State of Oregon Department of Environmental Quality

Notice of Proposed Modification to the Total Dissolved Gas Standard on the Mainstem Columbia River

Sept. 6, 2024

This package contains the following documents:

- Notice of a proposed five-year modification to the total dissolved gas water quality standard on the mainstem Columbia River.
- Oregon Administrative Rules related to the total dissolved gas water quality criteria on the mainstem Columbia River.
- Draft Proposed modification to the total dissolved gas water quality standard on the mainstem Columbia River

Note for Readers:

This package contains multiple documents. If you want to read more than one document at a time, you can open multiple copies of this PDF by downloading the PDF and then opening it in Adobe. You can then either:

- Click on the “Windows” item in the top ribbon
- Click on “New Window”
- A second copy of the PDF will open in a new window

Or:

- Click on “File” in the top ribbon
- Click on “Open” in the top ribbon
- Double click on the name of the PDF you want to open
- A second copy of the PDF will open in a separate tab in the same window

Table of Contents

Introduction

The Oregon Department of Environmental Quality invites public input on a proposed five-year modification to the total dissolved gas water quality standard on the mainstem Columbia River.

Overview

There are 13 evolutionarily significant units of Columbia River Basin salmon or steelhead species listed as threatened or endangered under the Endangered Species Act. Out-migrating juvenile salmonids pass the lower mainstem Columbia River dams through turbines and over the spillways. Fish experience an increased incidence of mortality from turbine passage as compared to spillway passage. Releasing water over a dam's spillway is an anadromous salmonid fishery-management tool used to reduce mortality and assist out-migrating juvenile salmonids on the Columbia River. However, spilling water over the dams increases the level of total dissolved gas in the river. Water plunging from a spillway traps air and carries it to a depth where the pressure forces the gas to dissolve into water. Total dissolved gas levels above 110 percent of saturation can cause gas bubble trauma in fish, which can cause adverse health impacts, including mortality.

Oregon adopted the U.S. Environmental Protection Agency's recommended total dissolved gas criteria of 110 percent of saturation. The 110 percent total dissolved gas standard protects beneficial uses of the Columbia River and protects aquatic life, such as endangered and threatened salmon and trout salmonid species. In 2002, Oregon and Washington issued the Total Maximum Daily Load (TMDL) for Lower Columbia River Total Dissolved Gas that was approved by EPA. The U.S. Army Corps of Engineers (Corps) operates the four dams – Bonneville, The Dalles, John Day, and McNary – on the lower Columbia River and is responsible for implementing the operational and structural modifications identified in the TMDL. The goal of the TMDL is to meet the 110 percent total dissolved gas criteria while allowing for voluntary fish passage spill.

Under Oregon Administrative Rules, the Environmental Quality Commission (EQC) commission may modify the total dissolved gas criteria on the mainstem Columbia River for the purpose of allowing increased spill for salmonid migration (OAR 340-041-0104(3)). In 2019, the EQC approved a five-year modification to the total dissolved gas water quality standard to allow for voluntary fish passage spill from April 1 through Aug. 31 at the four lower Columbia River dams. The 2019 modification order allowed for daily average total dissolved gas levels, measured as the average concentration of the 12 highest hours each day, to be up to 125 percent of atmospheric saturation during spring spill (April 1 – June 15) and up to 120 percent of atmospheric saturation during summer spill (June 16 – Aug. 31).

In July 2024, the Corps sent a letter to the Department of Environmental Quality (DEQ) requesting a renewal of Oregon's total dissolved gas modification order by January 2025 to allow for the planned spring spill operations to proceed in a manner consistent with Oregon's water quality standards and the Clean Water Act. The Corps expects to continue implementation of spill operations for fish passage as outlined in Appendix B of the U.S. Government Commitments in support of the Columbia Basin Restoration Initiative of the

Resilient Columbia Basin Agreement (Agreement). The Agreement – signed by U.S. Government and the Nez Perce Tribe, the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Indian Reservation of Oregon, the States of Oregon and Washington, and environmental advocacy groups led by the National Wildlife Federation – specifies that spill up to 125 percent total dissolved gas will continue to be used as a tool for juvenile fish passage.

Public Hearings

DEQ plans to hold one public hearing. Anyone can attend a hearing in person, or by webinar or teleconference.

