Final Regulatory Analyses:

Including the:

- 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

By

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For the

Water Quality Program

Washington State Department of Ecology

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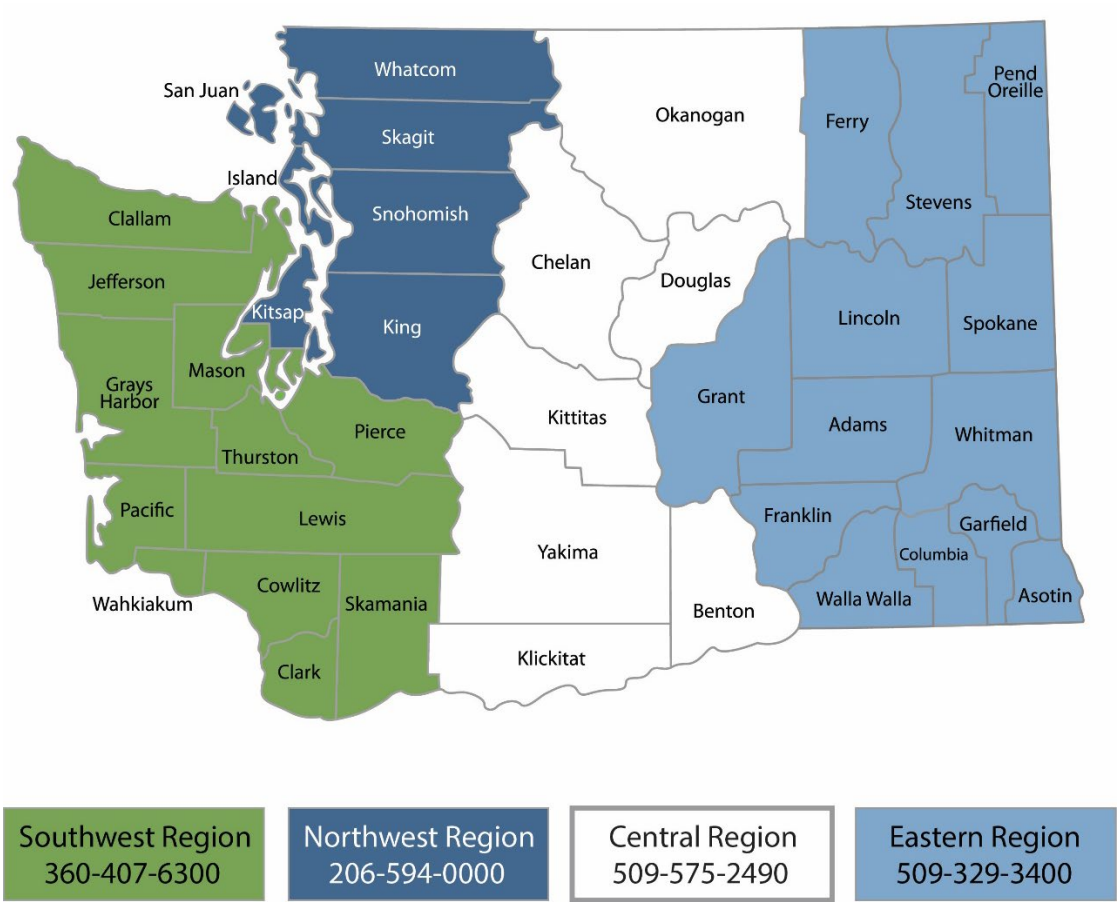
Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	P.O. Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	P.O. Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	P.O. Box 46700 Olympia, WA 98504	360-407-6000

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Chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington

Water Quality Program
Washington State Department of Ecology
Olympia, WA

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DEPARTMENT OF
ECOLOGY
State of Washington

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Abbreviations and Acronyms

APA	Administrative Procedure Act
BMP	Best Management Practice
CBA	Cost Benefit Analysis
CFR	Code of Federal Regulations
CWA	Clean Water Act
DMR	Discharge Monitoring Report
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FRA	Final Regulatory Analysis
FW	Fresh Water
GP	General Permit
IP	Individual Permit
LBA	Least Benefit Analysis
MTCA	Model Toxics Control Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Permit Discharge Elimination System
NIFC	Northwest Indian Fisheries Commission
PARIS	Permit and Reporting Information System
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PPA	Performance Partnership Agreement
PRA	Preliminary Regulatory Analysis
PSWC	Puget Sound Watershed Characterization
RCW	Revised Code of Washington
RFA	Regulatory Fairness Act
SW	Salt Water
SWIFD	Statewide Washington Integrated Fish Distribution
TMDL	Total Maximum Daily Load
ug/L	Micrograms Per Liter
USFWS	United States Fish and Wildlife Service

WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WQ	Water Quality

Executive Summary

This report presents the determinations made by the Washington State Department of Ecology as required under Chapters 34.05 RCW and 19.85 RCW, for the adopted amendments to the Water Quality Standards for the Surface Waters of the State of Washington rule (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

This rulemaking is focused on aquatic life toxics criteria to provide additional water quality protection for organisms that live in water (173-201A-240 WAC). These criteria are designed to protect aquatic life (fish, plants, and invertebrates) from the effects of toxic chemicals in the water.[2] Examples of toxic chemicals include lead, mercury, cadmium, and other harmful chemicals. Above certain amounts, toxic chemicals in the water can harm aquatic life through either short-term (acute) effects, such as immediate reductions in survival, and long-term (chronic) effects, such as changes in growth, reproduction, and survival.[3] In this way, criteria are set to prevent both short and long-term consequences of toxic chemicals.

Since Ecology's last major update of aquatic life toxics criteria in 1992, new information and scientific research has become available about the effects of toxic chemicals on aquatic life, and with it legal and public motivations to revise criteria.

The adopted rule amendments:

- **Amend WAC 173-201A-240, Toxic substances, specifically aquatic life criteria, including, but not limited to, Table 240 and footnotes**

  Revisions to existing toxics criteria:

  - Aldrin (freshwater and saltwater acute)
  - Arsenic (freshwater acute and chronic)
  - Cadmium (all)
  - Chromium III (freshwater acute and chronic)
  - Chromium VI (freshwater acute and chronic)

[2] For criteria to protect humans from the effects of toxic chemicals in the water see separate human health criteria 173-201A-240 WAC subpart (b), updated in 2016 annotated in Ecology publication 06-10-091.
[3] See Biological Opinions from Idaho and Oregon (U.S. Fish and Wildlife Service, 2012) that discuss sensitivities of similar species of concern in similar environments to that of Washington.

