



Preliminary Regulatory Analyses:

Including the:

- Preliminary Cost-Benefit Analysis
- Least-Burdensome Alternative Analysis
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

Chapter 173-201A WAC

*Water Quality Standards for Surface Waters of the
State of Washington. Salmon Spawning Habitat
Protection*

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For the
Water Quality Program

Washington State Department of Ecology
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October 2021, Publication 21-10-057

Publication Information

This document is available on the Department of Ecology's website at:

<https://apps.ecology.wa.gov/publications/SummaryPages/2110057.html>

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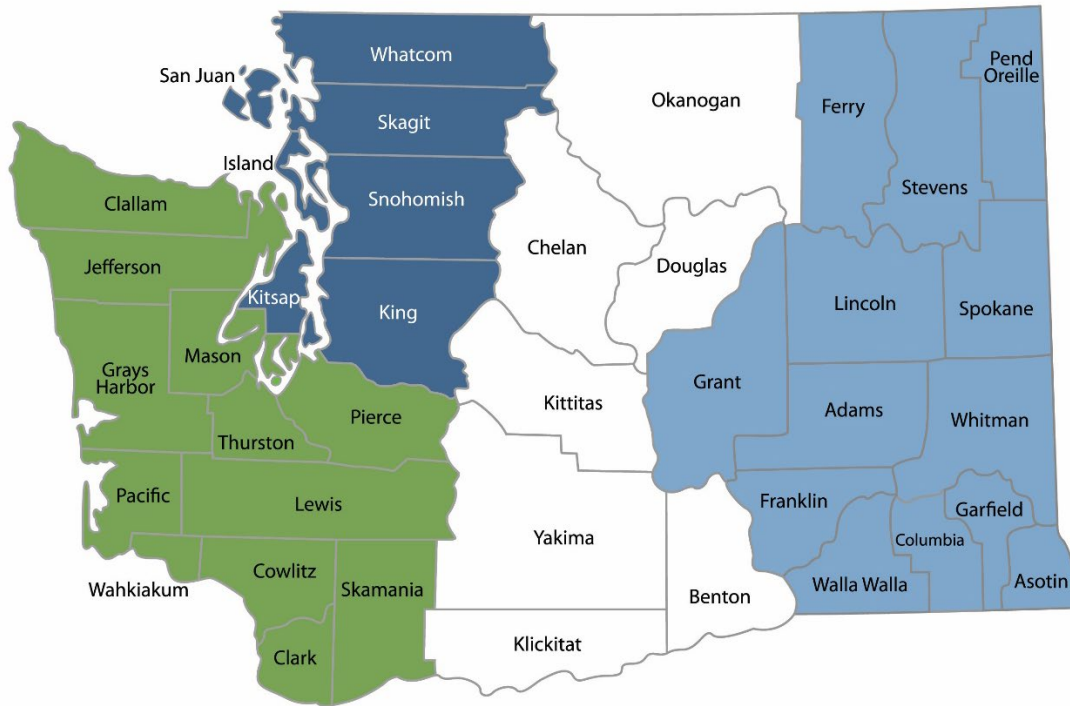
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Preliminary Cost-Benefit Analysis

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Surface Waters of the State of Washington. Salmon
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Water Quality Program
Washington State Department of Ecology
Olympia, WA

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DEPARTMENT OF
ECOLOGY
State of Washington

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Acronyms

AKART All known available and reasonable technologies

APA Administrative Procedure Act

BMP Best management practices

BPJ Best professional judgement

CBA Cost-Benefit Analysis

DO Dissolved oxygen

EPA Environmental Protection Agency

LBA Least-Burdensome Alternative Analysis

NOAA National Oceanic and Atmospheric Association

NWEA Northwest Environmental Advocates

PV Present value

RCW Revised Code of Washington

RFA Regulatory Fairness Act

TMDL Total maximum daily load

TSS Total suspended solids

Executive Summary

This report presents the determinations made by the Washington State Department of Ecology (Ecology), as required under Chapters 34.05 RCW and 19.85 RCW, for the proposed amendments to the Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC; the “rule”). This includes the:

Preliminary Cost-Benefit Analysis (CBA)
Least-Burdensome Alternative Analysis (LBA)
Administrative Procedure Act Determinations
Regulatory Fairness Act Compliance

The Washington Administrative Procedure Act (APA; RCW 34.05.328(1)(d)) requires Ecology to evaluate significant legislative rules to “determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the law being implemented.” Chapters 1 – 5 of this document describe that determination.

The APA also requires Ecology to “determine, after considering alternative versions of the rule...that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives” of the governing and authorizing statutes. Chapter 6 of this document describes that determination.

The APA also requires Ecology to make several other determinations (RCW 34.05.328(1) (a) – (c) and (f) – (h)) about the rule, including authorization, need, context, and coordination. Appendix A of this document provides the documentation for these determinations.

The Washington Regulatory Fairness Act (RFA; Chapter 19.85 RCW) requires Ecology to evaluate the relative impact of proposed rules that impose costs on businesses in an industry. It compares the relative compliance costs for small businesses to those of the largest businesses affected. Chapter 7 documents that analysis, when applicable.

All determinations are based on the best available information at the time of publication. We encourage feedback (including specific data) that may improve the accuracy of this analysis. This rulemaking would revise “WAC 173-201A-200 Fresh water designated uses and criteria” to provide additional water quality and habitat protection for early life stages of salmonids—including salmon, steelhead, and trout—and their spawning gravel. Ecology considers two general revisions in this rule:

Revising the freshwater dissolved oxygen criteria to increase protection of early life stages of salmonids in spawning gravels.

Adding fine sediment criteria to provide additional protection for spawning gravel habitat.

The proposed rule amendments would make the following changes:

Revising the freshwater dissolved oxygen criteria.

Adding the definitions of “Intragravel dissolved oxygen” and “Spatial median”.

- Setting more stringent water column dissolved oxygen criteria.
- Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria.
- Adding an oxygen saturation component to the dissolved oxygen criteria.
- Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.
- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

Costs

Potential costs associated with adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water:

- Costs for point source dischargers in TMDLs. If a waterbody with a current permittee discharging sediments is listed as impaired for the new narrative fine sediment criterion, that permittee could incur monitoring costs. We assume monitoring costs would be similar to monitoring costs for turbidity or total suspended solids (TSS). Ecology estimated these costs for sites with one to five acres at \$1,650 per year, and at \$2,721 per year for sites with more than five acres in the Small Business Economic Impact Analysis for Construction Stormwater General Permit (2021).² The estimated 20-year present value (PV)³ for fine sediments monitoring costs is between \$20,271 and \$33,429, depending on the size of a site.
- Costs for nonpoint dischargers. To address nonpoint sources of pollution, Ecology develops a list of best management practices (BMPs). Many of the BMPs address more than one of the water quality issues, such as temperature, bacteria, and chemical sediments, etc. Therefore, it is difficult to identify specific BMPs to address fine sediment and costs associated with implementation. However, we have some estimates for common BMPs used to address sediments.
- One of the most common BMPs addressing nonpoint sediments costs about \$15,500 per acre based on 33 previously funded grant agreements across the state from State Fiscal Years 2016 to 2019. Cost per acre varies based on specific site conditions and project scale. Costs range from about \$3,500 to \$35,000 depending on the:

² <https://apps.ecology.wa.gov/publications/documents/2010022.pdf>

³ All Ecology analyses look at a 20-year time span from the time of rule adoption, which is typically enough time to reflect consequences of a rulemaking. This standard is consistent with principles in federal guidance and historic analytical practices. Present value defined as the value of a consequence occurring at the present time that has the same effect on wellbeing as the future consequence, and calculated by discounting the monetary value of each future consequence by a factor that depends on the date it occurs. Ecology calculates present values based on the historic average real rate of return on US Treasury I-Bonds since 1998. US Treasury Department (2021). http://www.treasurydirect.gov/indiv/research/indepth/ibonds/res_ibonds_iratesandterms.htm

- Extent of invasive species control.
- Ease of access.
- Plant stock quality.
- Maintenance budget.

Typically, larger scale projects have a lower cost per acre. These costs are associated with funding programs and include administrative costs; while costs tend to be higher than if landowners implement BMPs on their own.

Benefits

We identified the probable environmental, social, and economic benefits from the proposed amendments. Chapter 4 discusses these further:

- **Streamlined process for identifying causes of dissolved oxygen impairment of waters.** The alternate criteria expressed in percent saturation would help to refine the list to identify those waters that are low in DO largely due to nutrients, potentially reducing the number of 303(d) listings by removing those that are solely attributed to temperature. This would result in less expenses associated with time and labor costs, and avoiding implementation of actions that address that are not addressing the real problem.
- **Increased protection of early life stages of salmonids.** Revising the freshwater dissolved oxygen criteria and adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water provide increased protection for early life stages of salmonids, although we cannot quantify how many salmonids will directly benefit from this rule.
- **Additional protection for other species.** Environmental benefits include additional habitat protections for other aquatic life and wildlife, including those organisms that depend on salmonids for their food.
- **Increased non-use values.** Social benefits include the non-use value of salmonids. People who are not involved in commercial fish harvesting or recreational fishing see value in increased salmonid protections. The proposed amendments also align with the values of indigenous cultures.
- **Determined economic benefits of use and non-use values.** For the economic analysis in this document, the total value of protecting salmonids is equal to the sum of use and non-use values. Use values include the value of the commercial fish harvest (market priced) and the value of recreational fishing trips (nonmarket value).

We conclude, based on a reasonable understanding of the quantified and qualitative costs and the benefits likely to arise from the proposed rule amendments as compared to the baseline, that the benefits of the proposed rule amendments are greater than the costs.

Least-Burdensome Alternative Analysis

The authorizing laws for this rule are:

- Clean Water Act 303(c)(2)(A)
- Water Pollution Control Act, Chapter 90.48 RCW
- Water Resources Act of 1971, Chapter 90.54 RCW

The goals and objectives of the authorizing statutes are to:

- Maintain the highest possible standards to insure the purity of all waters of the state consistent with:
 - Public health and public enjoyment thereof.
 - Propagation and protection of wild life, birds, game, fish and other aquatic life.
 - Industrial development of the state.
- Require the use of all known available and reasonable methods (AKART) by industries and others to prevent and control the pollution of the waters of the state of Washington.
- Retain and secure high quality for all waters of the state.
- Protect the public health or welfare, enhance the quality of the water, taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial and other purposes.
- Authorize compliance schedules lasting longer than ten years under certain circumstances.

After considering alternatives to the proposed rule's contents, within the context of the goals and objectives of the authorizing statute, we determined that the proposed rule represents the least-burdensome alternative of possible rule contents that meet the stated goals and objectives.

Regulatory Fairness Act Compliance

We conclude the rule amendments potentially have disproportionate impacts on small businesses, and therefore Ecology must include elements in the rule amendments to mitigate this disproportion, as far as is legal and feasible.

We cannot predict which existing dischargers would be included on updated 303(d) lists and what their TMDL would be. We also cannot predict what combination of BMPs and other technology controls an impacted discharger would use. Using the REMI E3+ model, we applied potential costs to various industries, based on current sediment monitoring data. We recognize that more industries may be affected. We randomly applied cost range to one business in every identified industry (because of the high degree of the uncertainty), and combined them in one model. The higher end of the costs range where applied to "Forestry and logging" sector, which affected the results. Modeling results did not indicate significant impacts to industries. Output would decrease by \$1.3 million in year 2022 over all industries in the state, which in relative indicators shows as a decrease

0.018% decrease from the baseline for "Forestry and logging",
0.004% decrease for "Support activities for agriculture and forestry", and
0.002% for "Other wood manufacturing" in 2022.