Public Hearing: 2024 Total Dissolved Gas Modification Order
Location: 700 NE Multnomah St.
700 Conference Room
Portland, OR 97232
Date: Sept. 20, 2024
Start time: 10 a.m.

Join Zoom Meeting

Meeting ID: 835 0490 4648
Dail-in: 877 853 5257 US Toll-free

Instructions on how to join webinar or teleconference: Instructions

DEQ will present an informational item including background on total dissolved gas management and the proposed draft modification order at the Sept. 26-27 EQC Meeting.

How to comment on this rulemaking proposal

DEQ is asking for public comment on the proposed rules. Anyone can submit comments and questions about this rulemaking. DEQ will accept comments by email, postal mail or verbally at the public hearing.

- **Email:** Send comments by email to: David.Gruen@deq.oregon.gov
- **At public hearing:** 10 a.m., Friday, Sept. 20, 2024

Comment deadline

DEQ will only consider comments on the proposed modification that DEQ receives by 4 p.m., on Sunday, Oct. 6, 2024.

Note for public university students:

ORS 192.345(29) allows Oregon public university and OHSU students to protect their university email addresses from disclosure under Oregon's public records law. If you are an Oregon public university or OHSU student, notify DEQ that you wish to keep your email address confidential.

What will happen next?

DEQ may modify the total dissolved gas modification order based on the comments. DEQ intends to bring a proposed total dissolved gas standard modification order for the mainstem Columbia River for commission action at the Nov. 26-27, 2024, Environmental Quality Commission meeting. The modification to Oregon's total dissolved gas water quality standard on the mainstem Columbia River only becomes effective if the EQC approves it.

Public Engagement

Public notice

DEQ provided notice of the proposed total dissolved gas modification order for the mainstem Columbia River by:

- Sending letters offering Government-to-Government consultation with four Tribes: Burns Paiute Tribe, the Confederated Tribes of Grande Ronde, Confederated Tribes of the Umatilla Indian Reservation, and the Confederated Tribes of the Warm Springs Reservation.
- Sending letters offering coordination to four Tribes: the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of the Colville Reservation, the Nez Perce Tribe, and the Spokane Tribe of Indians.
- Emailing approximately 20,300 interested parties on the following DEQ lists through GovDelivery:
    - DEQ Public Notices
    - TMDLs
- Posting on the DEQ event calendar: DEQ Calendar

DEQ will consider all comments and testimony received before the closing date. DEQ will summarize all comments and respond to comments in the Environmental Quality Commission staff report.

Supporting documents

Visit DEQ's Columbia River Basin website to access the following supporting documents:

- Oregon Administrative Rules related to the total dissolved gas water quality criteria on the mainstem Columbia River
- [Clean Version] Proposed Order Approving a Modification to Oregon's Water Quality Standard for Total Dissolved Gas in the Columbia River Mainstem

- U.S. Government Commitments in support of the Columbia Basin Restoration Initiative of the Resilient Columbia Basin Agreement
- Order Approving a Modification to the Oregon's Water Quality Standard for Total Dissolved Gas in the Columbia River Mainstem (2020)

Draft Proposed Total Dissolved Gas Modification Order for the Mainstem Columbia River

The following text provides a proposed total dissolved gas modification order for the mainstem Columbia River, showing changes from the 2019 *Order Approving a Modification to the Oregon's Water Quality Standard for Total Dissolved Gas in the Columbia River Mainstem.*

Key to Identifying Changed Text:

~~Deleted Text~~
New/inserted text

Order Approving a Modification to ~~the~~ Oregon's Water Quality Standard for Total Dissolved Gas in the Columbia River Mainstem

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

In the matter of modifying Oregon's	)	FINDINGS and
Water Quality Standards for Total Dissolved	)	ORDER
Gas in the Columbia River Mainstem	)	

Findings

1. The Department of Environmental Quality received a request from the U.S. Army Corps of Engineers (Corps) dated July 9~~10~~, 2024~~19~~, 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~~ agreed-to operations in Appendix B of the U.S. Government Commitments in Support of the Columbia River Basin Restoration Initiative of the Resilient Columbia Basin 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:*