- Copper (freshwater acute and chronic)
- Cyanide (freshwater acute and chronic)
- Dieldrin (freshwater acute and chronic)
- Endrin (freshwater acute and chronic)
- gamma-BHC (freshwater acute)
- Mercury (freshwater acute)
- Nickel (freshwater acute and chronic)
- Pentachlorophenol (freshwater acute and chronic and saltwater chronic)
- Selenium (freshwater acute and chronic)
- Silver (freshwater and saltwater acute)
- Zinc (freshwater acute and chronic)

New criteria:

- 6PPD-quinone (freshwater acute)
- Aluminum (freshwater acute and chronic)
- Acrolein (freshwater acute and chronic)
- Carbaryl (freshwater acute and chronic and saltwater acute)
- Demeton (freshwater and saltwater chronic)
- Diazinon (all)
- Guthion (freshwater and saltwater chronic)
- Malathion (freshwater and saltwater chronic)
- Methoxychlor (freshwater and saltwater chronic)
- Mirex (freshwater and saltwater chronic)
- Nonylphenol (all)
- Perfluorooctane Sulfonate (PFOS) (freshwater acute and chronic and saltwater acute)
- Perfluorooctanoic Acid (PFOA) (freshwater acute and chronic and saltwater acute)
- Silver (freshwater and saltwater chronic)
- Tributyltin (all)

- **Make Minor, non-substantive edits to rule language in WAC 173-201A-240 to correct typographical, calculation, and formatting errors**

Costs would originate from permit holders (in most cases, facilities) that change behavior to comply with new or revised permit conditions based on the adopted rule. However, many permit holders do not process the materials or operate equipment that would lead to any change in permit limits based on the new criteria, or already report effluent numbers low enough to comply with the adopted rule. Therefore, costs are not created by all permits and all criteria.

Estimated costs are generated by potential increases in level 1, 2, and 3 exceedances and the corrective actions required by them for existing criteria (with copper and zinc accounting for all of the level 2 and 3 exceedances), and increased monitoring and lab costs for new criteria.

Table 1: Estimated Present Value of Total Cost

Action Level	Low-Cost Estimate	High-Cost Estimate
1	$ 37,791	$ 75,583
2	$ 250,387	$ 250,387
3	$ 9,750,000	$ 29,250,000
Action Cost	**$ 10,038,179**	**$ 29,575,970**
Monitoring costs	$ 24,200,000	$ 83,200,000
Total Costs	**$ 34,238,179**	**$ 112,775,970**

Additional qualitative costs include but not limited to:

- Cost to individual permits beyond level 1 correction equivalent.
- Potential future actions surrounding new criteria.
- Potential for additional contaminated site cleanup.[4]

Table 2 provides the quantifiable present value of Washington's estimated willingness to pay for water quality improvements from the adopted Rule.

Table 2. Estimated Present Value of Quantifiable Benefits

Low Estimate	High Estimate
$76,706,731	$136,269,961

Additional qualitative benefits include but are not limited to:

- Values from protecting non-fish aquatic life.

[4] The adopted rule will generally not affect sites that were contaminated but have completed cleanup (WAC 173-340-702(12)(c))). See Appendix D for additional discussion.

- Values to Tribes and indigenous peoples.
- Human health spillover.
- Cost savings from less stringent freshwater acute Chromium (VI) criteria and saltwater Silver acute criteria.
- Reduction in discharge from individual permits beyond level 1 correction equivalents.
- Protection from new criteria (e.g., 6PPD-quinone, PFOS, PFOA, freshwater and saltwater silver).
- Benefits associated with monitoring and testing costs highlighted in Table 1[5].
- Potentially improved cleanup of contaminated sites.

We note that estimated costs in this analysis are higher than estimated in the Preliminary Regulatory Analyses for this rulemaking (Publication 24-10-009) largely due to revised monitoring costs based on input received during the public comment period. This results in overlapping ranges of quantified costs and benefits.

Under the APA, we consider quantified and qualitative costs and benefits, and have clarified qualitative benefits of monitoring throughout. We also note that currently some lab costs are particularly high (6PPD-q) due to a limited number of accredited labs able to perform this work, and we expect these costs to fall as the supply of labs increases.

We remind readers that quantitative benefits described in Table 2 represent a lower boundary by design. Relaxing the most conservative assumptions or adjusting for data limitations in these calculations produces a larger stream of benefits associated with the adopted rule; but may be less precise on account of introducing new assumptions in the place of missing or incomplete information.[6]

Taking the qualitative benefits above, conservative nature of quantitative benefits, and a likely downward shift in lab costs into consideration, we conclude, based on a reasonable understanding of the quantified and qualitative costs and benefits likely to arise from the rule amendments, as compared to the baseline, that the benefits of the rule amendments are likely greater than the costs.

[5] Monitoring for relevant discharge for these toxic chemicals following rule adoption will provide Ecology with information on their magnitude, frequency, and spatial distribution, as well as the development of appropriate BMPs. In this way testing will help avoid the cost of additional blanket requirements or miss important permit-level nuance (a benefit). Where data leads to future restrictions, testing requirements under the adopted rule are also partially responsible for gains in aquatic life associated to new toxic chemicals adopted by this rulemaking.

[6] For example, after allowing for impacts on lower, or unknown quality habitat and expanding impacts into non-Puget Sound regions, benefits range from $163 million to $315 million. To be additionally conservative, no estimate includes benefits from reductions associated with level 1 corrections. See Result Sensitivity in Chapter 4 for additional discussion.

After considering alternatives, within the context of the goals and objectives of the authorizing statute, we determined that the adopted rule represents the least-burdensome alternative of possible rule requirements meeting the goals and objectives.

We conclude that the rule amendments are likely to 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.

It was not feasible in the rule amendments to directly mitigate disproportionate impacts to small businesses, however, multiple elements of the baseline rule already in place serve to mitigate compliance costs for small businesses.

Chapter 1: Background and Introduction

1.1 Introduction

This report presents the determinations made by the Washington State Department of Ecology as required under Chapters 34.05 RCW and 19.85 RCW, for the adopted rule amendments to the Water Quality Standards for the Surface Waters of the State of Washington rule (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 adopted 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 of this document documents that analysis, when applicable.

All determinations are based on the best available information at the time of publication.

1.1.1 Background

This rulemaking considers revisions to Chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington. This rulemaking is focused on aquatic life toxics criteria to provide additional water quality protection for organisms that live in water (173-201A-240 WAC).

These criteria are designed to protect aquatic life (fish, plants, and invertebrates) from the effects of toxic chemicals in the water.[7] Examples of toxic chemicals include lead, mercury, cadmium, and other harmful chemicals. Above certain amounts, toxic chemicals in the water can harm aquatic life through either short-term (acute) effects, such as immediate reductions in survival, and long-term (chronic) effects, such as changes in growth, reproduction, and survival.[8] In this way, criteria are set to prevent both short and long-term consequences of toxic chemicals.

When setting limits for toxic chemicals, Ecology uses data to look at how the most sensitive species and life stage in an ecosystem might respond to a certain concentration of the chemical in the water. For example, larval stage fish might be more sensitive to a certain toxic chemical than a fish in the embryonic stage. This approach helps ensure that all species and life stages are protected.

1.2 Reasons for Amending the Current Rule

We submitted freshwater and marine aquatic life criteria for 26 toxic chemicals in 1988 and EPA approved those criteria in 1988. EPA determined that additional aquatic life criteria were needed to comply with CWA Section 303(c)(2)(B) and promulgated aquatic life criteria for Washington in the 1992 National Toxics Rule for acute and chronic freshwater and marine arsenic and selenium criteria, chronic marine copper criteria, and chronic marine cyanide criteria. Following EPA's promulgation of the 1992 National Toxics Rule, we submitted updates to toxic chemicals in 1993, 1998, and 2007, leading to Washington's withdrawal from the National Toxics Rule. Washington's last update to aquatic life criteria for toxic chemicals was in 2007.

Since Ecology's last major update of aquatic life toxics criteria in 1992, new information and scientific research has become available about the effects of toxic chemicals on aquatic life, and with it legal and public motivations to revise criteria.