This is due to the capital costs associated with BMPs implementation would occur in 2021. The monitoring costs did not show any effect on output, and therefore, revenue of the industries. These results are scalable based on the number of dischargers assumed to be impacted in each industry.

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Chapter 1: Background and Introduction

1.1 Introduction

This report presents the determinations made by the Washington State Department of Ecology (Ecology), as required under Chapters 34.05 RCW and 19.85 RCW, for the proposed amendments to the Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC; the “rule”). This includes the:

- Preliminary Cost-Benefit Analysis (CBA)
- Least-Burdensome Alternative Analysis (LBA)
- Administrative Procedure Act Determinations
- Regulatory Fairness Act Compliance

The Washington Administrative Procedure Act (APA; RCW 34.05.328(1)(d)) requires Ecology to evaluate significant legislative rules to “determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the law being implemented.” Chapters 1 – 5 of this document describe that determination.

The APA also requires Ecology to “determine, after considering alternative versions of the rule...that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives” of the governing and authorizing statutes. Chapter 6 of this document describes that determination.

The APA also requires Ecology to make several other determinations (RCW 34.05.328(1) (a) – (c) and (f) – (h)) about the rule, including authorization, need, context, and coordination. Appendix A of this document provides the documentation for these determinations.

The Washington Regulatory Fairness Act (RFA; Chapter 19.85 RCW) requires Ecology to evaluate the relative impact of proposed rules that impose costs on businesses in an industry. It compares the relative compliance costs for small businesses to those of the largest businesses affected. Chapter 7 documents that analysis, when applicable.

All determinations are based on the best available information at the time of publication. We encourage feedback (including specific data) that may improve the accuracy of this analysis.

1.1.1 Background

Salmon and steelhead populations have been declining in Washington State for more than a decade (State of the Salmon Report).⁴ Since 1991, the federal government has declared 14 species of salmon and steelhead in Washington as at-risk of extinction under the Endangered Species Act. Salmonids play a pivotal role in the structure and health of our fresh and marine water ecosystems. Chinook salmon, for example, are the primary food for the endangered Southern Resident Orca, and the decline of Chinook is one of the main factors attributed to the decline of this orca population, according to the 2018 Southern Resident Orca Task Force Final Report.⁵ Migrating salmon and steelhead bring essential nutrients from the ocean back to rivers, streams, and surrounding habitat. These nutrients are a significant part of the freshwater food web. Salmonids represent one of the most sensitive aquatic life species in Washington and therefore form the basis for protecting all aquatic life uses, as defined in the Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A).

This rulemaking would improve rules that protect salmonid spawning habitat in lakes, rivers, and streams. Both dissolved oxygen and the amount of fine sediment in substrate are key factors in ensuring early life stages of salmonids survive and properly develop. Dissolved oxygen and fine sediment are interrelated in that the delivery of oxygen to gravel is dependent on the size and permeability of the sediment. The proposed changes provide additional protection to ensure that there are sufficient dissolved oxygen levels in spawning gravels and to ensure the physical structure of salmonid nests (called redds) are conducive to spawning success.

This rulemaking would revise “WAC 173-201A-200 Fresh water designated uses and criteria” to provide additional water quality and habitat protection for early life stages of salmonids—including salmon, steelhead, and trout—and their spawning gravel. Ecology considers two general revisions in this rule:

- Revising the freshwater dissolved oxygen criteria to increase protection of early life stages of salmonids in spawning gravel.
- Adding fine sediment narrative criterion to provide additional protection for spawning gravel habitat.

⁴ State of Salmon reports can be found here: [Library | State of Salmon \(wa.gov\)](#)

⁵ Southern resident orca task force information can be found here: [Southern Resident Orca Task Force | Governor Jay Inslee \(wa.gov\)](#)

1.2 Summary of the proposed rule amendments

The proposed rule amendments would make the following changes:

- Revising the freshwater dissolved oxygen criteria.
 - Adding the definitions of “Intragravel DO” and “Spatial median”.
 - Setting more stringent water column dissolved oxygen criteria.
 - Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria.
 - Adding an oxygen saturation component to the dissolved oxygen criteria.
 - Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.
- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

1.3 Reasons for the proposed rule amendments

The salmon spawning habitat protection rule aims to increase protection for early life stages of salmonids by revising the current dissolved oxygen criteria and creating a new fine sediment criterion. The National Oceanic and Atmospheric Association (NOAA) identified the following four key factors affecting the health of fish: habitat, hydropower, hatchery, and harvest impacts. To improve habitat conditions, NOAA provided comment to Ecology expressing concerns that Washington’s dissolved oxygen standards may not be fully protecting early life stages of salmonids. Specifically, NOAA focused on oxygen levels necessary to maintain healthy conditions for salmon spawning gravels. Another goal of this rulemaking is to account for impacts of barometric pressure and summertime temperatures on dissolved oxygen when salmonid spawning and rearing are not present. Early life stages of salmonids are not present year-round in all waterbodies, and therefore, oxygen levels protective of spawning and rearing of salmonids do not need to be assigned when these uses are not present. Furthermore, this rule seeks to acknowledge the limitations in the capacity of oxygen to dissolve in water at higher elevations.

In our 2011 triennial review, Ecology identified the development of fine sediment criteria as a priority for future water quality standards work. In a 2018 U.S. District Court Stipulated Order of Dismissal (Order) between Northwest Environmental Advocates (NWEA), EPA, and Ecology, Ecology agreed to propose fine sediment criteria to protect early life stages of salmonids. In this rulemaking, we are addressing impacts of fine sediment on early life stages of aquatic life and developing methods to characterize a fine sediment impairment.

1.4 Document organization

The remainder of this document is organized in the following chapters:

- **Baseline and the proposed rule amendments (Chapter 2):** Description and comparison of the baseline (what would occur in the absence of the proposed rule amendments) and the proposed rule requirements.
- **Likely costs of the proposed rule amendments (Chapter 3):** Analysis of the types and sizes of costs we expect impacted entities to incur as a result of the proposed rule amendments.
- **Likely benefits of the proposed rule amendments (Chapter 4):** Analysis of the types and sizes of benefits we expect to result from the proposed rule amendments.
- **Cost-benefit comparison and conclusions (Chapter 5):** Discussion of the complete implications of the CBA.
- **Least-Burdensome Alternative Analysis (Chapter 6):** Analysis of considered alternatives to the contents of the proposed rule amendments.
- **Regulatory Fairness Act Compliance (Chapter 7):** When applicable, a comparison of compliance costs for small and large businesses, mitigation, and impact on jobs.
- **APA Determinations (Appendix A):** RCW 34.05.328 determinations not discussed in Chapters 5 and 6.

Chapter 2: Baseline and Proposed Rule Amendments

2.1 Introduction

We analyzed the impacts of the proposed rule amendments relative to the existing rule within the context of all existing requirements (federal and state laws and rules). This context for comparison is the baseline and reflects the most likely regulatory circumstances that entities would face if the proposed rule were not adopted.

2.2 Baseline

The baseline for our analyses generally consists of existing rules and laws and their requirements. This is what allows us to make a consistent comparison between the state of the Washington with and without the proposed rule amendments.

For this rulemaking, the baseline includes:

- The existing rule, WAC 173-201A.
- RCW 90.48 Water Pollution Control.
- 40 CFR 131.20 Water Quality Standards - State review and revision of water quality standards; requires states and tribes (with primacy for clean water actions) to periodically review and update the water quality standards.
- 2018 U.S. District Court Stipulated Order of Dismissal.⁶

2.3 Proposed rule amendments

The proposed rule amendments would make the following changes:

- Revising the freshwater dissolved oxygen criteria.
 - Adding the definitions of “Intragravel dissolved oxygen” and “Spatial median”.
 - Setting more stringent water column dissolved oxygen criteria.
 - Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria.
 - Adding an oxygen saturation component to the dissolved oxygen criteria.
 - Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.
- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

⁶ 2018 U.S. District Court Stipulated Order of Dismissal:
<https://www.bdlaw.com/content/uploads/2018/10/NWEA-stip.pdf>

2.3.1 Revising the freshwater dissolved oxygen criteria.

2.3.1.1 Adding the definitions of “Intragravel dissolved oxygen” and “Spatial median”.

Baseline

Currently, there are no definitions of “Intragravel dissolved oxygen” and “Spatial median” in the rule.

Proposed

“‘Intragravel dissolved oxygen’ means the concentration of oxygen in the spaces between sediment particles in a streambed.” This is a new component to the dissolved oxygen criteria.

“‘Spatial median’ is the middle value of multiple intragravel D.O. measurements taken within the sampling area.” This is the quantitative method used to measure intragravel dissolved oxygen.

Expected impact

The definitions themselves cause no impact to entities. The intent of the definition is to clarify new components of the dissolved oxygen criteria.

2.3.1.2 Setting more stringent water column dissolved oxygen criteria.

Baseline

Table 1 shows the current criteria for dissolved oxygen.

Table 1. Washington’s water quality criteria for dissolved oxygen (WAC 173-201A-200).

Category	Dissolved oxygen level (mg/L; 1-day minimum)
Char Spawning and Rearing	9.5
Core Summer Salmonid Habitat	9.5
Salmonid Spawning, Rearing, and Migration	8.0
Salmonid Rearing and Migration Only	6.5
Non-anadromous Interior Redband Trout	8.0
Indigenous Warm Water Species	6.5

Proposed

The proposed rule amendments would revise the water column based dissolved oxygen concentration criteria and add two additional components to the dissolved oxygen criteria, each with a set of associated criteria.

The proposed dissolved oxygen criteria for water column based dissolved oxygen concentration, oxygen saturation, and intragravel dissolved oxygen are found in Table 2. Compliance may be demonstrated through one or more of the dissolved oxygen criteria.

Table 2. Proposed water quality criteria for dissolved oxygen (WAC 173-201A-200).

Aquatic Life Use Category	Water column dissolved oxygen concentration (1-day minimum)		Intragravel dissolved oxygen concentration (1-day minimum)*
Char Spawning and Rearing	10.0 mg/L or 90% oxygen saturation	OR	8.0 mg/L
Core Summer Salmonid Habitat	10.0 mg/L or 90% oxygen saturation	OR	8.0 mg/L
Salmonid Spawning, Rearing, and Migration	10.0 mg/L or 90% oxygen saturation	OR	8.0 mg/L
Salmonid Rearing and Migration Only	6.5 mg/L or 90% oxygen saturation	OR	Not applicable
Non-anadromous Interior Redband Trout	10.0 mg/L or 90% oxygen saturation	OR	8.0 mg/L
Indigenous Warm Water Species	6.5 mg/L or 90% oxygen saturation	OR	Not applicable

* Intragravel dissolved oxygen must be measured as a spatial median (see WAC 173-201A-020 Definitions).

Expected impact

The proposed 1-day minimum water column concentrations of 10 mg/L dissolved oxygen for protection of salmonid-based designated uses would likely result in benefits, as there is scientific support that these values are fully protective of early life stages of salmonids.

We examined whether this proposed amendment was likely to impact current dischargers and found that it is not likely to add any costs.

Anyone who owns or operates a facility discharging or proposing to discharge wastewater to the state waters must apply for an individual wastewater discharge permit. One of the requirements of the permit application is that “[e]very applicant must submit data for Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Organic Carbon (TOC), Total Suspended Solids (TSS), Temperature (winter and summer), and pH.”

While 375 (35.8%)⁷ of facilities have BOD limits and dilution factors to ensure compliance with the dissolved oxygen water quality criteria, the majority of Water Quality permittees do not directly monitor dissolved oxygen in their permits.

⁷ Discharge Monitoring Reports. Water Quality Permitting and Reporting Information System (PARIS). <https://apps.ecology.wa.gov/paris/DischargeMonitoringData.aspx>.