   Since 1996, the Northwest Power and Conservation Council Fish and Wildlife Program's Comparative Survival Study (CSS) has implemented a large-scale monitoring study to evaluate the effects of the federal Columbia River hydropower system operations on juvenile and adult survival. Of the thirteen Endangered Species Act listed evolutionarily significant units (ESUs) of salmonids that migrate past the Columbia River dams, two ESUs in particular have struggled to meet recovery goals. Based on the CSS ~~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 2021~~16~~, Snake River spring/summer Chinook salmon SARs have been above 2 percent ~~for~~ in only 2 years, with an average SAR of ~~less than~~ 1 percent, signifying major population declines. From 1997 through 2020~~15~~, Snake River summer steelhead SARs have been above 2 percent ~~for~~ in 8 years with an average SAR of 1.6~~7~~ percent.

~~An increase in the total dissolved gas criteria to~~A renewal of the modification allowing for total dissolved gas to be up to 125 percent ~~from the level of 120 percent previously allowed~~ during the spring juvenile salmonid migration will allow the Corps to implement planned ~~increase~~ voluntary spill operations, passing more juvenile Snake River spring/summer Chinook salmon and steelhead over the spillways and reducing their passage through the turbines and bypass systems, a route collectively referred to as powerhouse passage. The CSS model finds that increased rates of powerhouse passage negatively impact both 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.~~ There were no exceedances of the biological monitoring of juvenile salmonids during spill seasons 2020-2024 and the CSS analyses and modeling show no evidence of detrimental effects of high total dissolved gas levels to salmonids across juvenile migration years 1998-2022. Opportunities to monitor juvenile salmonid exposure to total dissolved gas levels above 125~~0~~ 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.

If the Commission were to not modify the TDG standard, the statewide standard of 110 percent would apply – requiring significant curtailment of voluntary spill.

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.[1,2] However, field observations conducted for comparing species sensitives to total dissolved gas have shown that juvenile salmonids are more sensitive than the resident species examined.[3] Monitoring of resident aquatic fish species for gas bubble trauma occurred below McNary and Bonneville Dams during spill seasons 2021-2024. There were low levels of gas bubble trauma and no exceedances of the biological thresholds that would have required spill to be curtailed under the 2019 total dissolved gas modification order.

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.

(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 in 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 on the Corps website. ~~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 202419 document ~~"~~*Gas Bubble Trauma Monitoring Protocol and GBT.net Data Entry Users Manual*~~," available at: ftp://ftp.fpc.org/gbt/gbtmanual_datasheet~~. Juvenile

[1] Ryan BA and Dawley EM. 1998. Effects of dissolved gas supersaturation on fish residing in the Snake and Columbia rivers, 1997. Bonneville Power Administration.
[2] 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.
[3] 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

salmonids and non-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

The Environmental Quality Commission approves the following modification to the statewide standard for total dissolved gas (OAR 340-41-0031(2)) of 110 percent for the lower Columbia River at McNary, John Day, The Dalles and Bonneville dams, as provided for in OAR 340-41-0104(3):

1. The total dissolved gas standard for the Columbia River as measured in the tailraces of McNary, John Day, The Dalles, and Bonneville dams is 125 percent for the period from April 1 through June 15.
2. The total dissolved gas standard for the Columbia River as measured in the tailraces of McNary, John Day, The Dalles, and Bonneville dams is 120 percent for the period from June 16 through Aug. 31.
3. These limits do not apply when the stream flow exceeds the seven-day, ten-year frequency flood.
4. The DEQ Director may approve additional periods of application of this modification up to 120 percent total dissolved gas, beyond the April 1 to Aug. 31 period, subject to subsections 7.a) to 7.d) for reasons including passing Spring Creek Hatchery fish releases and other voluntary fish passage operations, maintenance activities, and biological or physical studies of spillway structures and prototype fish passage devices. The Corps must notify DEQ in writing at least one week prior to the spill describing the proposed ~~purposed~~ action, including its ~~the~~ purpose, ~~of the action~~ and the location and dates of elevated total dissolved gas levels. Spill must be reduced to meet the 110 percent total dissolved gas criterion if requested by the DEQ Director. ~~action at least one week prior to the spill. The Corps must obtain written approval from the Director prior to such spill.~~
5. The modified total dissolved gas standards will apply for five years, 2025~~0~~, 2026~~1~~, 2027~~2~~, 2028~~3~~ and 2029~~4~~.
6. Voluntary fish passage spill during the spring spill season, occurring from April 1 through June 15, is subject to the following conditions:
    a) Spill at a dam must be reduced when:
        i. Instantaneous total dissolved gas levels exceed 127 percent of saturation, calculated as the average of any two consecutive hourly TDG measurements in the tailrace of the dam; or
        ii. The average of the twelve highest hourly TDG measurements in the tailrace of the dam in a calendar day exceeds 125 percent.
    b) Spill at a dam must be reduced to 120 percent as calculated in 7.a)i. when:
        i. The calculated incidence of gas bubble trauma in salmonids (with a minimum sample size of fifty fish required weekly) or non-salmonids