1.2.1 Litigation

On December 29, 2021, the U.S. District Court ruled that the EPA would be required to determine within 180 days if Washington's current aquatic life toxics criteria are consistent with the Clean Water Act (CWA) (33 U.S.C. §1251 et seq.) or if they need to be revised (NWEA vs. EPA, 2021, Case No. C20-1362 MJP). If they are determined to be inadequate, the CWA requires the EPA to promulgate new regulations for Washington, unless the state adopts them in the meantime.

[7] For criteria to protect humans from the effects of toxic chemicals in the water see separate human health criteria 173-201A-240 WAC subpart (b), updated in 2016 annotated in Ecology publication 06-10-091.
[8] See Biological Opinions from Idaho and Oregon (U.S. Fish and Wildlife Service, 2012) that discuss sensitivities of similar species of concern in similar environments to that of Washington.

Updating all necessary aquatic life toxics criteria is influenced, in part, by ongoing litigation and Ecology's preference to do a state-specific evaluation of the EPA's aquatic life toxics criteria recommendations and avoid federal promulgation of these criteria for Washington.

In May 2023, EPA determined that Washington's existing criteria for arsenic, cadmium, copper, cyanide, mercury, nickel, and selenium are not protective of the applicable designated use and that Washington lacks aquatic life criteria for acrolein and aluminum where information indicates that Washington needs criteria for those pollutants to protect applicable designated uses. The other eight toxic pollutants in this litigation are required to be evaluated by June 2026.

1.2.2 Endangered Species Act Considerations

While the EPA is tasked with developing national recommendations for aquatic life toxics criteria for states to use that are protective of aquatic species, previous Endangered Species Act (ESA) consultation reports for criteria in other EPA Region 10 states have indicated that the EPA's recommendations for some aquatic life toxics may not adequately protect ESA-listed species and their populations in Washington.

The EPA derivation methods aim to protect 95% of genera 99% of the time. However, endangered species can fall within the 5% of genera not protected, thereby resulting in less than full protection and potential adverse effects. Other times, endangered species populations are at risk for extinction and require additional protection to maintain populations. If Washington adopts EPA national 304(a) recommendations for aquatic life toxics not shown to be protective of endangered species and their populations, we risk not receiving federal approval as demonstrated in other Pacific Northwest states (e.g., Oregon and Idaho).[9] The EPA's nationally recommended aquatic life criteria for some toxics have not been approvable through ESA consultation as outlined in previous federal biological opinions by NOAA and USFWS (USFWS, 2012; NMFS, 2012; NMFS, 2014; USFWS, 2015).

In this way, the use of more recent scientific data may be needed to calculate more protective criteria than EPA national recommendations. Criteria may need to use alternative criteria derivation methods to make them approvable through ESA consultation.

1.2.3 Other Motivation

Updates to aquatic life toxics criteria were outlined in Ecology's performance partnership agreement (PPA) with the EPA in 2021.[10] Also, during the last public review of its draft water quality standards workplan in 2021, Ecology received overwhelming support from commenters for updating rules for aquatic life toxics criteria based on new information and approaches to

[9] In 2013, EPA disapproved a number of aquatic life criteria that the Oregon Environmental Quality Commission (ODEQ) adopted in 2004. Since 2013, ODEQ adopted and EPA approved revisions to several of the disapproved criteria. EPA's approvals of Idaho's aquatic life criteria likewise have been stalled, leaving the state-adopted criteria unusable for CWA actions.

[10] https://apps.ecology.wa.gov/publications/documents/2101002.pdf

aquatic life protection. Ecology considered several approaches to rulemaking during our 2021 Triennial Review Process—most recently submitted to the EPA in April 2022.[11]

Ecology anticipates that a single rulemaking of all aquatic life toxics criteria will be more efficient than multiple rulemakings. This is because stakeholders, tribes, and other interested parties will be able to engage in the full scope of aquatic life toxic criteria considerations within one rulemaking, without Ecology placing one toxic substance or group of substances at a higher priority than others.

1.3 Summary of the rule amendments

The rule amendments:

- **Amend WAC 173-201A-240, Toxic substances, specifically aquatic life criteria, including, but not limited to, Table 240 and footnotes**

  Revisions to existing toxics criteria:

  - Aldrin (freshwater and saltwater acute)
  - Arsenic (freshwater acute and chronic)
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  - Dieldrin (freshwater acute and chronic)
  - Endrin (freshwater acute and chronic)
  - gamma-BHC (freshwater acute)
  - Mercury (freshwater acute)
  - Nickel (freshwater acute and chronic)
  - Pentachlorophenol (freshwater acute and chronic and saltwater chronic)
  - Selenium (freshwater acute and chronic)
  - Silver (freshwater and saltwater acute)
  - Zinc (freshwater acute and chronic)

[11] https://apps.ecology.wa.gov/publications/documents/2210002.pdf

New criteria:

- 6PPD-quinone (freshwater acute)
- Aluminum (freshwater acute and chronic)
- Acrolein (freshwater acute and chronic)
- Carbaryl (freshwater acute and chronic and saltwater acute)
- Demeton (freshwater and saltwater chronic)
- Diazinon (all)
- Guthion (freshwater and saltwater chronic)
- Malathion (freshwater and saltwater chronic)
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- Perfluorooctanoic Acid (PFOA) (freshwater acute and chronic and saltwater acute)
- Silver (freshwater and saltwater chronic)
- Tributyltin (all)

- **Make Minor, non-substantive edits to rule language in WAC 173-201A-240 to correct typographical, calculation, and formatting errors**

1.4 Document organization

The chapters of this document are organized as follows:

- **Chapter 2 - Baseline and the rule amendments:** Description and comparison of the baseline (what would occur in the absence of the rule amendments) and rule requirements.
- **Chapter 3 - Likely costs of the rule amendments:** Analysis of the types and sizes of costs we expect impacted entities to incur as a result of the rule amendments.
- **Chapter 4 - Likely benefits of the rule amendments:** Analysis of the types and sizes of benefits we expect to result from the rule amendments.
- **Chapter 5 - Cost-benefit comparison and conclusions :** Discussion of the complete implications of the CBA.

- **Chapter 6 - Least-Burdensome Alternative Analysis:** Analysis of considered alternatives to the contents of the rule amendments.
- **Chapter 7 - Regulatory Fairness Act Compliance:** When applicable. Comparison of compliance costs for small and large businesses; mitigation; impact on jobs.
- **Appendix A - APA Determinations:** RCW 34.05.328 determinations not discussed in chapters 5 and 6.

Chapter 2: Baseline and the Rule Amendments

2.1 Introduction

We analyzed the impacts of the 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 called the baseline and reflects the most likely regulatory circumstances that entities would face if Ecology does not adopt the rule.

2.2 Baseline

The baseline for our analyses generally consists of existing laws and rules. This is what allows us to make a consistent comparison between the state of the world with and without the rule amendments. Should Ecology not adopt the rulemaking, standards for aquatic life criteria and their administration are determined as described within the remainder of this chapter.

2.2.1 Existing Aquatic Life Toxics Criteria

State Criteria

As listed in 173-201A-240 WAC, Table 240 and relevant footnotes.

National EPA Recommended Water Quality Criteria

The Environmental Protection Agency (EPA) periodically updates their nationally recommended water quality criteria based on new information for each toxic chemical.[12] Aquatic life criteria for toxic chemicals are considered by the EPA to be the highest concentration of specific pollutants or parameters in water that are not expected to pose a significant risk to the majority of species in a given environment or a narrative description of the desired conditions of a water body being "free from" certain negative conditions.[13]

Not moving forward with this rulemaking would subject Ecology to The Environmental Protection Agency's (EPA) promulgation of their federal criteria.