Of those that directly monitor dissolved oxygen (11.8%), no facilities report dissolved oxygen only because reductions in the water column are often attributed to the impact of excess nutrients and increased temperature. Excess nutrients lead to growth of algae and aquatic plants. When these blooms die or deteriorate, respiring microorganisms increase in abundance and consume oxygen in the water. Higher temperatures can be a factor in promoting excess growth of algae and plants in the presence of nutrients and is known to physically limit the capacity for oxygen to dissolve in water.

We do not expect any changes in the dissolved oxygen sampling schedules for the dischargers, as the list of sampling parameters would remain the same.

All of Ecology's Water Quality permits already include the best methods of controlling the levels of those toxic pollutants.

Federal and state law require the implementation of technology-based controls. Moreover, the Clean Water Act and Chapter 90.48 RCW recognize that a manageable and equitable clean water program requires a technology-based program, even though the treatment might be greater than required to meet water quality standards. Requiring technology-based treatment may continually reduce the pollutant load and postpone the necessity of allocating the waste load from each discharge.

All water quality permits issued by Ecology include a reasonable potential determination of whether technology-based controls are sufficient to meet water quality standards. If not, water quality-based limits are developed.

Based on permit writing practices, we assume that all of the dischargers either do not have dissolved oxygen limits or already are required to use technology-based controls.

Water quality based limits are implemented with a water body is impaired. The water quality assessment adds new dissolved oxygen impairment (303(d)) listings when Ecology receives data that demonstrates a waterbody is impaired due to low dissolved oxygen measurements. New 303(d) listings will occur as new data are provided for this assessment effort. When more data is assessed, there is greater potential 303(d) listing will be identified. However, we do not expect an increase in dissolved oxygen listings attributable to this rulemaking. Rather, the updated dissolved oxygen criteria would enable the refinement of the list of impaired waters.

The current dissolved oxygen 303(d) listings include some listings in which temperature may be the cause or a large contributing factor of the low dissolved oxygen values. The oxygen saturation criteria is anticipated to refine the 303(d) list to identify those waters that are low in dissolved oxygen largely due to nutrients, potentially reducing the number of 303(d) listings by removing those that are solely attributed to temperature.

Those changes are not likely to affect dischargers' behavior because waters will be assessed separately for compliance with temperature and dissolved oxygen criteria. Given that the updated 303(d) listings will better identify which waters are impaired due to nutrients (better detected by percent oxygen saturation) and those affected by human caused temperature increases (better identified by the temperature criteria) the actions necessary to bring the waterbody into compliance will be identified earlier in the water cleanup process. We do not anticipate more dissolved oxygen listings due to the additional compliance option of percent saturation, regardless of the dissolved oxygen concentration.

2.3.1.3 Adding intragravel dissolved oxygen criteria.

Baseline

The current criteria for dissolved oxygen can be found in Table 1. The current dissolved oxygen criteria does not include an intragravel dissolved oxygen component that could be used for compliance.

Proposed

See the proposed criteria for dissolved oxygen in Table 2. Note that Intragravel dissolved oxygen must be measured as a spatial median.

Expected impact

The proposed Intragravel dissolved oxygen criterion of 8.0 mg/L would likely result in net benefits. The proposed criteria allows direct assessment of oxygen levels in gravels where early life stages of salmonids reside, leading to a more accurate assessment of habitat protections. The 10 mg/L water column criteria are based on the worst-case assumption that there is a 2.0 mg/L drop in dissolved oxygen levels from the water column to gravel. However, the dissolved oxygen depression of 2.0 mg/L may be overestimated in some waterbodies, especially those with optimal substrate conditions.

The Intragravel dissolved oxygen criteria presents an alternate method to demonstrate that early life stages of salmonids are protected by directly measuring dissolved oxygen levels in the interstitial spaces of gravel. Furthermore, the Intragravel dissolved oxygen criteria relies on in-situ conditions rather than assumptions of dissolved oxygen depression values and quality of substrate for a given water body. While direct Intragravel dissolved oxygen levels may be more difficult to measure accurately, it may be the most relevant method to determine if early life stages of salmonids are protected.

The proposed rule adds an intragravel dissolved oxygen component to the dissolved oxygen criteria. Because the rule proposes that compliance may be demonstrated through one or more of the dissolved oxygen criteria, this provides flexibility and potential cost savings (benefits) for the dischargers.

It is important to stress that a discharger would choose to monitor and report the intragravel dissolved oxygen parameter only if it expects the potential costs of the sampling to be less than the potential benefits (or cost savings) of verifying their compliance using the alternative method.

2.3.1.4 Adding oxygen saturation criteria.

Baseline

Table 1 shows the current criteria for dissolved oxygen. The current dissolved oxygen criteria do not include an oxygen saturation component that could be used for compliance.

Proposed

See the proposed criteria for dissolved oxygen in Table 2.

Expected impact

The proposed oxygen saturation component in the dissolved oxygen criteria would likely result in benefits as it accounts for temperature- and elevation-related influences on dissolved oxygen, resulting in a more accurate measurement of the oxygen conditions of a water body. Furthermore, oxygen saturation provides needed flexibility to the dissolved oxygen criteria during the summer months when water temperatures rise and, in many streams, early life stages of salmonids are not present. During these warmer seasons, more stringent dissolved oxygen criteria are not necessary and often not physically achievable due to effects of temperature on oxygen capacity in waters.⁸ See examples in the table below of how the 90% oxygen saturation parameter would allow a discharger to comply with the proposed rule at different water temperatures.

⁸ See Salmon Spawning Habitat Protection Rule. Preliminary Technical Support Document. October 2021.

Table 3. Examples of minimum dissolved oxygen concentrations allowed by 90% saturation conditions at sea level for salmonid based aquatic life designated uses.

Designated Aquatic Life Use	Temperature (°C)	Minimum dissolved oxygen level at 90% saturation (mg/L)	Current Washington dissolved oxygen criteria (mg/L)
Salmonid spawning, rearing and migration	17.5 (maximum)	8.6	8
	13	9.5	8
	10	10.2	8
	8	10.7	8
	5	11.5	8
Core summer salmonid habitat	16 (maximum)	8.9	9.5
	13* (maximum)	9.5	9.5
	10	10.2	9.5
	8	10.7	9.5
	5	11.5	9.5
Char Spawning	12 (maximum)	9.7	9.5
	9* (maximum)	10.4	9.5
	7	10.9	9.5
	5	11.5	9.5

* Supplemental spawning temperature criteria

Oxygen saturation is typically measured using a hydroprobe. Most hydroprobes can provide simultaneous information on oxygen saturation and water column dissolved oxygen concentrations. Measuring oxygen saturation is anticipated to take minimal time and compared with water column based dissolved oxygen concentrations. Thus, oxygen saturation should not add additional costs, because the discharger has existing requirements to measure water column dissolved oxygen concentrations.

2.3.1.5 Sampling Considerations for Intragravel dissolved oxygen.

Baseline

Currently there is no Intragravel dissolved oxygen criterion or definition in the rule.

Proposed

The rule proposes collection of Intragravel dissolved oxygen measurements over a spatial area within the same habitat and calculation of a median value for a given spawning area.

Expected impact

The proposed definitions of the habitat type and spatial extent for sample collection of intragravel dissolved oxygen data, dissolved oxygen does not result in any impacts and therefore, do not have any costs.

2.3.2 Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

Baseline

Adding fine sediment criteria aligns with the agreement in the 2018 U.S. District Court Stipulated Order of Dismissal (Order) between Northwest Environmental Advocates (NWEA), EPA, and Ecology.⁹ In the Order, Ecology agreed to propose fine sediment criteria to protect salmonid redds.

Proposed

The rule proposes adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water. The narrative criterion is as follows: “Water bodies shall not contain fine sediment (<2 mm) from anthropogenic sources at levels that cause adverse effects on aquatic life, their reproduction, or habitat. When reference sites are used, sediment conditions shall be compared to sites that represent least disturbed conditions of a neighboring or similar water body.”

Expected impact

The proposed rule would create costs and benefits by requiring an evaluation of anthropogenic sources of fine sediment that may adversely affect early life stages of salmonids and result in a water body impairment.

The rule would impact point and nonpoint dischargers differently. Point dischargers are regulated through permits. If a waterbody with a current permittee discharging sediments is listed as impaired for the new narrative fine sediment criterion, that permittee could incur monitoring costs.

It is likely that permitted dischargers already have sediment discharge controls in place due to technology-based limits, or via another parameter of concern (bacteria, metals, toxics, etc.) that binds to sediment. Therefore, any discharger currently covered by the Industrial Stormwater or Construction Stormwater general permits would likely avoid investing into additional control technologies. The others, such as some with individual permits, may incur costs for sediment control actions.

If the pollutant comes from a set of diffuse sources (referred to as a nonpoint source), such as general urban, residential, farm runoff, or other land activities, that generate pollution discharges. To address these nonpoint sources, Ecology develops a list of best management practices (BMPs) for each of the water quality pollution sources identified. Nonpoint dischargers of fine sediments would incur capital and operational costs. Some would require very basic erosion and sediment control BMPs (mulch, silt fence, etc.), while others would need extensive treatment technologies (sediment ponds, filters, etc.).

⁹ 2018 U.S. District Court Stipulated Order of Dismissal <https://www.bdlaw.com/content/uploads/2018/10/NWEA-stip.pdf>

Chapter 3: Likely Costs of the Proposed Rule Amendments

3.1 Introduction

We analyzed the likely costs, as compared to the baseline, associated with the proposed rule amendments. Chapter 2 of this document discusses the proposed rule amendments and the baseline.

3.2 Cost analysis

The proposed rule amendments would make the following changes:

- Revising the freshwater dissolved oxygen criteria.
 - Adding the definitions of “Intragravel dissolved oxygen” and “Spatial median”.
 - Setting more stringent water column dissolved oxygen criteria.
 - Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria.
 - Adding an oxygen saturation component to the dissolved oxygen criteria.
 - Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.
- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

3.2.1 Revising the freshwater dissolved oxygen criteria.

3.2.1.1 Adding the definitions of “Intragravel dissolved oxygen” and “Spatial median”.

Adding the definition of “Intragravel dissolved oxygen” does not itself create any costs, as any costs come from its use in implementation of the new criteria, not from the definition itself. See 3.2.1.3.

3.2.1.2 Setting more stringent water column dissolved oxygen criteria

The proposed 1-day minimum water column concentrations of 10 mg/L DO for protection of salmonid-based designated uses would not likely result in costs for any current permittees. Anyone who owns or operates a facility discharging or proposing to discharge wastewater to the state waters must apply for an individual wastewater discharge permit. One of the requirements of the permit application is that “[e]very applicant must submit data for Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Organic Carbon (TOC), Total Suspended Solids (TSS), Temperature (winter and summer), and pH.”

While 375 (35.8%)¹⁰ of facilities have BOD limits and dilution factors to ensure compliance with the dissolved oxygen water quality criteria, the majority of Water Quality permittees do not directly monitor dissolved oxygen in their permits. Of those that directly monitor dissolved oxygen (11.8%), no facilities report dissolved oxygen only because reductions in the water column are often attributed to the impact of excess nutrients and increased temperature. Excess nutrients lead to growth of algae and aquatic plants. When these blooms die or deteriorate, respiring microorganisms increase in abundance and consume oxygen in the water. Higher temperatures can be a factor in promoting excess growth of algae and plants in the presence of nutrients and is known to physically limit the capacity for oxygen to dissolve in water.

We do not expect any changes in the dissolved oxygen sampling schedules for the dischargers, as the list of sampling parameters would remain the same. All of Ecology's Water Quality permits also already include the best methods of controlling the levels of those toxic pollutants.

