider all public comments received, conduct its own technical analysis and present the Corps' request for the EQC's decision during their January 2020 meeting.

All parties providing comment during the public comment period will be notified in writing of the final decision. Other interested parties who want notification of the decision should write or call DEQ at the above address.

**Alternative formats**

DEQ can provide documents in an alternate format or in a language other than English upon request. Call DEQ at 800-452-4011 or email [deqinfo@deq.state.or.us](mailto:deqinfo@deq.state.or.us).

# Order Approving the U.S. Army Corps of Engineers' Request for a Modification to the State's Total Dissolved Gas Water Quality Standard

## BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

In the matter of the U.S. Army Corps	)	FINDINGS and
of Engineers' request to spill water	)	ORDER
to assist out-migrating threatened	)	
and endangered salmon smolts	)	

### **Findings**

1. The Department of Environmental Quality received a request from the U.S. Army Corps of Engineers (Corps) dated July 10, 2019, to adjust the 110 percent total dissolved gas water quality standard as necessary to spill water over McNary, John Day, The Dalles and Bonneville dams on the Lower Columbia River to assist out-migrating threatened and endangered salmonid smolts during the fish passage season of April 10 to Aug. 31. The request sought approval in alignment with the 2019-2021 Spill Operations Agreement

2. Acting under **OAR 340-041-0104(3)** the commission finds that:

(a) *Failure to act would result in greater harm to salmonid stock survival through in-river migration than would occur by increased spill:*

Of the thirteen Endangered Species Act listed evolutionarily significant units of salmonids that migrate past the Columbia River dams, two ESUs in particular have struggled to meet recovery goals. Based on annual reporting of the Comparative Survival Study (CSS) juvenile fish passage survival model, Snake River spring/summer Chinook salmon and summer steelhead have fallen short of the 2-6 percent smolt-to-adult return (SAR) target for recovery established by the Northwest Power and Conservation Council. From 1994 through 2016, Snake River spring/summer Chinook salmon SARs have been above 2 percent for only 2 years, with an average SAR of less than 1 percent, signifying major population declines. From 1997 through 2015, Snake River summer steelhead SARs have been above 2 percent for 8 years with an average SAR of 1.7 percent.

A seasonal increase in the total dissolved gas criteria to 125 percent from the historical 120 percent during the spring juvenile salmonid passage will allow the Corps to increase voluntary spill, passing more juvenile Snake River spring/summer Chinook salmon and steelhead over the spillway and reduce their passage through the turbines, a route referred to as powerhouse passage. Although mortality as a direct result of powerhouse passage is low, the CSS model finds that increased rates of powerhouse passage negatively impacts in-river survival and early ocean survival of juvenile salmonids.

Fish Passage Center data estimate an approximate 1 percent incidence of gas bubble trauma in juvenile salmonids in the Columbia River when total dissolved gas levels are managed to 120 percent in the tailrace. This estimate is based on monitoring information collected between 1995 and 2019. Opportunities to monitor juvenile salmonid exposure to total dissolved gas above 120 percent occurs during involuntary spill such as times of high stream flows. Based on observations of gas bubble trauma monitoring of juvenile salmonids, gas bubble trauma threshold of 15 percent gas bubble trauma prevalence has generally been exceeded with exposure to total dissolved gas levels near 130 percent or higher.

Based on these considerations, the Commission finds that failure to approve the modification requested by the Corps would, on balance, result in greater harm to salmonid stock survival than would approval of the modification.

- (b) *The modified total dissolved gas criteria associated with the increased spill provides a reasonable balance of the risk of impairment due to elevated total dissolved gas to both resident biological communities and other migrating fish and to migrating adult and juvenile salmonids when compared to other options for in-river migration of salmon:*

Risk of aquatic life impairment due to elevated total dissolved gas exposure is dependent on factors including species sensitivity to high total dissolved gas and depths where species are located during different life stages. Depth is an important consideration because total dissolved gas is reduced approximately 10 percent for each meter of depth, a phenomenon known as hydrostatic depth compensation. Given the variability of field conditions and life stages it is difficult to generalize relationships of total dissolved gas exposure and gas bubble trauma observed for resident species. Studies have shown instances when greater than 15 percent of resident fish examined have signs of gas bubble trauma when exposed to 120-125 percent total dissolved gas.<sup>1,2</sup> However, field observations conducted for comparing species sensitivities to total dissolved gas have shown that juvenile salmonids are more sensitive than the resident species examined.<sup>3</sup>

Increasing the level of total dissolved gas allowed during periods of voluntary spill during the specified periods of the year will increase the risk of impairment to both resident and other migrating fish, as well as to migrating salmon. However, the predicted benefits to survival rates for Snake River spring/summer Chinook salmon and summer steelhead are significant and reasonably balance the increase in risk.