2.2.2 Clean Water Act

Section 303(c)(2)(A) states, about surface water quality standards:

> …Such standards shall be such as to protect the public health or welfare, enhance the quality of the water and serve the purposes of this Chapter. Such

[12] https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

[13] At the time of this writing, federal guidelines for PFOS and PFOA are in a draft stage awaiting adoption (https://www.epa.gov/system/files/documents/2022-04/pfoa-pfos-draft-factsheet-2022.pdf). For this reason, this analysis will not consider Federal criteria in its baseline to be conservative.

standards shall be established taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes and agricultural, industrial and other purposes and also taking into consideration their use and value for navigation.

2.2.3 Water Pollution Control Act

RCW 90.48.010 states, about water quality standards:

> It is declared to be the public policy of the state of Washington to **maintain the highest possible standards to insure the purity of all waters of the state** consistent with public health and public enjoyment thereof, **the propagation and protection of wild life, birds, game, fish and other aquatic life**, and the industrial development of the state, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the state of Washington. Consistent with this policy, the state of Washington will exercise its powers, as fully and as effectively as possible, to retain and secure high quality for all waters of the state. The state of Washington in recognition of the federal government's interest in the quality of the navigable waters of the United States, of which certain portions thereof are within the jurisdictional limits of this state, proclaims a public policy of working cooperatively with the federal government in a joint effort to extinguish the sources of water quality degradation, **while at the same time preserving and vigorously exercising state powers to insure that present and future standards of water quality within the state shall be determined by the citizenry, through and by the efforts of state government, of the state of Washington**.

RCW 90.48.035 states, about rule-making authority:

> The department shall have the authority to, and shall promulgate, amend, or rescind such rules and regulations as it shall deem necessary to carry out the provisions of this Chapter, including but not limited to rules and regulations relating to standards of quality for waters of the state and for substances discharged therein in order to **maintain the highest possible standards of all waters of the state** in accordance with the public policy as declared in RCW 90.48.010.

2.2.4 Permitting Guidelines

Permitting guidelines help permit writers determine how to approach different permit scenarios. They assist permit writers in how to think through meeting water quality criteria for protection of aquatic life to permittee-specific requirements. While not a legal requirement, guidance informs how aquatic life criteria might impact permittees who discharge effluent to water bodies. Therefore, in describing the baseline for this analysis of the rule amendments, it is necessary to consider the permitting guidelines in the baseline and amended scenarios, as they will contribute to the cost and benefit estimates and discussion of impacts.

Ecology uses the Water Quality Program Permit Writer's Manual (Ecology, 2018) for technical guidance when developing wastewater discharge permits.[14] A general overview of the permitting process for all dischargers includes:

- Ecology receiving the permit application.
- Review of the application for completeness and accuracy.
- Derivation of applicable technology-based effluent limits.
- Determination of whether effluent will cause, or have reasonable potential to cause or contribute to, violation of water quality standards.
- If yes, derivation of water quality-based effluent limits.
- Determination of monitoring requirements and other special conditions.
- Review process for the draft or proposed permit.
- Issuance of the final permit decision.

To evaluate the effect of effluent toxic pollutants on a receiving water, the permit writer uses the water quality criteria and standards, the criteria for mixing zones, and an analysis of the concentrations of specific pollutants or effects of pollutants within or at the edge of the mixing zone or the assigned dilution factor. The requirement for imposing effluent limitations for the protection of water quality does not require a demonstration of impact beyond any doubt but only that there is a determination of reasonable potential determined by a rational and scientific process.

Defining water quality impacts and developing effluent limits is usually more complex for toxic pollutants than for the other pollutants. The aquatic life toxic criteria are given at two levels (acute and chronic), each of which contains three components (magnitude, duration, and frequency). The analysis to predict water quality impacts and thus to define effluent limits must be conducted for both acute and chronic criteria to define the most limiting criteria. Many of the criteria for toxic pollutants depend on variable receiving water conditions. Permit writers calculate effluent limits to protect receiving water quality during critical (worst-case) conditions.

2.2.5 Impaired Waterbody Listing and Cleanup Plan

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 and 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

[14] https://apps.ecology.wa.gov/publications/documents/92109.pdf

status of water quality. Once the assessment is complete, the public is given a chance to review it and give comments. The final assessment is formally submitted to the EPA for approval.

Waters with beneficial 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 not expected to improve within the next two years. The 303(d) list, so called because the processes for developing the list and addressing the polluted waters on the list are described in section 303(d) of the federal CWA comprises waters in the polluted water category.

Ecology's assessment of which waters to place on the 303(d) list is guided by federal laws, state water quality standards, and the Policy on the Washington State Water Quality Assessment (WQP Policy 1-11; March 2023).[15] This policy describes how the standards are applied, requirements for the data used, and how to prioritize Total Maximum Daily Loads (TMDL), among other issues.[16] 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.

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

2.2.6 Past or existing compliance behavior

The baseline includes past or existing compliance behavior. This includes behavior undertaken in response to federal and state laws, rules, permits, guidance, and policies. This also includes business decisions in response to regulatory, economic, or environmental changes. Such behavior might include, but is not limited to, existing treatment technologies, production processes, and effluent volumes. Including these behaviors in the baseline is necessary to assess the incremental impacts of the adopted rule over existing requirements.

2.2.7 Discharger and Total Maximum Daily Load growth trajectories

The amended rule applies to existing and future dischargers, on existing and future impaired water bodies, and water bodies with TMDLs and without TMDLs, so the baseline must also account for attributes and behaviors of future dischargers and future TMDLs.

[15] https://apps.ecology.wa.gov/publications/documents/1810035.pdf

[16] A TMDL is the sum of the Load Allocations and Wasteload Allocations, plus reserves for future growth and a margin of safety, which are equal to the Loading Capacity of the water body. This is a requirement of Section 303(d) of the federal Clean Water Act and is defined in 40 CFR 130.2(i). The term "TMDL" is often also applied to the process to determine a TMDL ("Ecology is doing a TMDL") and to the final documentation of the TMDL ("Ecology has submitted a TMDL").

The baseline forecast of future growth in the number, locations, and types of TMDLs is based on past TMDL behavior and planned structuring of TMDL planning. We forecast expected types of TMDLs based on prospective new locations, and how they fit into the framework for planning and completing TMDLs.

The baseline forecast of future dischargers is based on attributes of existing dischargers. The forecast assumes that future discharger contaminants and concentrations are the same as in existing dischargers. This means unexpected changes in technology over time (e.g., using different inputs or technologies) that reduces pollutants in effluent would reduce the actual impacts of the adopted rule.

2.2.8 Existing allowance for compliance schedules

The baseline includes existing compliance schedules. A compliance schedule is an enforceable tool used as part of a permit, order, or directive to achieve compliance with applicable effluent standards and limitations, water quality standards, or other legally applicable requirements. Compliance schedules include a sequence of interim requirements such as actions, operations, or milestone events to achieve the stated goals. Compliance schedules are a broadly used tool for achieving compliance with state and federal regulations; compliance schedules under the Clean Water Act are defined federally at CWA 502(17) and 40 CFR Section 122.2.