Federal and state law require the implementation of technology-based controls. Moreover, the Clean Water Act and Chapter 90.48 RCW recognize that a manageable and equitable clean water program requires a technology-based program, even though the treatment might be greater than required to meet water quality standards. Requiring technology-based treatment may continually reduce the pollutant load and postpone the necessity of allocating the waste load from each discharge.

All water quality permits issued by Ecology include a reasonable potential determination of whether technology-based controls are sufficient to meet water quality standards. If not, water quality-based limits are developed.

The updated dissolved oxygen criteria would be used for identifying impaired waters. Cleanup actions for impaired waters require the development of TMDLs, which would identify point sources of nutrient discharges. Based on permit writing practices, we assume that all current dischargers either do not have dissolved oxygen limits or already are required to use technology-based controls.

3.2.1.3 Adding intragravel dissolved oxygen criteria.

The proposed rule adds an intragravel dissolved oxygen component to the dissolved oxygen criteria. Because the rule proposes that compliance may be demonstrated through one or more of the dissolved oxygen criteria, this provides flexibility and potential cost savings (benefits) for the dischargers.

¹⁰ Water Quality Permitting and Reporting Information System (PARIS).
<https://apps.ecology.wa.gov/paris/PermitLookup.aspx>

It is important to stress that a discharger would choose to monitor and report the intragravel dissolved oxygen parameter only if it expects the potential costs of the sampling to be less than the potential benefits (or cost savings) of verifying their compliance using the alternative method.

3.2.1.4 Adding oxygen saturation to the dissolved oxygen criteria.

Oxygen saturation is typically measured using a hydroprobe. Hydroprobes can provide simultaneous information on oxygen saturation and water column dissolved oxygen concentrations. Measuring oxygen saturation is anticipated to take minimal time and effort compared with water column based dissolved oxygen concentrations. Thus, oxygen saturation should not add additional costs, assuming the discharger has existing requirements to measure water column dissolved oxygen concentrations.

3.2.1.5 Clarifying the habitat type and spatial extent of sampling when evaluating intragravel dissolved oxygen.

We do not expect any costs caused by this amendment. See 3.2.1.1 for the discussion.

3.2.2 Adding a narrative fine sediment criterion

The EPA considers fine sediment as the nation's most prevalent pollutant in surface waters, and Ecology has identified fine sediment as a common pollutant that can adversely affect aquatic life health.¹¹ Currently, the Water Quality Standards for Surface Waters of the State of Washington rely on general narrative criteria for limiting deleterious material, but do not have specific criteria to limit fine sediment. Ecology prioritized addressing the impacts of fine sediment on early life stages of aquatic life and developing methods to characterize a fine sediment impairment as part of this proposed rule.

The proposed narrative fine sediment criteria is part of a stipulated order of dismissal resulting from litigation. The settlement agreement requires that final guidance regarding a listing methodology for fine sediment be completed within 18 months of this rule adoption. The development or update of a listing methodology is a regular need whenever the state develops new water quality standards criteria.

One of the potential costs associated with the new proposed criterion is Ecology's need of FTEs to develop a new methodology in Policy 1-11 to assess fine sediments and then evaluate the available fine sediment data according to this methodology. We generally do not estimate costs for Ecology to comply with the proposed rules.

The new methodology is likely to lead to more 303(d) listings that would identify water bodies as impaired for fine sediment.

¹¹ Salmon Spawning Habitat Protection Rule. Preliminary Technical Support Document. Ecology. October 2021.

We discuss the following sets of likely costs qualitatively or with rough estimates, as they are multivariate in regards to sediment data collection, business, dischargers, location, and TMDL development. Many of these variables are unknown at this time, such that we are not able to forecast them quantitatively with sufficient confidence.

303(d) impaired waterbody listing policy

The federal Clean Water Act's section 303(d) established a process to identify and clean up polluted waters. Every two years, all states are required to perform a water quality assessment of surface waters in the state, including all the rivers, lakes, and marine waters where data are available. Ecology compiles its own water quality data, federal data, and invites other groups to submit water quality data they have collected. All data submitted must be collected using appropriate scientific methods. The assessed waters are placed in categories that describe the status of water quality. Once the assessment is complete, there is a public review period where comments can be provided. The final assessment is formally submitted to the EPA for approval. Ecology last submitted a revised 303(d) list to EPA in August 2021.

Federal laws, state water quality standards, and the Policy on the Washington State Water Quality Assessment (WQP Policy 1-11; revised July 2020) guide Ecology's assessments. Policy 1-11 describes how the standards are applied, requirements for the data used, and how to prioritize TMDLs, among other issues. Ecology periodically revises the Water Quality Assessment Policy based on new information and updates to EPA guidance. Each revision includes a public review process.

Waters with designated uses – such as for drinking, recreation, aquatic habitat, and industrial use – that are impaired by pollutants are placed in the polluted water category in the water quality assessment 303(d) list. These water bodies fall short of state surface water quality standards and are identified as polluted.

Waters placed on the 303(d) list require the preparation of a water cleanup plan (TMDL). The water cleanup plan identifies how much pollution needs to be reduced or eliminated to achieve water quality standards (clean water), and allocates that amount of required pollution reduction among the existing point (discrete) and nonpoint (diffuse) sources.

In addition, even before a TMDL is completed, the inclusion of a water body on the 303(d) list can reduce the amount of pollutants allowed to be released under permits issued by Ecology to specific impaired waters.

Point source dischargers in TMDLS

If the pollutant comes from a discrete source (referred to as a point source), such as a municipal or industrial facility's discharge pipe, that facility's share of the loading capacity is called a wasteload allocation. General and individual permits regulate point source dischargers.

The proposed narrative fine sediment criterion will not impact permits unless facilities are discharging fine sediments to a water impaired for fine sediment. If the receiving water body is impaired and point source dischargers are identified as contributors, restrictions to total suspended sediments (TSS) or turbidity in effluent may be an option to reduce fine sediment inputs into a receiving water body.

Washington currently has numeric criteria for turbidity that are based on a change above background turbidity conditions. This criteria structure is useful for limiting anthropogenic sources of turbidity, and therefore excess sediment, entering a waterbody. These criteria rely on the change in turbidity conditions related to a discharge to, or activity within, the waterbody to limit human impacts to the aquatic habitat. However, turbidity criteria do not provide information on bedded sediment nor does it differentiate naturally occurring sediment deposition from anthropogenic sources of sediment deposition.

TSS criteria are currently assigned to any facility discharging to a 303(d) listed waterbody impaired for sediment. TSS criteria target solids with size of <0.06 mm versus fine sediments, defined as particles < 2 mm.¹²

TSS is frequently monitored in industrial dischargers as a result of activities that tend to generate more dust or small sediment that would leave the site in stormwater or based on effluent guidelines in 40 CFR Subchapter N, Effluent Guidelines and Standards.

TSS is a required permit monitoring parameter for the following industry classes¹³:

- Hazardous Waste Treatment, Storage and Disposal Facilities
- Timber Product Industry
- Paper and Allied Products
- Wood Product Manufacturing
- Coal Mining
- Oil and Gas Extraction
- Nonmetallic Mining and Quarrying
- Petroleum and Coal Products Manufacturing
- Nonmetallic Mineral Product Manufacturing
- Steam Electric Power Generation
- Marine Industrial Construction
- Non Hazardous Waste Landfills

¹² Fine sediments will be defined at those sediments classified as fines or sands and are less than 2 mm in diameter.

¹³ Communication with Ecology's Industrial Stormwater General Permit engineer.

We analyzed the Water Quality Permitting and Reporting Information System (PARIS), Discharge Monitoring Reports (DMR) data and found that in the most likely affected by the proposed rule categories of general permits; all dischargers have monitoring requirements for total suspended sediments, turbidity, or both. (See Table 4).

Table 4. Dischargers that have monitoring requirements for total suspended sediments, turbidity, or both.

Permit category	Total number of dischargers	Turbidity	TSS	No sediment measurement
Construction SW GP	313	313	0	0
Industrial Storm water GP	50	46	17	0
Industrial to ground State Wastewater Discharge Permit IP	19	2	13	5
Industrial NPDES IP	86	19	70	9
Total	468	380	100	14

If a waterbody with a current permittee discharging sediments is listed as impaired for the new narrative fine sediment criterion, that permittee could incur monitoring costs. We assume that monitoring costs would be similar to monitoring costs for turbidity. Ecology estimated these costs for sites with 1-5 acres at \$1,650 per year, and at \$2,721 per year for sites 5+ acres in the Small Business Economic Impact Analysis for Construction Stormwater General Permit (2021).¹⁴ The estimated 20-year PV for fine sediments monitoring costs is between \$20,271 and \$33,429, depending on the size of a site.

It is likely that permitted dischargers already have sediment discharge controls in place due to technology-based limits, or via another parameter of concern (bacteria, metals, toxics, etc.) that binds to sediment. Therefore, any discharger currently covered by the Industrial Stormwater or Construction Stormwater general permits would likely avoid investing into additional control technologies. The others, such as some with individual permits mentioned above, may incur costs for sediment control actions (BMPs, settling, electrocoagulation, and filtration).

The estimate range for the filtration technologies is between \$2,000 and \$40,000. The most common technology control is swale (constructing 100 feet of which costs approximately \$200). The manufactured devices are more expensive: canister filters cost around \$7,000, and a Filtera filter costs around \$20,000.

¹⁴ Small Business Economic Impact Analysis Construction Stormwater General Permit. May, 2020. <https://apps.ecology.wa.gov/publications/documents/2010022.pdf>

Nonpoint dischargers

If the pollutant comes from a set of diffuse sources (referred to as a nonpoint source), such as general urban, residential, farm runoff, or other land activities, that generate pollution discharges, the cumulative share is called a load allocation. Permits do not govern nonpoint sources; thus, they are more difficult to provide assurances that the associated load allocations will be met. The possible sources of nonpoint fine sediment pollution are:

- Soil erosion on cropland
- Soil erosion on pasture, rangelands, and animal confinement areas
- Soil erosion associated with timber harvesting
- Stormwater (non-permitted)
- Roads: gravel roads, roadside ditches, traction sand
- Streambank erosion

To address these nonpoint sources, Ecology develops a list of best management practices (BMPs) for each of the water quality pollution sources identified. Some sites will require very basic erosion and sediment control BMPs (mulch, silt fence, etc.), while others will need extensive treatment technologies (sediment ponds, filters, etc.). BMPs described below are deemed reasonable and feasible, and funding assistance is available to incentivize implementation.

Many of the BMPs address more than one of the water quality issues, such as temperature, addressing bacteria and chemical sediments, etc. Therefore, it is difficult to identify specific BMPs to address fine sediment and costs associated with implementation. However, we have some estimates for common BMPs used to address sediments.

The BMPs for managing fine sediments at nonpoint sources include:

- Reducing erosion (vegetative buffers, conservation-based tillage).
- Reducing runoff-carrying sediment.
- Reducing livestock impacts.
- Informing and educating watershed residents about water quality issues.

To illustrate possible unit costs, we refer to the costs estimates for nonpoint BMPs made by the Lower White River TMDL Workgroup at Ecology (Table 5).¹⁵

¹⁵ [Puyallup - Washington State Department of Ecology](#)

Table 5. Nonpoint TMDL Implementation Cost Estimates

Nonpoint BMPs	Cost per unit¹⁶	Type of Unit
Manure Storage Structure	\$17,500	Per parcel
Off-stream, Watering	\$11,250	Per miles of fenced stream length
Nutrient Management Planning	\$28.73	Per acre
Livestock Exclusion Fencing	\$5.00	Per foot
Riparian Buffers	\$3,779.56	Per acre

Another estimate made by Ecology’s Water Quality Combined Funding Program is the average cost to complete riparian restoration, which is approximately \$15,500 per acre based on 33 previously funded grant agreements across the state from State Fiscal Years 2016 to 2019. Cost per acre varies based on specific site conditions and project scale. Costs range from approximately \$3,500 to \$35,000, depending on the extent of invasive species control, ease of access, plant stock quality, and if maintenance is included in the budget. Typically, larger scale projects have a lower cost per acre. These costs are associated with funding programs and include administrative costs, and costs tend to be higher than if landowners were implementing BMPs on their own.