(with a minimum sample size of fifty fish required weekly) exceeds gas bubble trauma in non-paired fins of fifteen percent, or gas bubble trauma in non-paired fins of five percent and gas bubbles occlude more than twenty-five percent of the surface area of the fin. If gas bubble trauma exceeds these biological thresholds, additional monitoring must demonstrate the incidence of gas bubble trauma below biological thresholds before TDG can be increased to the level specified in this order. Gas bubble trauma monitoring data shall be excluded from comparison to biological thresholds when higher than normal river flow contributes to excess spill above 125 percent. This monitoring data exclusion shall apply for one full calendar day after reduced river flow allows attainment of 125 percent TDG levels in the tailrace of the dam.

c) The tailrace maximum TDG criteria for spring spill in this modification will be applied in a manner consistent with the applicable requirements of the federal Endangered Species Act.
d) Physical monitoring must occur and be adequate for implementing the requirements of this order.
e) Application of the tailrace maximum TDG criteria must be accompanied by a DEQ-approved biological monitoring plan designed to measure impacts to fish exposed to increased TDG conditions throughout the spring spill season. ~~Beginning in the year 2021, p~~Plans must include monitoring for non-salmonid fish species. 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.

7. Voluntary fish passage spill during the summer spill season, occurring from June 16 through Aug. 31, is subject to the following conditions:

a) Spill at a dam must be reduced when:
    i. The average of the twelve highest hourly TDG measurements in the tailrace of the dam in a calendar day exceeds 120 percent of saturation; or
    ii. Instantaneous total dissolved gas levels exceed 125 percent of saturation in the tailrace of the dam, calculated as the average of the two highest hourly total dissolved gas measures in a calendar day.
b) The DEQ Director may halt the voluntary spill program or require reductions in voluntary spill to reduce TDG levels if voluntary spill results in biological threshold exceedances when:
    i. More than 15 percent of salmonids examined show signs of gas bubble disease in their non-paired fins, or
    ii. More than five percent of 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.
c) Physical monitoring must occur and be adequate for implementing the requirements set out in this order.
d) Application of the tailrace maximum TDG criteria must be accompanied by a DEQ-approved biological monitoring plan designed to measure impacts to fish exposed to increased TDG conditions throughout the summer spill

season. ~~Beginning in the year 2021, p~~Plans must include monitoring for non-salmonid fish species. 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.

8. 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.
9. 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) Evaluation of the relationship between observations of non-salmonid gas bubble trauma monitoring and exposure to elevated total dissolved gas levels;
    f) Description and results of any biological or physical studies of spillway structures and prototype fish passage devices to test spill at operational levels; and
    g) Implementation of gas abatement measures identified through adaptive management.
10. If requested, the Corps must report to the commission on any of the above matters or other matters relevant to this order.
11. The commission reserves the right to terminate or modify this order at any time.
12. ~~The department will report back to the commission the results of monitoring after two years of spring spill.~~

Adaptive Management

Implementation of the TMDL for Lower Columbia River Total Dissolved Gas will continue. Oregon 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

Accessibility Information

Español | 한국어 | 繁體中文 | Русский | Tiếng Việt | العربية

Contact: 800-452-4011 | TTY: 711 | deqinfo@deq.state.or.us

DEQ does not discriminate on the basis of race, color, national origin, disability, age or sex in administration of its programs or activities.

Visit DEQ's Civil Rights and Environmental Justice page.