2.3 Adopted rule amendments

The adopted rule amendments:

- **Amend WAC 173-201A-240, Toxic substances, specifically aquatic life criteria, including, but not limited to, Table 240 and footnotes**

  Revisions to existing aquatic life criteria

  - Aldrin (freshwater and saltwater acute)
  - Arsenic (freshwater acute and chronic)
  - Cadmium (all)
  - Chromium III (freshwater acute and chronic)
  - Chromium VI (freshwater acute and chronic)
  - Copper (freshwater acute and chronic)
  - Cyanide (freshwater acute and chronic)
  - Dieldrin (freshwater acute and chronic)
  - Endrin (freshwater acute and chronic)
  - gamma-BHC (freshwater acute)

- Mercury (freshwater acute)
- Nickel (freshwater acute and chronic)
- Pentachlorophenol (freshwater acute and chronic and saltwater chronic)
- Selenium (freshwater acute and chronic)
- Silver (freshwater and saltwater acute)
- Zinc (freshwater acute and chronic)

New criteria

- 6PPD-quinone (freshwater acute)
- Aluminum (freshwater acute and chronic)
- Acrolein (freshwater acute and chronic)
- Carbaryl (freshwater acute and chronic and saltwater acute)
- Demeton (freshwater and saltwater chronic)
- Diazinon (all)
- Guthion (freshwater and saltwater chronic)
- Malathion (freshwater and saltwater chronic)
- Methoxychlor (freshwater and saltwater chronic)
- Mirex (freshwater and saltwater chronic)
- Nonylphenol (all)
- PFOS (freshwater acute and chronic and saltwater acute)
- PFOA (freshwater acute and chronic and saltwater acute)
- Silver (freshwater and saltwater chronic)
- Tributyltin (all)

- **Make Minor, non-substantive edits to rule language in WAC 173-201A-240 to correct typographical, calculation, and formatting errors**

2.4 Regulatory Impacts by Component

The EPA derivation methods aim to protect 95% of genera 99% of the time. However, endangered species can fall within the 5% of genera not protected, thereby resulting in less than full protection and potential adverse effects. Other times, endangered species populations are susceptible to extinction and require additional protection to maintain populations. If Washington adopts the EPA recommendations for aquatic life toxics not shown to be protective

of endangered species and their populations, it will not receive federal approval as demonstrated in other Pacific Northwest states (e.g., Oregon and Idaho). The EPA's nationally recommended aquatic life for some toxics have not been approvable through ESA consultation as outlined in previous federal biological opinions by NOAA and USFWS. [17]

Ecology's strategy for new and updated criteria in this rule making therefore was to review new scientific studies and/or derive criteria from the 1st percentile of the genus toxicity data distribution for toxics not meeting ESA requirements and adopt the EPA recommendations for all other toxics.[18]

Note that since the EPA criteria recommendations are in this rulemaking's baseline, the analytical scope of this regulatory analysis is reduced to new or existing aquatic life criteria that:

1.) Differ from WAC 173-201A-240 (Table 240) **and**

2.) Differ from EPA's 304(a) national recommendations for aquatic and related derivation methods (due to Ecology concerns over ESA protection, new science, and/or having no EPA recommendation)

Applying this filter (**see Table** 16 **in Appendix B** for illustration and additional information), this analysis includes the following:

Analytical Scope

- Arsenic (freshwater acute and chronic)
- Cadmium (fresh water acute and chronic)
- Copper (freshwater acute and chronic)
- Chromium III (freshwater acute and chronic)
- Chromium VI (fresh water acute and chronic)
- Nickel (fresh water acute and chronic)
- Silver (all)
- Zinc (fresh water acute and chronic)
- 6PPD-quinone (freshwater acute)
- Cyanide (freshwater acute and chronic)
- Pentachlorophenol (freshwater acute and chronic and saltwater chronic)

[17] See Biological Opinions from Idaho (https://repository.library.noaa.gov/view/noaa/26460) and Oregon (U.S. Fish and Wildlife Service, 2012) discussing similar species sensitivities. Note that while there is strong evidence that EPA recommendations would not pass ESA review based on experiences in other states, Ecology cannot be completely certain that disallowance would occur in WA, nor can it be completely certain of the criteria limits that would be approved in ESA consultation. Therefor we leave ESA approval limits—that are ambiguous, and Ecology is using best discretion to meet—out of the baseline to be conservative in our estimates.

[18] EPA, 1985.

- PFOS (freshwater acute and chronic and saltwater acute) [19]
- PFOA (freshwater acute and chronic and saltwater acute) [20]

Minor, non-substantive edits to rule language in WAC 173-201A-240 to correct typographical, calculation, and formatting errors associated with the list above.

2.4.1 Arsenic (freshwater acute and chronic)

Baseline

State

- Freshwater Acute[21]: 360 micrograms per liter (ug/L hereafter)
- Freshwater Chronic[22]: 190 ug/L

Federal

- Freshwater Acute: 340 ug/L
- Freshwater Chronic: 150 ug/L

Adopted

Preliminary FW and SW criteria use new science and 1st percentile of toxicity data distribution:

- Freshwater Acute: 300 ug/L
- Freshwater Chronic: 130 ug/L

Expected Impact

Freshwater acute and chronic criteria would be made more stringent by the rule. Future permit effluent limits for new facilities that receive limits for arsenic would also be more stringent under this rule than effluent limits established in the baseline.

If general permit holders exceed the more stringent effluent limits, they will be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed the more stringent effluent limits will be required to take corrective action, however the specific actions required will likely differ by permit.

[19] At the time of this writing, federal guidelines for PFOS are in a draft stage awaiting adoption. For this reason, this analysis will not consider Federal criteria in its baseline (i.e. included in analytical scope) to be conservative.
[20] At the time of this writing, federal guidelines for PFOA are in a draft stage awaiting adoption. For this reason, this analysis will not consider Federal criteria in its baseline (i.e. included in analytical scope) to be conservative.
[21] A 1-hour average concentration not to be exceeded more than once every three years on the average. This definition of acute is valid for other criteria for the remainder of the document unless otherwise noted.
[22] A 4-day average concentration not to be exceeded more than once every three years on the average. This definition of chronic is valid for other criteria for the remainder of the document unless otherwise noted.

2.4.2 Cadmium (fresh water acute and chronic)

Acute and chronic cadmium criteria for freshwater in the baseline and adopted rule are derived through hardness-based equations (as opposed to fixed values). Since the effects of small differences in complex equations can be unclear, constant inputs (hardness of 100 mg/L) were chosen, and the resulting criteria values presented for the sake of consistent comparison with Federal and State baselines. **Note that because hardness will vary by water body, it is unlikely these will be the actual criteria values for any one permit limit.**

Baseline

State

- Freshwater Acute: 3.7 ug/L
- Freshwater Chronic: 1.0 ug/L

Federal

- Freshwater Acute: 1.8 ug/L
- Freshwater Chronic: 0.25 ug/L

Adopted

- Freshwater Acute: 1.3 ug/L
- Freshwater Chronic: 0.41 ug/L

Expected Impact

Freshwater acute and chronic criteria will be made more stringent by the rule. Future permits for new facilities will also be more stringent under this rule than effluent limits in the baseline.

If general permit holders exceed the more stringent effluent limits, they will be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed the more stringent effluent limits will be required to take corrective action, however the specific actions required will likely differ by permit.