We provide the ranges, because the costs are likely to vary significantly from real costs of upgrading a particular site, depending on the site’s specific conditions. Site-specific factors such as background water characteristics, site constraints, geotechnical conditions, and the condition and layout of the existing control technologies can have a dramatic impact on the ultimate cost of a nonpoint pollution mitigation project.

3.3 Costs summary

3.3.1 Revising the freshwater dissolved oxygen criteria.

Setting more stringent water column dissolved oxygen criteria

Those changes are not likely to affect dischargers’ behavior, as their waters are commonly still assessed based on the temperature criteria and dissolved oxygen criteria, separately.

¹⁶ The BMP costs are for work in Boise, Pussyfoot, and Second Creeks only.

Given that the updated 303(d) listings will better identify which waters are impaired due to nutrients (better detected by percent saturation) and those affected by human caused temperature increases (better identified by the temperature criteria) the actions necessary to bring the waterbody into compliance will be identified earlier in the water cleanup process.

Adding oxygen saturation and intragravel dissolved oxygen criteria

If a discharger is required to monitor, report, and use technology to control degradation of dissolved oxygen, we assume that any discharger with limits based on water column concentrations may want to take additional measurements of dissolved oxygen (oxygen saturation or intragravel dissolved oxygen) in the event of noncompliance with water quality standards.

It is important to stress that a discharger would choose to monitor and report the intragravel dissolved oxygen parameter only if it expects the potential costs of the sampling to be less than the potential benefits (or cost savings) of verifying their compliance using the alternative method.

Intragravel dissolved oxygen sampling can only be measured in the stream and there are many environmental factors at play in a water body that would not be associated with the facility. We typically regulate dischargers' effluent before it goes to the stream and thus, it is not likely that a discharger would choose to take this sample frequently. We assume that a discharger would want to take the intragravel between never and quarterly. The 20-year PV costs for one discharger would be between \$0 and \$842. We mention these costs for illustration only.

3.3.2 Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

Point source dischargers in TMDLS

If the pollutant comes from a discrete source (referred to as a point source), such as a municipal or industrial facility's discharge pipe, that facility's share of the loading capacity is called a wasteload allocation. General and individual permits regulate point source dischargers. The proposed narrative fine sediment criterion will not impact permits unless facilities are discharging fine sediments to a water impaired for fine sediment. If the receiving water body is impaired and point source dischargers are identified as contributors, restrictions to total suspended sediments (TSS) or turbidity in effluent may be an option to reduce fine sediment inputs into a receiving water body.

If a waterbody with a current permittee discharging sediments is listed as impaired for the new narrative fine sediment criterion, that permittee could incur monitoring costs. We assume that monitoring costs would be similar to monitoring costs for turbidity or TSS.

Ecology estimated these costs for sites with 1-5 acres at \$1,650 per year, and at \$2,721 per year for sites 5+ acres in the Small Business Economic Impact Analysis for Construction Stormwater General Permit (2021).¹⁷ The estimated 20-year PV for fine sediments monitoring costs is between \$20,271 and \$33,429, depending on the size of a site.

It is very likely that a discharger with permit limits for TSS or turbidity already has sediment technology controls in place that are suitable for the fine sediment pollution prevention. For example, TSS criteria target solids with size of <0.06 mm versus fine sediments, defined as particles < 2 mm. Sites that would not need to take additional action would not incur these additional costs as a result of the proposed rule amendments.

Nonpoint dischargers

If the pollutant comes from a set of diffuse sources (referred to as a nonpoint source), such as general urban, residential, farm runoff, or other land activities, that generate pollution discharges, the cumulative share is called a load allocation. Permits do not govern nonpoint sources; thus, they are more difficult to provide assurances that the associated load allocations will be met.

To address these nonpoint sources, Ecology develops a list of best management practices (BMPs) for each of the water quality pollution sources identified. Some sites will require very basic erosion and sediment control BMPs (mulch, silt fence, etc.), while others will need extensive treatment technologies (sediment ponds, filters, etc.). Many of the BMPs address more than one of the water quality issues, such as temperature, addressing bacteria and chemical sediments, etc. Therefore, it is hard to identify which of the BMPs and costs associated with them would address the fine sediments uniquely.

Ecology's Water Quality Combined Funding Program estimated the average cost to complete riparian restoration – one of the most common BMPs addressing nonpoint sediments is approximately \$15,500 per acre based on 33 previously funded grant agreements across the state from State Fiscal Years 2016 to 2019. Cost per acre varies based on specific site conditions and project scale. Costs range from approximately \$3,500 to \$35,000, depending on the extent of invasive species control, ease of access, plant stock quality, and if maintenance is included in the budget. Typically, larger scale projects have a lower cost per acre. These costs are associated with funding programs and include administrative costs, and costs tend to be higher than if landowners were implementing BMPs on their own.

¹⁷ <https://apps.ecology.wa.gov/publications/documents/2010022.pdf>

Chapter 4: Likely Benefits of the Proposed Rule Amendments

4.1 Introduction

We analyzed the likely benefits, as compared to the baseline, associated with the proposed rule amendments. Chapter 2 of this document discusses the proposed rule amendments and the baseline.

4.2 Benefits analysis

The proposed rule amendments would make the following changes:

- Revising the freshwater dissolved oxygen criteria.
 - Adding the definitions of “Intragravel dissolved oxygen” and “Spatial median”.
 - Setting more stringent water column dissolved oxygen criteria.
 - Adding an intragravel dissolved oxygen component to the dissolved oxygen criteria.
 - Adding an oxygen saturation component to the dissolved oxygen criteria.
 - Clarifying the habitat type and spatial extent for sample collection when evaluating intragravel dissolved oxygen.
- Adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water.

4.2.1 Revising the freshwater dissolved oxygen criteria.

4.2.1.1 Adding the definitions of “Intragravel dissolved oxygen” and “Spatial median”.

The definitions themselves cause no impact, as they are an inherent part of adding parameters used to measure dissolved oxygen. This addition expands dischargers’ compliance options.

4.2.1.2 Setting more stringent water column dissolved oxygen criteria.

The rule proposes revisions to the biologically-based water column dissolved oxygen criteria to provide benefits of increased protection of early life stages of salmonids.

The 10 mg/L protective values are based on EPA’s recommendation¹⁸ of 11 mg/L as a mean value for full protection and 9 mg/L as a minima value. Prior to EPA’s 1986 recommendations, the National Academy of Sciences (1972)¹⁹ suggested that dissolved oxygen criteria for salmonid eggs be between maximum protection (11 mg/L) and high level of protection (9 mg/L).

¹⁸ U.S. Environmental Protection Agency, 1986. Gold Book, Pub. No. EPA 440/5-86- 001, Quality Criteria for Water.

¹⁹ National Academy of Sciences (US). Committee on Water Quality Criteria. Water quality criteria, 1972. US Environmental Protection Agency, 1974.

Given that Washington is continuing to use a 1-day minimum duration value for dissolved oxygen, the 10 mg/L value aligns with federal recommendations for dissolved oxygen. The 10 mg/L dissolved oxygen protection level was chosen to reflect a maximum 2 mg/L dissolved oxygen depression value from the water column to gravel. Therefore, the 10 mg/L dissolved oxygen water column value assumes that 8.0 mg/L dissolved oxygen is present in gravels. Ecology agrees with EPA and the scientific literature²⁰ that 8.0 mg/L in gravels is fully protective of early life stages of salmonids.

Water quality based limits are implemented with a water body is impaired. The water quality assessment adds new dissolved oxygen impairment (303(d)) listings when Ecology receives data that demonstrates a waterbody is impaired due to low dissolved oxygen measurements. New 303(d) listings will occur as new data are provided for this assessment effort. When more data is assessed, there is greater potential 303(d) listing will be identified. However, we do not expect an increase in dissolved oxygen listings attributable to this rulemaking. Rather, the updated dissolved oxygen criteria would enable the refinement of the list of impaired waters. The current dissolved oxygen 303(d) listings include some listings in which temperature may be the cause or a large contributing factor of the low dissolved oxygen values. The oxygen saturation criteria is anticipated to refine the 303(d) list to identify those waters that are low in dissolved oxygen largely due to nutrients, potentially reducing the number of 303(d) listings by removing those that are solely attributed to temperature. Those changes are not likely to affect dischargers' behavior because waters will be assessed separately for compliance with temperature and dissolved oxygen criteria. Given that the updated 303(d) listings will better identify which waters are impaired due to nutrients (better detected by percent oxygen saturation) and those affected by human caused temperature increases (better identified by the temperature criteria) the actions necessary to bring the waterbody into compliance will be identified earlier in the water cleanup process. We do not anticipate more dissolved oxygen listings due to the additional compliance option of percent saturation, regardless of the dissolved oxygen concentration.

Moreover, we anticipate to streamline the process for identifying causes of dissolved oxygen impairment of waters. This would result in less expenses associated with time and labor costs, and avoiding implementation of actions that address that are not addressing the real problem.

4.2.1.3 Adding intragravel dissolved oxygen criteria.

The rule proposes biologically-based intragravel dissolved oxygen criteria to provide benefits of increased protection of early life stages of salmonids.

²⁰ See Salmon Spawning Habitat Protection Rule. Preliminary Technical Support Document. October 2021.

Intragravel dissolved oxygen criteria is a direct measurement of dissolved oxygen levels where early life stages of salmonids reside, whereas the water column dissolved oxygen levels are dependent on an assumption of dissolved oxygen depression from the water column to the interstitial spaces of gravels.

An extensive scientific literature review²¹ validates the decision to set a 10 mg/L water column based dissolved oxygen value for early life stages of salmonids. The majority of qualified studies found that dissolved oxygen depression may be much less than 2.0 mg/L in relatively sediment-free streams and in the absence of variables that influence oxygen demand. Ecology believes analyzing dissolved oxygen depression with minimal outlying variables is the correct approach because there are other water quality criteria that address variables that may influence freshwater dissolved oxygen (fine sediment, nutrients, turbidity, temperature, etc.). This would allow Ecology to focus on factual causes of water pollution.

4.2.1.4 Adding oxygen saturation criteria.

The purpose of the oxygen saturation component is to account for temperature and elevation impacts on dissolved oxygen levels. Furthermore, oxygen saturation provides needed flexibility to the dissolved oxygen criteria during the summer months when water temperatures rise and, in many streams, early life stages of salmonids are not present.

The proposed 90% oxygen saturation value is based on monitoring data from several waterbodies in Washington considered relatively pristine or undisturbed by human influences. A 90% oxygen saturation value is more protective than the current biologically-based criteria at sea level at the maximum allowable temperature for all salmonid related aquatic life uses, except for core summer salmonid habitat. However, Washington has supplemental spawning criteria that has identified water bodies that have early life stages of salmonids present during the summer months and, thus, require more stringent temperature criteria. Ecology concludes that 90% oxygen saturation is commensurate with protection levels for aquatic life uses that include early life stages during the summer months while accounting for climatic variability.

The addition of oxygen saturation and intragravel measurement compliance options for the dissolved oxygen criteria would also potentially result in cost savings for the current and future dischargers, if the more accurate assessment allows them to be delisted from the 303(d) list (see 3.2.1.4). This flexibility may also assist entities in monitoring and assessing protection of aquatic life.

²¹ Ibid.