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<sup>1</sup> Ryan BA and Dawley EM. 1998. Effects of dissolved gas supersaturation on fish residing in the Snake and Columbia rivers, 1997. Bonneville Power Administration.

<sup>2</sup> Schrank BP, Ryan B and Dawley EM. 1998. Effects of dissolved gas supersaturation on fish residing in the Snake and Columbia Rivers, 1996. Report by National Marine Fisheries Service, to US Army Corps of Engineers, North Pacific Division, Portland, Oregon.

<sup>3</sup> Toner MA and Dawley EM. 1995. Evaluation of the effects of dissolved gas supersaturation on fish and invertebrates downstream from Bonneville Dam, 1993. Coastal Zone and Estuarine Studies Division, Northwest Fisheries Science Center, National Marine Fisheries Service

*(c) Adequate data will exist to determine compliance with the standards:*

Physical monitoring for total dissolved gas is necessary for evaluating compliance with the standards. The Corps utilizes real-time total dissolved gas observations from fixed monitoring stations located the tailraces of McNary, John Day, The Dalles and Bonneville Dams. The Corps reviews their total dissolved gas monitoring plan annually and updates it as needed. The plan will be available at: <https://www.nwd.usace.army.mil/CRWM/Water-Quality/>. Implementation of the total dissolved gas monitoring plan will ensure that data will exist to determine compliance with the standards for the voluntary spill program identified in this Order. The Corps will report each year's physical monitoring results to DEQ.

*(d) Biological monitoring is occurring to document that the migratory salmonid and resident biological communities are being protected:*

Biological monitoring occurs according to the Fish Passage Center 2019 document "Gas Bubble Trauma Monitoring Protocol and GBT.net Data Entry Users Manual," available at: [ftp://ftp.fpc.org/gbt/gbtmanual\\_datasheet](ftp://ftp.fpc.org/gbt/gbtmanual_datasheet). Juvenile salmonids are collected at Bonneville and McNary Dams and examined for incidence of gas bubble trauma, and assigned ranks based on severity of their symptoms. Monitoring non-salmonid species for gas bubble trauma can occur by utilizing the existing infrastructure for sampling juvenile salmonids. The Corps will report each year's biological monitoring results to DEQ.

## **Order**

1. The Environmental Quality Commission approves the requested modification to the 110 percent total dissolved gas water quality standard for voluntary fish passage spill at McNary, John Day, The Dalles and Bonneville Dams on the Lower Columbia River, subject to the following conditions:
  - (i) The modified total dissolved gas standard for the Columbia River applies during the voluntary spill period from 00:00 April 10 to 24:00 Aug. 31 for the purpose of fish passage.
  - (ii) The DEQ Director may approve additional periods of application of this modification, beyond the April 10 to Aug. 31 period, subject to subsections (v)a) to (v)d) for reasons including passing Spring Creek Hatchery fish releases, maintenance activities, and biological or physical studies of spillway structures and prototype fish passage devices. The Corps must notify DEQ in writing describing the purposed action, the purpose of the action and dates of action at least one week prior to the spill. The Corps must obtain approval from the Director prior to such spill.
  - (iii) The modified total dissolved gas standards will apply for two years, 2020 and 2021.
  - (iv) Voluntary fish passage spill during the spring spill season, occurring from April 10 through June 15, is subject to the following conditions:

- a) Spill must be reduced when:
  - i. The average total dissolved gas concentration of the 12 highest hourly measurements in a calendar day exceeds 125 percent of saturation in the tailraces of McNary, John Day, The Dalles or Bonneville Dams monitoring stations, or
  - ii. Instantaneous total dissolved gas levels exceed 126 percent of saturation, calculated as the average of the two highest hourly total dissolved gas measures in a calendar day in the tailraces of McNary, John Day, The Dalles or Bonneville Dams monitoring stations.
- b) Physical monitoring must occur and be adequate for implementing the requirements set out in subsections (iv)a) and (vi) to (viii).
- c) Biological monitoring must occur and include monitoring for effects of elevated total dissolved gas exposure on salmonid and non-salmonid fish species. Best efforts must be made to obtain sufficient biological monitoring sample size of 100 each for salmonids and non-salmonids. Biological monitoring must be adequate to implement the requirements set out in subsections (iv)d) and (vi) to (viii). Gas bubble trauma monitoring for juvenile salmonids may be halted if there is a high mortality risk due to compounded effects of the evaluation procedure and adverse environmental factors such as high stream temperatures.
- d) Voluntary fish passage spill will be subject to conditions in subsections (v)a) through (v)d) for the remainder of the spring spill season if either of the following biological thresholds are exceeded as a result of voluntary fish passage spill:
  - i. 15 percent or more of salmonids or non-salmonids examined show signs of gas bubble disease in their non-paired fins, or
  - ii. Five percent or more of salmonids or non-salmonids examined show signs of gas bubble trauma in their non-paired fins where more than 25 percent of the surface area of the fin is occluded by gas bubbles.
- (v) Voluntary fish passage spill during the summer spill season, occurring from June 16 through Aug. 31, is subject to the following conditions:
  - a) Spill must be reduced when:
    - i. The average total dissolved gas concentration of the 12 highest hourly measurements in a calendar day exceeds 120 percent of saturation in the tailraces of McNary, John Day, The Dalles and Bonneville Dams monitoring stations, or
    - ii. Instantaneous total dissolved gas levels exceed 125 percent of saturation, calculated as the average of the two highest hourly total dissolved gas measures in a calendar day in the tailraces of McNary, John Day, The Dalles and Bonneville Dams monitoring stations.
  - b) Physical monitoring must occur and be adequate for implementing the requirements set out in subsections (v)a) and (vi) to (viii).
  - c) Biological monitoring must occur and include monitoring for effects of elevated total dissolved gas exposure on juvenile salmonids. Biological monitoring must include monitoring for effects of elevated total dissolved gas exposure on salmonid fish species. Best efforts must be made to obtain sufficient biological monitoring sample size of 100. Biological monitoring must be adequate to

implement the requirements set out in subsections (v)d) and (vi) to (viii). Gas bubble trauma monitoring for juvenile salmonids may be halted if there is a high mortality risk due to compounded effects of the evaluation procedure and adverse environmental factors such as high stream temperatures.

- d) The DEQ Director will halt the voluntary spill program or require reductions in voluntary spill to reduce TDG levels if either of the following biological thresholds are exceeded as a result of voluntary fish passage spill:
  - i. 15 percent or more of salmonids examined show signs of gas bubble disease in their non-paired fins, or
  - ii. Five percent or more of salmonids or non-salmonids examined show signs of gas bubble trauma in their non-paired fins where more than 25 percent of the surface area of the fin is occluded by gas bubbles.
- (vi) The Corps must provide written notice to DEQ within 24 hours of any violations of the conditions in the modification as it relates to voluntary spill. Such notice must include actions proposed to reduce total dissolved gas levels or the reason(s) for no action.
- (vii) No later than Jan. 31 following each year of this modification, the Corps must provide an annual written report to DEQ detailing the following:
  - a) Flow and runoff descriptions for the spill season;
  - b) Spill quantities and durations;
  - c) Quantities of water spilled for fish versus spill for other reasons for each project;
  - d) Data results from the physical and biological monitoring programs, including incidences of gas bubble trauma regardless of sample size;
  - e) Description and results of any biological or physical studies of spillway structures and prototype fish passage devices to test spill at operational levels; and
  - f) Implementation of gas abatement measures identified through adaptive management.
- (viii) If requested, the Corps must report to the commission on any of the above matters or other matters relevant to this order.
- (ix) The commission reserves the right to terminate or modify this order at any time.

### **Adaptive Management**

Implementation of the TMDL for Lower Columbia River Total Dissolved Gas will continue. Oregon and Washington may request further studies to determine additional structural and operational gas abatement actions that can be feasibly implemented to reduce total dissolved gas.

Dated: \_\_\_\_\_

ON BEHALF OF THE COMMISSION

\_\_\_\_\_  
DEQ Director