2.4.3 Copper (freshwater acute and chronic)

Acute and chronic copper criteria for freshwater in the baseline and adopted rule are derived through multiple linear regression models (as opposed to fixed values). Since the effects of small differences in complex equations can be unclear, constant inputs were chosen, and the resulting criteria values presented for the sake of consistent comparison. The current state or baseline criteria are based on the mean statewide hardness value (70.2 mg/L). The MLR-based criteria below are based on statewide mean values for concurrently sampled pH (7.58), hardness (59.69 mg/L), and dissolved organic carbon (DOC; 2.71 mg/L). Comparison to EPA's criteria recommendations is not available because the biotic ligan model requires 10 input parameters to calculate a criteria value and these 10 water quality parameters have not been

assessed on a statewide level in this rulemaking. **Note that because these water quality inputs will vary by water body, it is unlikely these will be the criteria values for any one permit limit.**

Baseline

State

- Freshwater Acute: 12 ug/L (hardness of 70.2 mg/L)
- Freshwater Chronic: 8.4 ug/L (hardness of 70.2 mg/L)

Federal

- Freshwater Acute: Biotic Ligand Model (inputs unavailable)
- Freshwater Chronic: Biotic Ligand Model (inputs unavailable)

Adopted

- Freshwater Acute: 9.3 ug/L (pH of 7.58, hardness of 59.69 mg/L, and 2.71 mg/L DOC)
    - Western Cordillera: 1.4 ug/L
    - Marine West Coast Forest: 2.4 ug/L
    - Cold Desert: 4.8 ug/L
- Freshwater Chronic: 7.3 ug/L (pH of 7.58, hardness of 59.69 mg/L, and 2.71 mg/L DOC)
    - Western Cordillera: 1.2 ug/L
    - Marine West Coast Forest: 1.8 ug/L
    - Cold Desert: 3.2 ug/L

Expected Impact

Freshwater acute and chronic criteria would be made more stringent by the rule. Future permits for new facilities would also be more stringent under this rule than effluent limits in the baseline.

If general permit holders exceed the more stringent effluent limits, they would be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed the more stringent effluent limits would be required to take corrective action, however the specific actions required would likely differ by permit.

2.4.4 Chromium III (freshwater acute and chronic)

Acute and chronic chromium III criteria for freshwater in the baseline and adopted rule are derived through hardness-based equations (as opposed to fixed values). Since the effects of small difference in complex equations can be unclear, constant inputs (hardness of 100 mg/L) were chosen, and the resulting criteria values presented for the sake of consistent comparison. **Note that because hardness will vary by water body, it is unlikely these will be the actual criteria values for any one permit limit.**

Baseline

State

- Freshwater Acute: 550 ug/L
- Freshwater Chronic: 180 ug/L

Federal

- Freshwater Acute: 570 ug/L
- Freshwater Chronic: 74 ug/L

Adopted

- Freshwater Acute: 470 ug/L
- Freshwater Chronic: 61 ug/L

Expected Impact

Freshwater acute and chronic criteria will be made more stringent by the rule. Future permits for new facilities will also be more stringent under this rule than effluent limits in the baseline.

If general permit holders exceed the more stringent effluent limits, they will be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed the more stringent effluent limits will be required to take corrective action, however the specific actions required will likely differ by permit.

2.4.5 Chromium VI (freshwater acute and chronic)

Baseline

State

- Freshwater Acute: 15 ug/L
- Freshwater Chronic: 10 ug/L

Federal

- Freshwater Acute: 16 ug/L
- Freshwater Chronic: 11 ug/L

Adopted

- Freshwater Acute: 18 ug/L
- Freshwater Chronic: 6.6 ug/L

Expected Impact

Freshwater chronic criteria would be made more stringent by the rule.[23] Future permits for new facilities would also be more stringent under this rule than effluent limits in the baseline.

Freshwater acute criteria would be made less stringent by the rule. Future permits for new facilities would also be less stringent under this rule than effluent limits in the baseline.

The impact of these changes are somewhat vague as freshwater chronic limits (more stringent) are beyond quantification limits, while less stringent freshwater acute limits might allow for permit holders to require less corrective action under the adopted rule.

2.4.6 Nickel (fresh water acute and chronic)

Acute and chronic nickel criteria for freshwater in the baseline and adopted rule are derived through hardness-based equations (as opposed to fixed values). Since the effects of small difference in complex equations can be unclear, constant inputs (hardness of 100 mg/L) were chosen, and the resulting criteria values presented for the sake of consistent comparison. **Note that because hardness would vary by water body, it is unlikely these would be the actual criteria values for any one permit limit.**

Baseline

State

- Freshwater Acute: 1415 ug/L
- Freshwater Chronic: 157 ug/L

Federal

- Freshwater Acute: 470 ug/L
- Freshwater Chronic: 52 ug/L

Adopted

- Freshwater Acute: 58 ug/L
- Freshwater Chronic: 11 ug/L

Expected Impact

Freshwater acute and chronic criteria would be made more stringent by the rule. Future permits for new facilities would also be more stringent under this rule than effluent limits in the baseline.

If general permit holders exceed the more stringent effluent limits, they would be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that

exceed the more stringent effluent limits would be required to take corrective action, however the specific actions required would likely differ by permit.

2.4.7 Silver (all)

Acute and chronic silver criteria for freshwater in the baseline and adopted rule are derived through hardness-based equations (as opposed to fixed values). Since the effects of small difference in complex equations can be unclear, constant inputs (hardness of 100 mg/L) were chosen, and the resulting criteria values presented for the sake of consistent comparison. **Note that because hardness would vary by water body, it is unlikely these would be the actual criteria values for any one permit limit.**

Baseline

State

- Freshwater Acute: 3.4 ug/L
- Freshwater Chronic: None
- Saltwater Acute: 1.9 ug/L
- Saltwater Chronic: None

Federal

- Freshwater Acute: 3.2 ug/L
- Freshwater Chronic: None
- Saltwater Acute: 1.9
- Saltwater Chronic: None

Adopted

- Freshwater Acute: 0.44 ug/L
- Freshwater Chronic: 0.17 ug/L
- Saltwater Acute: 2.3 ug/L
- Saltwater Chronic: 0.91 ug/L

Expected Impact

Freshwater acute criterion-based limits would be made more stringent by the rule. Freshwater chronic criterion-based limits are new criteria introduced by this rulemaking, and not otherwise in the baseline. Saltwater acute criterion-based limits would be made less stringent by the rule, while saltwater chronic criterion-based limits are new criteria introduced by this rulemaking, and not otherwise in the baseline.

Future permits for new facilities could be more, or less, stringent under this rule than effluent limits in the baseline. If general permit holders exceed the more stringent effluent limits, they

would be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed the more stringent effluent limits would be required to take corrective action, however the specific actions required would likely differ by permit. Less stringent saltwater acute limits may require less corrective action by future permittees under the adopted rule compared to baseline. [24]

2.4.8 Zinc (freshwater acute and chronic)

Acute and chronic zinc criteria for freshwater in the baseline and adopted rule are derived through hardness-based equations (as opposed to fixed values). Since the effects of small difference in complex equations can be unclear, constant inputs (hardness of 100 mg/L) were chosen, and the resulting criteria values presented for the sake of consistent comparison. **Note that because hardness would vary by water body, it is unlikely these would be the actual criteria values for any one permit limit.**

Baseline

State

- Freshwater Acute: 114 ug/L
- Freshwater Chronic: 105 ug/L

Federal

- Freshwater Acute: 120 ug/L
- Freshwater Chronic: 120 ug/L

Adopted

- Freshwater Acute: 67 ug/L
- Freshwater Chronic: 24 ug/L

Expected Impact

Freshwater acute and chronic criteria would be made more stringent by the rule. Future permits for new facilities would also be more stringent under this rule than effluent limits in the baseline.