4.2.1.5 Clarifying the habitat type and spatial extent of sampling when evaluating intragravel dissolved oxygen.

Ecology believes that a single intragravel dissolved oxygen measurement may not be representative of a site-specific location or a water body. Intragravel dissolved oxygen conditions can vary spatially and temporally depending on the substrate conditions of a water body. Therefore, the rule proposes that intragravel dissolved oxygen measures be collected over a spatial area and a median value be calculated for a given spawning area. This clarification would contribute to the provision of benefits of increased protection of early life stages of salmonids.

4.2.2 Adding a narrative fine sediment criterion

The EPA does not currently have recommended criteria for fine sediment criterion. In 2003²², EPA summarized the biological effects of suspended and bedded sediments in aquatic systems and reviewed all states' criteria that addressed fine sediment. In the 2003 review, EPA concluded that generalizing protective criteria for fine sediment is difficult because biological responses vary with species and sediment characteristics. EPA also noted that many states have standards set to address suspended and bedded sediments but that there is little consistency among the criteria.

The proposed rule would create benefits by including evaluation and limiting anthropogenic sources of fine sediment that may adversely affect early life stages of salmonids and result in a water body impairment.

4.3 Benefits of salmonid protection

The goal of the proposed rule is to provide additional water quality and habitat protection for early life stages of salmonids—including salmon, steelhead, and trout—and their spawning gravel. Although we cannot quantify how increased protections in this rule would benefit salmonids populations, we can list which areas of Washington's environmental, social, and economic life that would benefit.

Use benefits

In the context of economic analysis, the total value is equal to the sum of the use and nonuse value. Use values include value of commercial fish harvest (market priced) and value of recreational fishing trips (nonmarket value). Nonuse value is discussed in social benefits below.

²² Jha M, Swietlik B. 2003. Ecological and toxicological effects of suspended and bedded sediments on aquatic habitats-A concise review for developing water quality criteria for suspended and bedded sediments (SABS). US EPA, Office of Water draft report. Berry, W., Rubinstein, N., Melzian, B. and Hill, B., 2003. The biological effects of suspended and bedded sediment (SABS) in aquatic systems: a review. United States Environmental Protection Agency, Duluth, 32(1): 54-55.

According to the report “State of salmon in watershed 2020”, commercial and recreational fishing in Washington is estimated to support 16,000 jobs and \$540 million in personal income. People fishing and harvesting shellfish recreationally in Washington spend an estimated \$1.5 billion annually on equipment and trip-related costs, supporting many rural families and businesses.

Non-use benefits

Non-use value of natural resources, among which is the “value of knowledge that species are protected”.²³ This concept captures individuals’ preferences for a public good or resource that are not derived from their use.

Salmon and steelhead populations have been declining in Washington State for more than a decade.²⁴ Since 1991, the federal government has declared 14 species of salmon and steelhead in Washington as at-risk of extinction under the Endangered Species Act. Based on the economic concept, even if individuals are not involved in commercial fish harvesting or recreational fishing, they value salmonid protection.

Although this concept contributes to the total economic value of environmental resources, we define it as a social benefit because individuals’ motives are to provide opportunities for their children or others in society to use or enjoy the resource in the future.

Salmonids are important to Tribes in Washington for economic and cultural reasons. Protecting salmonids provides indigenous populations with the nutritional benefits, economic savings and revenues, and supports recovery and maintenance of tribal lifeways.

Environmental benefits

Many other animals rely on salmon. Scientists estimate 138 species of wildlife, from whales to insects, depend on salmon for their food.²⁵ Migrating salmon and steelhead bring essential nutrients from the ocean back to rivers, streams, and surrounding habitat. These nutrients are a significant part of the freshwater food web.

Salmonids represent one of the most sensitive aquatic life species in Washington and therefore form the basis for protecting all aquatic life uses.

²³ Klamath River basin restoration nonuse value survey. https://kbifrm.psmfc.org/wp-content/uploads/2016/12/Graham_2012_0010_Klamath-River-Basin-Restoration-Nonuse-Value-Survey-Final-Report.pdf

²⁴ State of the Salmon Report 2020. <https://stateofsalmon.wa.gov/wp-content/uploads/2020/12/StateofSalmonExecSummary2020.pdf>.

²⁵ State of salmon in watershed 2020. Report. <https://stateofsalmon.wa.gov/salmon-101/>.

Chapter 5: Cost-Benefit Comparison and Conclusions

5.1 Summary of costs and benefits of the proposed rule amendments

Costs

In Chapter 3, we identified the following potential costs associated with adding a narrative fine sediment criterion to all existing and designated aquatic life uses for fresh water:

- **Costs for point source dischargers in TMDLs.** If a waterbody with a current permittee discharging sediments is listed as impaired for the new narrative fine sediment criterion, that permittee could incur monitoring costs. We assume that monitoring costs would be similar to monitoring costs for turbidity. Ecology estimated these costs for sites with 1-5 acres at \$1,650 per year, and at \$2,721 per year for sites 5+ acres in the Small Business Economic Impact Analysis for Construction Stormwater General Permit (2021).²⁶ The estimated 20-year PV for fine sediments monitoring costs is between \$20,271 and \$33,429, depending on the size of a site.
- **Costs for nonpoint dischargers.** To address these nonpoint sources, Ecology develops a list of BMPs. Many of the BMPs address more than one of the water quality issues, such as temperature, addressing bacteria and chemical sediments, etc. Therefore, it is hard to identify which of the BMPs and costs associated with them would address the fine sediments uniquely.

One of the most common BMPs addressing nonpoint sediments is approximately \$15,500 per acre based on 33 previously funded grant agreements across the state from State Fiscal Years 2016 to 2019. Cost per acre varies based on specific site conditions and project scale. Costs range from approximately \$3,500 to \$35,000, depending on the extent of invasive species control, ease of access, plant stock quality, and if maintenance is included in the budget. Typically, larger scale projects have a lower cost per acre. These costs are associated with funding programs and include administrative costs, and costs tend to be higher than if landowners were implementing BMPs on their own.

Benefits

We identified which areas of Washington's environmental, social, and economic life would benefit from the proposed amendments, and Chapter 4 discussed these further:

- **Streamlined process for identifying causes of dissolved oxygen impairment of waters.** The alternate criteria expressed in percent saturation would help to refine the list to identify those waters that are low in DO largely due to nutrients, potentially reducing the number of 303(d) listings by removing those that are solely attributed to temperature.

²⁶ Small Business Economic Impact Analysis. Construction Stormwater General Permit. May, 2020. <https://apps.ecology.wa.gov/publications/documents/2010022.pdf>

This would result in less expenses associated with time and labor costs, and avoiding implementation of actions that address that are not addressing the real problem.

- **Increased protection of early life stages of salmonids.** Revising the freshwater dissolved oxygen criteria and adding aquatic life fine sediment criterion to all existing and designated uses for fresh water provide increased protection for early life stages of salmonids, although we cannot quantify how many salmonids will directly benefit from this rule.
- **Additional protection for other species.** Environmental benefits include additional habitat protections for other aquatic life and wildlife, as well as those organisms that depend on salmonids for their food.
- **Increased non-use values.** Social benefits include the non-use value of salmonids. Individuals who are not involved in commercial fish harvesting or recreational fishing see value in increased salmonid protections, and these proposed amendments align with the values of indigenous cultures.
- **Determined economic benefits of use and non-use values.** For the economic analysis in this document, the total value of protecting salmonids is equal to the sum of use and non-use values. Use values include the value of the commercial fish harvest (market priced) and the value of recreational fishing trips (nonmarket value).

5.2 Conclusion

We conclude, based on a reasonable understanding of the quantified and qualitative costs and benefits likely to arise from the proposed rule amendments, as compared to the baseline, that the benefits of the proposed rule amendments are greater than the costs.

Chapter 6: Least-Burdensome Alternative Analysis

6.1 Introduction

RCW 34.05.328(1)(c) requires Ecology to “...[d]etermine, after considering alternative versions of the rule and the analysis required under (b), (c), and (d) of this subsection, that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated under (a) of this subsection.” The referenced subsections are:

- (a) Clearly state in detail the general goals and specific objectives of the statute that the rule implements;
- (b) Determine that the rule is needed to achieve the general goals and specific objectives stated under (a) of this subsection, and analyze alternatives to rule making and the consequences of not adopting the rule;
- (c) Provide notification in the notice of proposed rulemaking under RCW 34.05.320 that a preliminary cost-benefit analysis is available. The preliminary cost-benefit analysis must fulfill the requirements of the cost-benefit analysis under (d) of this subsection. If the agency files a supplemental notice under RCW 34.05.340, the supplemental notice must include notification that a revised preliminary cost-benefit analysis is available. A final cost-benefit analysis must be available when the rule is adopted under RCW 34.05.360;
- (d) Determine that the probable benefits of the rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented.

In other words, to be able to adopt the rule, we are required to determine that the contents of the rule are the least burdensome set of requirements that achieve the goals and objectives of the authorizing statute(s).

We assessed alternative proposed rule content and determined whether they met the goals and objectives of the authorizing statute(s). Of those that would meet the goals and objectives, we determined whether those chosen for inclusion in the proposed rule amendments were the least burdensome to those required to comply with them.

6.2 Goals and objectives of the authorizing statute

The authorizing statutes for this rule are

- Clean Water Act 303(c)(2)(A)
- Water Pollution Control Act, Chapter 90.48 RCW
- Water Resources Act of 1971, Chapter 90.54 RCW

We summarize the goals and objectives of the authorizing statutes as:

- To retain and secure high quality for all waters of the state.
- Insure the purity of all waters of the state consistent with:
 - Public health and public enjoyment thereof.
 - Propagation and protection of wild life, birds, game, fish and other aquatic life.
 - Industrial development of the state.
- Require the use of all known available and reasonable methods (AKART) by industries and others to prevent and control the pollution of the waters of the state of Washington.
- To protect the public health or welfare, enhance the quality of the water, taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial and other purposes.

6.3 Alternatives considered and reason for exclusion

We considered the following alternative rule content and did not include it in the proposed rule amendments for the reasons discussed in each subsection below.

- Develop numeric fine sediment criteria
- Do not include intragravel dissolved oxygen criteria
- Set a 95% oxygen saturation value
- Set a 11 mg/L water column dissolved oxygen level
- Develop chronic criteria for water column based dissolved oxygen criteria

6.3.1 Develop numeric fine sediment criteria

A single fine sediment threshold cannot be generalized statewide as each water body's sediment characteristics are unique. Furthermore, the science surrounding relationships between fine sediment based parameters and biological responses are not fully developed. The current state of the science suggests that a single parameter to measure fine sediment will not adequately capture sediment dynamics, changes within a water body, or harmful effects on aquatic life. A multi-parameter approach is necessary to understand sediment quality from a biological, chemical, geological, and physical perspective.

This alternative would not have met stated goals and objectives, as RCW 90.48.010 requires Ecology to "exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state."

6.3.2 Do not include intragravel dissolved oxygen criteria

Intragravel dissolved oxygen criteria are included to provide additional flexibility in the dissolved oxygen criteria and provide a means to directly measure the water condition needed to fully protect early life stages of salmonids. Rather than relying on a worst-case assumption of dissolved oxygen depression, direct measurements of intragravel dissolved oxygen eliminate the need to assume a reduction in oxygen from the water column to the spaces between gravels. The elimination of this assumption allows for a more accurate measurement of protection levels. This alternative does not meet stated goals and objectives, as RCW 90.48.010 requires Ecology to “exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state.”