If general permit holders exceed the more stringent effluent limits, they would be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed the more stringent effluent limits would be required to take corrective action, however the specific actions required would likely differ by permit.

[24] While incorporating new science led to a criterion adjustment, aquatic life protection levels are considered the same. Therefore, we do not expect new costs from a material change in related ecosystem services. We emphasize that If an existing permittee has limits for discharge and is currently meeting those limits, then they will not be afforded a less stringent limit due to federal backsliding laws.

2.4.9 6PPD-quinone (freshwater acute)

Baseline

State

- Freshwater Acute: None

Federal

- Freshwater Acute: None

Adopted

- Freshwater Acute: 0.012 ug/L

Expected Impact

Freshwater acute criterion-based limits for 6PPD-quinone are new criteria introduced by this rulemaking, and not otherwise in the baseline. Future permits for new facilities would also need to establish limits under this rule compared to no 6PPD-quinone criteria in the baseline.

Permit holders impacted by these are assumed to already be monitoring monthly. Sampling costs in this case would be negligible, however they would still need to test for the new criteria. If general permit holders exceed effluent limits, they would be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed effluent limits would be required to take corrective action, however the specific actions required would likely differ by permit.

2.4.10 Cyanide (freshwater acute and chronic)

Baseline

State

- Freshwater Acute: 22 ug/L
- Freshwater Chronic: 5.2 ug/L

Federal

- Freshwater Acute: 22 ug/L
- Freshwater Chronic: 5.2 ug/L

Adopted

- Freshwater Acute: 8.2 ug/L
- Freshwater Chronic: 1.9 ug/L

Expected Impact

Freshwater acute and chronic criteria would be made more stringent by the rule.[25] Future permits for new facilities would also be more stringent under this rule than effluent limits in the baseline.

If general permit holders exceed the more stringent effluent limits, they would be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed the more stringent effluent limits would be required to take corrective action, however the specific actions required would likely differ by permit.

2.4.12 Pentachlorophenol (freshwater acute and chronic and saltwater chronic)

Baseline[26]

State

- Freshwater Acute: 20 ug/L
- Freshwater Chronic: 13 ug/L
- Saltwater Chronic: 7.9 ug/L

Federal

- Freshwater Acute: 19 ug/L
- Freshwater Chronic: 15 ug/L
- Saltwater Chronic: 7.9 ug/L

Adopted

- Freshwater Acute: 11 ug/L
- Freshwater Chronic: 5.4 ug/L
- Saltwater Chronic: 6.7 ug/L

Expected Impact

[25] As written in rule. Note that through a cursory review, chronic freshwater concentrations for cyanide may no longer be able to be quantified using approved analytical methods (see Rule Implementation Plan for additional discussion).. concentration as low as the criteria. Since there are no quantitation concerns over acute criteria, and acute values exist alongside chronic for this toxic, we assume quantitation limits would have limited impact for the purposes of this analysis.

[26] These criteria are pH dependent. A pH of 7.8 was used to construct these illustrative criteria.

Freshwater acute and chronic and saltwater chronic criteria would be made more stringent by the rule. Future permits for new facilities would also be more stringent under this rule than effluent limits in the baseline.

If general permit holders exceed the more stringent effluent limits, they would be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed the more stringent effluent limits would be required to take corrective action, however the specific actions required would likely differ by permit.

2.4.13 Perfluorooctane Sulfonate (freshwater acute and chronic and saltwater acute)

Baseline

State

- Freshwater Acute: None
- Freshwater Chronic: None
- Saltwater Acute: None

Federal

- Freshwater Acute: 3000 ug/L
- Freshwater Chronic: 8.4 ug/L
- Saltwater Acute: 550 ug/L

Adopted

- Freshwater Acute: 3000 ug/L
- Freshwater Chronic: 8.4 ug/L[27]
- Saltwater Acute: 550 ug/L

Expected Impact

Note that at the time of this writing, EPA recommendations for Perfluorooctane Sulfonate (PFOS) are in a draft stage. PFOS limits in this rulemaking remain in our analytical scope and represent new freshwater acute, freshwater chronic, and saltwater acute criteria.

Future permits for new facilities would also need to establish limits under this rule compared to no PFOS criteria in the baseline.

Permit holders impacted by these are assumed to already be monitoring monthly. Sampling costs in this case would be negligible, however they would still need to test for the new criteria.

[27] 8.4 µg/L (water) is used here for readability. Note that the rule also allows for freshwater chronic tissue criteria that are intended to be independently applicable and no one criterion takes primacy. These alternative limits are 0.937 mg/kg ww (invertebrate whole-body) or 6.75 mg/kg ww (fish whole-body) or 2.91 mg/kg ww (fish muscle).

If general permit holders exceed effluent limits, they would be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed effluent limits would be required to take corrective action, however the specific actions required would likely differ by permit.

2.4.14 Perfluorooctanoic Acid (freshwater acute and chronic and saltwater acute)

Baseline

State

- Freshwater Acute: None
- Freshwater Chronic: None
- Saltwater Acute: None

Federal[28]

- Freshwater Acute: 49000 ug/L (draft)
- Freshwater Chronic: 94 ug/L (draft)
- Saltwater Acute: 7000 ug/L (draft)

Adopted

- Freshwater Acute: 49000 ug/L
- Freshwater Chronic: 94 ug/L[29]
- Saltwater Acute: 7000 ug/L

Expected Impact

Note that at the time of this writing, EPA recommendations for Perfluorooctanoic Acid (PFOA) are in a draft stage. PFOA limits in this rulemaking remain in our analytical scope and represent new freshwater acute, freshwater chronic, and saltwater acute criteria.

Future permits for new facilities would also need to establish limits under this rule compared to no PFOA criteria in the baseline.

Permit holders impacted by these are assumed to already be monitoring monthly. Sampling costs in this case would be negligible, however they would still need to test for the new criteria. If general permit holders exceed effluent limits, they would be required to undertake progressive levels of corrective actions. Similarly, individual permit holders that exceed effluent

[28] See draft EPA recommendations at https://www.epa.gov/system/files/documents/2022-04/pfoa-pfos-draft-factsheet-2022.pdf

[29] 94 µg/L (water) is used here for readability. Note that the rule also allows for freshwater chronic tissue criteria that are intended to be independently applicable and no one criterion takes primacy. These alternative limits are 1.11 mg/kg ww (invertebrate whole-body) or 6.10 mg/kg ww (fish whole-body) or 0.125 mg/kg ww (fish muscle)

limits would be required to take corrective action, however the specific actions required would likely differ by permit.

2.4.15 Minor, non-substantive edits to rule language in WAC 173-201A-240 to correct typographical, calculation, and formatting errors associated with the list above.

Baseline

State

- None

Federal

- None

Adopted

- None

Expected Impact

None

Chapter 3: Likely Costs of the Adopted Rule Amendments

3.1 Introduction

We analyzed the likely costs associated with the adopted rule amendments, as compared to the baseline. The adopted rule amendments and the baseline are discussed in detail in Chapter 2 of this document.