6.3.3 Set a 95% oxygen saturation value

The intention of the oxygen saturation criteria is to provide flexibility in the dissolved oxygen criteria at warmer water temperatures, higher elevations, and in the absence of early life stages of salmonids. Ecology considered a 95% oxygen saturation value but found this alternative more burdensome compared to the same level of protection, and ultimately landed on a 90% oxygen saturation value. Setting a 95% oxygen saturation value does not provide adequate flexibility during summer months when water temperatures can become elevated and early life stages of salmonids are not present. A 95% oxygen saturation value at sea level and at the maximum allowable water temperatures is considered more stringent than the current water column based dissolved oxygen criteria and therefore, does meet the stated goals of providing flexibility when water temperatures and elevations are high and early life stages are not present.

6.3.4 Set a 11 mg/L water column dissolved oxygen level

EPA recommends a more stringent 11 mg/L water column based DO level based on the assumption that there is a 3 mg/L drop in dissolved oxygen from the water column to gravels. In gravels, 8 mg/L is considered fully protective of early life stages of salmonids. The EPA assumption of 3 mg/L is based on two field studies that do not meet the minimum qualifications to be used to evaluate dissolved oxygen depression. Ecology evaluated literature since EPA's 1986 recommendations and found several new published field studies that met the minimum qualifications of little or no fine sediment in streams. These studies indicated a maximum dissolved oxygen reduction of 2 mg/L from the water column to the gravels²⁷. Using the assumption of a 2 mg/L dissolved oxygen depression and protective intragravel dissolved oxygen levels of 8 mg/L, we conclude that water column levels should be set at 10 mg/L.

²⁷ Salmon Spawning Habitat Protection Rule. Preliminary Technical Support Document. October 2021.

EPA's recommendation of 11 mg/L in the water column is found to be excessively high (and, therefore, more burdensome) based on the current literature available.

6.3.5 Do not add a fine sediment criteria

Ecology, as a rule-making authority (RCW 90.48.035), has obligations in a 2018 settlement agreement²⁸ that Ecology would develop a fine sediment criterion.

6.3.6 Do not revise freshwater dissolved oxygen criteria

The current dissolved oxygen criteria includes protection levels for the water column only and does not account for influences of temperature or elevation on dissolved oxygen. We would continue to have dissolved oxygen criteria that applies to higher elevations (e.g. alpine, subalpine areas) that cannot physically meet oxygen requirements. Furthermore, early life stages of salmonids would not be fully protected, given that the current criteria are based on water column protection levels and not intragravel oxygen conditions.

This alternative does not meet stated goals and objectives, as RCW 90.48.010 requires Ecology to "exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state."

6.3.7 Implement seasonal dissolved oxygen criteria to protect early life stages

This rule includes protection for all salmonids, including salmon, steelhead, trout, whitefish, and grayling. This level of detail is beyond the scope of this rulemaking. Spawning and rearing time can vary significantly based on the water body and the species present. Thus, seasonal site-specific criteria would require information on salmonid spawning and rearing across water bodies in Washington State.

We considered setting a generic seasonal criterion from fall to spring months. However, it is well known that spawning and rearing occurs almost year-round in some streams in Washington State. These streams would not be protected by a seasonal dissolved oxygen criterion.

6.3.8 Develop chronic criteria for water column based dissolved oxygen criteria

We considered setting acute and chronic based dissolved oxygen criteria. However, the current rule proposal only includes an acute based dissolved oxygen criterion. One reason for this decision is the advice provided by the Science Advisory Group (SAG) that was assembled during this rulemaking.

²⁸ 2018 U.S. District Court Stipulated Order of Dismissal
<https://www.bdlaw.com/content/uploads/2018/10/NWEA-stip.pdf>

The SAG noted that salmonids are most fragile during early life stages and using the highest level of protection should be considered due to uncertainty and variability in environmental conditions. Given environmental conditions and the high sensitivity of early life stages of salmonids, we proposed an acute criterion protective of both acute and chronic effects. This proposal aligns with the current dissolved oxygen criteria for Washington State that includes only an acute criterion. Further support for this decision was based on previous comments by the National Oceanic and Atmospheric Administration (NOAA).

Our recent review of scientific literature indicates support for a 10 mg/L dissolved oxygen level for the protection of sub-lethal effects and 9 mg/L dissolved oxygen level for the protection of lethal effects (see technical support document for this rulemaking). In a previous rulemaking, NOAA noted concerns with the acute protective level of 9.5 mg/L for the Core Summer Salmonid Habitat designated use during an Endangered Species Act (ESA) review. NOAA based their analysis on EPA recommendations of 11.0 mg/L (chronic value) and a 3 mg/L dissolved oxygen depression between the water column and gravels. NOAA concerns revolved around chronic exposures during incubation.

While an acute criterion 9.0 mg/L dissolved oxygen may be justified based on current literature, it does not protect against sublethal effects and is not supported by NOAA when considering acute criteria only. Furthermore, a 9.0 mg/L acute criterion would represent a less stringent acute criterion than the current 9.5 mg/L dissolved oxygen criterion for the Core Summer Salmonid Habitat and Char Spawning uses. While a 10 mg/L chronic criterion and a 9 mg/L acute criterion was considered, there are concerns that setting a 9.0 mg/L acute criterion would not be accepted during ESA review based on previous comments by NOAA.

We have decided to set a more stringent 10 mg/L dissolved oxygen level protective of both sublethal (chronic) and lethal (acute) effects. The proposed 10 mg/L value is based on the high sensitivity of early life stages of salmonids to fluctuations in oxygen conditions, new science demonstrating a 2 mg/L dissolved oxygen depression value from the water column to gravels, and NOAA's previous comments that 9.5 mg/L acute criterion alone may not be fully protective.

6.4 Conclusion

After considering alternatives to the proposed rule's contents, within the context of the goals and objectives of the authorizing statute, we determined that the proposed rule represents the least-burdensome alternative of possible rule contents that meet the stated goals and objectives.

Chapter 7: Regulatory Fairness Act Compliance

7.1 Introduction

The Regulatory Fairness Act (RFA; RCW 19.85.070) requires Ecology to perform a set of analyses and make certain determinations regarding the proposed rule amendments. This chapter presents the:

- Analysis of relative compliance cost burden.
- Consideration of lost sales or revenue.
- Cost-mitigating elements of the rule, if required.
- Small business and local government consultation.
- Industries likely impacted by the proposed rule.
- Expected impact on jobs.

A small business is defined by the RFA as having 50 or fewer employees, at the highest ownership and operator level. Estimated compliance costs are determined as compared to the baseline (the regulatory environment in the absence of the proposed rule amendments, limited to existing federal and state requirements). Analyses under the RFA only apply to costs to “businesses in an industry” in Washington State. This means the impacts, for this part of our analyses, are not evaluated for government agencies.

7.2 Analysis of relative compliance cost burden

We calculated the estimated per-business costs to comply with the proposed rule amendments, based on the costs estimated in Chapter 3 of this document. In this section, we estimate compliance costs per employee. As we do not know what industries would be affected by the rule, we used the list of industries currently reporting the TSS and turbidity measurements. We recognize that less, more, or other industries may be affected.

We used current Employment Security Department (ESD)²⁹ data to estimate the average number of employees through all identified industries. Note that ESD data is collected at the facility level, not the business level of highest owner or operator. This means:

- The small business number may be underestimated.
- The largest businesses number is likely significantly underestimated.
- Any identified disparity may be larger than presented from the available data.

²⁹ Employment Security Department/Labor Market and Economic Analysis (LMEA), March 2020.

The average affected small business likely to be covered by the proposed rule amendments employs approximately nine people.

The largest ten percent of affected businesses employ an average of 855 people. Based on cost estimates in Chapter 3, we estimated the following compliance costs per employee.

We cannot make an assumption that small sites have less employees or a riparian buffer project (or other BMP) would be less complex. Therefore, we compare small and large business with small and large sites; simple and complex projects.

Table 6: Compliance costs per employee

Cost Category	\$ per employee, small business, small site	\$ per employee, small business, large site	\$ per employee, large business, small site	\$ per employee, large business, large site
Monitoring	2252	3714	24	39
Livestock Exclusion Fencing	464	4639	5	49
Riparian buffer (simple)	389	3889	4	41
Riparian buffer (complex)	3889	38889	41	409

We conclude the rule amendments potentially have disproportionate impacts on small businesses, and therefore Ecology must include elements in the rule amendments to mitigate this disproportion, as far as is legal and feasible.

7.3 Loss of sales or revenue

Businesses that would incur costs could experience reduced sales or revenues if the proposed rule amendments significantly affect the prices of the goods they sell. The degree to which this could happen is strongly related to each business’s production and pricing model (whether additional lump-sum costs would significantly affect marginal costs), as well as the specific attributes of the markets in which they sell goods, including the degree of influence each firm has on market prices, as well as the relative responsiveness of market demand to price changes.

We used the REMI E3+ model for Washington State to estimate the impact of the proposed rule amendments on directly affected markets, accounting for dynamic adjustments throughout the economy. The model accounts for inter-industry impacts; price, wage, and population changes; and dynamic adjustment of all economic variables over time.

We cannot predict which existing dischargers would be included on updated 303(d) lists and what their TMDL would be. We also cannot predict what combination of BMPs and other technology controls an impacted discharger would use. Using the REMI E3+ model, we applied potential costs to various industries, based on current sediment monitoring data. We randomly applied cost range to one business in every identified industry (because of the high degree of the uncertainty), and combined them in one model. The higher end of the costs range were applied to “Forestry and logging” sector, which affected the results. Modeling results did not indicate significant impacts to industries. Output would decrease by \$1.3 million in year 2022 over all industries in the state, which in relative indicators shows as a decrease.

0.018% decrease from the baseline for “Forestry and logging”,

0.004% decrease for “Support activities for agriculture and forestry”, and

0.002% for “Other wood manufacturing” in 2022.

This is due to the capital costs associated with BMPs implementation would occur in 2021. The monitoring costs did not show any effect on output, and therefore, revenue of the industries. These results are scalable based on the number of dischargers assumed to be impacted in each industry.

7.4 Action taken to reduce small business impacts

The RFA (19.85.030(2) RCW) states that:

“Based upon the extent of disproportionate impact on small business identified in the statement prepared under RCW 19.85.040, the agency shall, where legal and feasible in meeting the stated objectives of the statutes upon which the rule is based, reduce the costs imposed by the rule on small businesses. The agency must consider, without limitation, each of the following methods of reducing the impact of the proposed rule on small businesses:

- a) Reducing, modifying, or eliminating substantive regulatory requirements;
- b) Simplifying, reducing, or eliminating recordkeeping and reporting requirements;
- c) Reducing the frequency of inspections;
- d) Delaying compliance timetables;
- e) Reducing or modifying fine schedules for noncompliance; or
- f) Any other mitigation techniques including those suggested by small businesses or small business advocates.”

We considered all of the above options, the goals and objectives of the authorizing statutes (see Chapter 6), and the scope of this rulemaking. We limited compliance cost-reduction methods to those that:

- Are legal and feasible.
- Meet the goals and objectives of the authorizing statute.
- Are within the scope of this rulemaking.

The scope of this rulemaking was limited to revising the freshwater dissolved oxygen criteria and adding a fine sediment criteria to all existing and designated aquatic life uses for fresh water. We could not meet legally stated goals and objectives if the proposed rule amendments included reduced or variable water quality standards, recordkeeping, or reporting.

We included the following elements in the proposed rule amendments to reduce costs to small businesses. This rulemaking is reducing, modifying, or eliminating substantive regulatory requirements by providing alternative compliance options to the existing dissolved oxygen criteria. Because the rule proposes that compliance may be demonstrated through one or more of the dissolved oxygen criteria, this provides flexibility and potential cost savings (benefits) for the dischargers. A discharger would choose to monitor and report the intragravel dissolved oxygen parameter only if it expects the potential costs of the sampling to be less than the potential benefits (or cost savings) of verifying their compliance using the alternative method.

Updated dissolved oxygen criteria would enable the refinement of the list of impaired waters. The current DO 303(d) listings include some listings in which temperature may be the cause or a large contributing factor of the low dissolved oxygen values. The alternate criteria expressed in percent saturation would help to refine the list to identify those waters that are low in dissolved oxygen largely due to nutrients, potentially reducing the number of 303(d) listings by removing those that are solely attributed to temperature.

7.5 Small business and government involvement

We involved small businesses and local governments in its development of the proposed rule amendments, using:

- Water Quality Information Listserv:
 - Voluntary membership to stay informed on the salmon spawning habitat protection rulemaking.
- Public webinars:
 - Clark Regional wastewater district, Sunnyside Valley Irrigation District, Trout Unlimited, Clean Water ATS, Puget Sound Keeper Alliance, South Columbia Basin Irrigation District, The National Council for Air and Stream Improvement (NCASI), Northwest Environmental Advocates, Washington State Water Resources Association, RE Sources, Port of Longview, Parametrix, WSP, Port of Tacoma, Dell, Chelan PUD, Avista Corp, NW Fishletter, Tupper Mack Wells PLLC, Skagit River System Cooperative, Skagit Fishereies Enhancement Group.

- NWIFC, Confederated Tribes of Coos, Lower Umpqua and Siuslaw Indians, City of Tacoma, WA Department of Natural Resources, City of Kirkland, Idaho department of environmental quality, Quileute Nation, Pierce County, , City of Spokane, City of Seattle, Lower Columbia Fish Enhancement Group, US Bureau of Reclamation, City of Federal Way, Snohomish Conservation District, Pierce Conservation District, Snohomish County, US Department of Agriculture, City of Vancouver, Tacoma-Pierce County Health Department, King County, Tulalip Tribe, Spokane Tribe, Port Gamble S’Klallam Tribe, Suquamish Tribe, Environmental Protection Agency, City of Bainbridge, City of Vancouver, Chehalis Tribe, City of Bellingham, US Corp of Engineers, Skokomish Tribe, Lewis Conservation District, Thurston County, CRITFC, City of Vancouver, Quileute Tribe, Washington Department of Fish and Wildlife, Alaska Department of Environmental Conservation, Hoh Tribe, Klickitat County, Stillaguamish Tribe.
- Science Advisory Team:
 - Ashley Coble (NCASI), Chris Frissell (Salish Kootenai College), Brian Mattax (WSP)
 - Joy Archuleta (US Forest Service), Jennifer Arthur (Seattle Public Utilities), Jordan Bauer (Ecology), Seth Book (Skokomish Tribe), Joanna Crowe Curran (US Corp of Engineers), Lindsay Guzzo (EPA), Tim Hagen (Pierce County), Kirk Krueger (WA Fish and Wildlife), Patrick Lizon (Ecology), Glen Merritt (Ecology), Cleo Nuculae (Ecology), Ted Parker (Snohomish County), Cole Provence (Ecology), Rainy Rau (City of Vancouver), Keunyea Song (Ecology), Leanne Weiss (Ecology), Angela Zeigenfuse (Ecology).

7.6 North American Industry Classification System (NAICS) codes of impacted industries

The proposed rule amendments likely impacts the following industries, with associated NAICS codes. NAICS definitions and industry hierarchies are discussed at <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?chart=2017>.

113310	Forestry and Logging
321912, 321918	Wood Product Manufacturing
332323	Fabricated Metal Product Manufacturing
423310, 423930	Merchant Wholesalers, Durable Goods
452319	General Merchandise Stores
488210	Support Activities for Transportation
561990	Administrative and Support Services
811122	Repair and Maintenance

7.7 Impact on jobs

We used the REMI E3+ model for Washington State to estimate the impact of the proposed rule amendments on jobs in the state, accounting for dynamic adjustments throughout the economy.

The proposed rule amendments would result in transfers of money within and between industries, as compared to the baseline. The modeled impacts on employment are the result of multiple small increases and decreases in employment, prices, and other economic variables across all industries in the state.

We cannot predict which existing dischargers would be included on updated 303(d) lists and what their TMDL would be. We also cannot predict what combination of BMPs and other technology controls an impacted discharger would use. Using the REMI E3+ model, we applied potential costs to various industries, based on current sediment monitoring data. We randomly applied cost range to one business in every identified industry (because of the high degree of the uncertainty), and combined them in one model. The higher end of the costs range were applied to “Forestry and logging” sector, which also affected the results of impact on jobs on the particular industry.

Table 7: Impacts on jobs

Industry	Initial Jobs Impact	Jobs Impact in 20 years
Whole state	8	0.25
Forestry and Logging	1.7	0.005
Support activities for agriculture and forestry	1.4	0.005
Construction	0.8	0.007
Manufacturing	0.5	0.025
Wholesale trade	0.222	0.008
Retail trade	0.66	0.023
Transportation and warehousing	0.228	0.012

References

RCW 34.05.272 requires Ecology to categorize sources of information used in significant agency actions made in the Water Quality Program.

Independent peer review: an independent third party oversees Review.

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N/A

Open review: Documented open public review process that is not limited to invited organizations or individuals.

N/A

Legal and policy documents: Documents related to the legal framework for the significant agency action, including but not limited to: federal and state statutes, court and hearings board decisions, federal and state administrative rules and regulations, and policy and regulatory documents adopted by local governments.

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<https://www.bdlaw.com/content/uploads/2018/10/NWEA-stip.pdf>.

40 CFR 131.20 Water Quality Standards - State review and revision of water quality standards; requires states and tribes (with primacy for clean water actions) to periodically review and update the water quality standards.

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Chapter 90.54 RCW, Water Resources Act of 1971.

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Washington Administrative Procedure Act (APA; RCW 34.05.328(1)(d)).

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N/A

Appendix A: Administrative Procedure Act (RCW 34.05.328) Determinations

A. RCW 34.05.328(1)(a) – Clearly state in detail the general goals and specific objectives of the statute that this rule implements.

See Chapter 6.

B. RCW 34.05.328(1)(b) –

1. Determine that the rule is needed to achieve the general goals and specific objectives of the statute.

See Chapters 1 and 2.

2. Analyze alternatives to rulemaking and the consequences of not adopting this rule.

Fine Sediment

Meeting legal obligations made in a 2018 U.S. District Court Stipulated Order of Dismissal between NWEA, EPA, and Ecology to do the following:

- i. Propose fine sediment criteria to protect salmonid redds. If the rule is a narrative criterion, ECY will concurrently issue draft guidance on how it will interpret and apply the criterion, including its use in 303(d) listing.

The only alternative we considered for the proposed fine sediment criterion was to not move forward with rulemaking. The consequence of not revising sections of the rule that we agreed to in the Stipulated Order of Dismissal between NWEA, EPA, and Ecology is that we would be in contempt of a legally binding agreement. Not meeting this agreement may also negatively affect our working relationship with the EPA, and negatively impact our relationship with NWEA.

Dissolved Oxygen

- i. Do not include intragravel dissolved oxygen criteria
An intragravel dissolved oxygen criteria is included to provide additional flexibility in the dissolved oxygen criteria and provide a means to directly measure the water condition needed to fully protect early life stages of salmonids. Rather than relying on a worst-case assumption of DO depression, direct measurements of intragravel-dissolved oxygen eliminate the need to assume a reduction in oxygen from the water column to the spaces between gravels. The elimination of this assumption allows for a more accurate measurement of protection levels.
- ii. Propose a 95% oxygen saturation criteria rather than 90%
The intention of the oxygen saturation criteria is to provide flexibility in the DO criteria at warmer water temperatures, higher elevations, and in the absence of early life stages of salmonids. We considered a 95% oxygen saturation value but ultimately landed on a 90% oxygen saturation value.

Setting a 95% oxygen saturation value does not provide adequate flexibility during summer months when water temperatures can become elevated and early life stages of salmonids are not present. A 95% oxygen saturation value at sea level and at maximum allowable water temperatures can be considered much more stringent than the current water column based DO criteria.

- iii. Set a 11 mg/L water column based dissolved oxygen criteria
EPA recommends a 11 mg/L water column based dissolved oxygen level based on the assumption that there is a 3 mg/L drop in dissolved oxygen from the water column to gravels. In gravels, 8 mg/L is considered fully protective of early life stages of salmonids. The EPA assumption of 3 mg/L is based on two field studies that do not meet the minimum qualifications to be used to evaluate dissolved oxygen depression. We evaluated literature since EPA's 1986 recommendations and found several new field studies that have been published that met the minimum qualifications of little or no fine sediment in streams. These studies indicated a maximum dissolved oxygen reduction of 2 mg/L from the water column to the gravels. Using the assumption of a 2 mg/L dissolved oxygen depression, while using protective intragravel DO levels of 8 mg/L in gravels, we conclude that water column levels should be set at 10 mg/L. EPA recommendation of 11 mg/L in the water column is found to be excessively high based on the current literature available.
- iv. Do not revise freshwater DO criteria
The current dissolved oxygen criteria includes protection levels for the water column only and does not account for influences of temperature or elevation on dissolved oxygen. We would continue to have DO criteria that applies to alpine and subalpine areas that cannot physically meet oxygen requirements. Furthermore, early life stages of salmonids would not be fully protected.

Please see the Least Burdensome Alternative Analysis, Chapter 6 of this document, for discussion of alternative rule content considered.

C. RCW 34.05.328(1) (c) - A preliminary cost-benefit analysis was made available.

When filing a rule proposal (CR-102) under RCW 34.05.320, Ecology provides notice that a preliminary cost-benefit analysis is available. At adoption (CR-103 filing) under RCW 34.05.360, Ecology provides notice of the availability of the final cost-benefit analysis.

D. RCW 34.05.328(1)(d) – Determine that probable benefits of this rule are greater than its probable costs, taking into account both the qualitative and quantitative benefits and costs and the specific directives of the statute being implemented.

See Chapters 1 – 5.

E. RCW 34.05.328 (1)(e) - Determine, after considering alternative versions of the analysis required under RCW 34.05.328 (b), (c) and (d) that the rule being adopted is the least burdensome alternative for those required to comply with it that will achieve the general goals and specific objectives stated in Chapter 6.

Please see Chapter 6.

F. RCW 34.05.328(1) (f) - Determine that the rule does not require those to whom it applies to take an action that violates requirements of another federal or state law.

40 CFR 131.20 requires states and tribes (with primacy for clean water actions) to periodically review and update the Water Quality Standards. The adopted updates are reviewed and approved by the EPA before becoming effective for Clean Water Act actions.

G. RCW 34.05.328 (1) (g) - Determine that the rule does not impose more stringent performance requirements on private entities than on public entities unless required to do so by federal or state law.

The rule revisions do not impose more stringent performance requirements on private entities than on public entities as the rule applies to surface waters of the state. Any entity, whether public or private, must adhere to the rules protecting water quality in the state of Washington.

H. RCW 34.05.328 (1) (h) Determine if the rule differs from any federal regulation or statute applicable to the same activity or subject matter.

No.

If **yes**, the difference is justified because of the following:

(i) A state statute explicitly allows Ecology to differ from federal standards. [If checked, provide the citation included quote of the language.]

(ii) Substantial evidence that the difference is necessary to achieve the general goals and specific objectives stated in Chapter 6.

[If checked, explain.]

I. RCW 34.05.328 (1) (i) – Coordinate the rule, to the maximum extent practicable, with other federal, state, and local laws applicable to the same subject matter.

We will work with EPA to ensure that this rule is approvable and meets Clean Water Act requirements. We will also meet with tribes to help understand how the potential rule could impact water quality regulations in the Chelan River.

We worked with EPA during the litigation discussions and they are supportive of us moving forward with a rulemaking that included the addition of a fine sediment criterion. The revisions will help EPA with their obligations in this lawsuit.