3.2 Cost analysis

The adopted rule amendments revise existing aquatic life criteria, including:

- Aldrin (freshwater and saltwater acute)
- Arsenic (freshwater acute and chronic)
- Cadmium (all)
- Chromium III (freshwater acute and chronic)
- Chromium VI (freshwater acute and chronic)
- Copper (freshwater acute and chronic)
- Cyanide (freshwater acute and chronic)
- Dieldrin (freshwater acute and chronic)
- Endrin (freshwater acute and chronic)
- gamma-BHC (freshwater acute)
- Mercury (freshwater acute)
- Nickel (freshwater acute and chronic)
- Pentachlorophenol (freshwater acute and chronic and saltwater chronic)
- Selenium (freshwater acute and chronic)
- Silver (freshwater and saltwater acute)
- Zinc (freshwater acute and chronic)

New criteria

- 6PPD-quinone (freshwater acute)
- Aluminum (freshwater acute and chronic)
- Acrolein (freshwater acute and chronic)

- Carbaryl (freshwater acute and chronic and saltwater acute)
- Demeton (freshwater and saltwater chronic)
- Diazinon (all)
- Guthion (freshwater and saltwater chronic)
- Malathion (freshwater and saltwater chronic)
- Methoxychlor (freshwater and saltwater chronic)
- Mirex (freshwater and saltwater chronic)
- Nonylphenol (all)
- PFOS (freshwater acute and chronic and saltwater acute)
- PFOA (freshwater acute and chronic and saltwater acute)
- Silver (freshwater and saltwater chronic)
- Tributyltin (all)

The analytical scope of this regulatory analysis is reduced to new or existing aquatic life criteria that:

1. Differ from WAC 173-201A-240 (Table 240) **and**
2. Differ from EPA's 304(a) national recommendations for aquatic life and related derivation methods (due to Ecology concerns over ESA protection, new science, and/or having no EPA recommendation)

This narrows the list above to:

- Arsenic (freshwater acute and chronic)
- Cadmium (fresh water acute and chronic)
- Copper (freshwater acute and chronic)
- Chromium III (freshwater acute and chronic)
- Chromium VI (freshwater acute and chronic)
- Nickel (freshwater acute and chronic)
- Silver (all)
- Zinc (freshwater acute and chronic)
- 6PPD-quinone (freshwater acute)
- Cyanide (freshwater acute and chronic)
- Pentachlorophenol (freshwater acute and chronic and saltwater chronic)

- PFOS (freshwater acute and chronic and saltwater acute) [30]
- PFOA (freshwater acute and chronic and saltwater acute) [31]

Minor, non-substantive edits to rule language in WAC 173-201A-240 to correct typographical, calculation, and formatting errors associated with the list above.

3.2.1 Permits affected by new criteria

Costs would originate from permit holders (in most cases, facilities) that change behavior to comply with new or revised permit conditions based on the adopted rule. However, many permit holders do not process the materials or operate equipment that would lead to any change in permit limits based on the new criteria, or already report effluent numbers low enough to comply with the adopted rule. Therefore, costs are not created by all permits and all criteria.

We assume instead that recent historical effluent levels in exceedance of the criteria in the adopted rule can predict the need for actions to avoid future permit violations. That is, the size of a behavioral change corresponds to the concentration of a pollutant in amounts over the new criteria, and the potential persistence of that effluent level over time.[32]

Exceedance levels and corrective actions

From discussion with Ecology engineers, if permit benchmark levels are set according to the new criteria, general permit (GP) effluent levels high enough to exceed the new criteria in a single quarter ("level 1 violation") would lead to the equivalent of minor adjustments like sweeping and moving materials away from drains to come into compliance. For permits falling into this category, and the waterbodies they discharge into, we expect limited costs.

Exceedance of permit benchmarks for two sequential quarters ("level 2 violation") might lead to installing berms, removing materials suspected of contributing to pollutants, and coating various pipes and surfaces. At a minimum, a level 2 violation would necessitate development and implementation of a source control plan.

Three sequential quarterly violations ("level 3 violation") requires facility improvements likely to include water treatment filters, catch basins, and other engineering solutions. Permittees facing corrections to address level 3 violations therefore represent the largest costs compared to a baseline state of the world.

Potential for permit-required corrective actions based on exceedance of new criteria

[30] At the time of this writing, federal guidelines for PFOS are in a draft stage awaiting adoption. For this reason, this analysis will not consider Federal criteria in its baseline (i.e. included in analytical scope) to be conservative.
[31] At the time of this writing, federal guidelines for PFOA are in a draft stage awaiting adoption. For this reason, this analysis will not consider Federal criteria in its baseline (i.e. included in analytical scope) to be conservative.
[32] We assume perfect compliance in this analysis. That is, effluent not meeting the proposed criteria will either be addressed when the rule is implemented and the permit is renewed, or after one or more violations occur. This makes recent historical effluent levels a good proxy for actions needed to avoid future permit violations.

To quantitatively identify the potential for permittees to exceed the new criteria and require corrective action, we conducted a Permitting and Reporting Information Systems (PARIS) query of reported effluent data (see Appendix D of the Technical Support Document of this rulemaking for a detailed description of the initial query).[33] For active GPs, we compared maximum concentrations reported in Discharge Monitoring Reports (DMRs) or priority pollutant scans in PARIS for 2 years (2021 and 2022) to the applicable acute aquatic life toxics criteria.[34] We then made note of the quarter-year in which an exceedance would have occurred and by what amount in percentage terms.

Using exceedance frequency and magnitude information above, we estimated violation levels based on the following assumptions:

a) We assume that a Level 3 correction is potentially required if historical exceedances occurred in 3 consecutive quarters, and all three violations were greater than or equal to 100% (double) of what the adopted rule allows.[35]

b) We assume that a Level 2 corrections is potentially required for any permittee that does not fall into level 3 and have 2 or more consecutive exceedances greater than or equal to 30% over what the adopted rule allows.

The balance of permittees with potential violations fall into level 1. This includes permittees with only 1 quarter of exceedance or consecutive quarters of exceedance at less than 30% of the adopted rule.

Note that thresholds above adhere to the notion that receiving an initial level 1 violation under the adopted rule will lead to a change in a permittee's behavior, thus preventing a level 2 violation and so on. However if the predicted magnitude of exceedance is sufficiently large, that permit will have more difficulty coming back in line with the adopted criteria at lower levels. It is in this way that utilizing information on magnitude, in addition to violation frequency, helps better capture the behavioral response, and eventual correction level required under the adopted rule.

In comparison to GPs, monitoring periods for individual permits (IP) can range from daily to yearly. Permit limit calculations account for effluent variability and sampling frequencies, as well as receiving water conditions and mixing. Violations of permit limits are also considered for correction on a case-by-case basis. For this reason, we were not able to categorize potential in terms of violation levels in the same manner as GPs. We instead assume that all IPs with effluent levels that exceed the adopted criteria (accounting for mixing zones) will bear the

[33] This analysis is not definitive, and methods used do not account for all facets of developing effluent limits. However, this analysis provides an approximation of potential future permit changes that would need to be considered if this rule is approved by the EPA.

[34] The acute toxics criteria are the more pertinent criteria to the general permits based on the short-term duration of general permit discharges such as stormwater runoff and time-limited discharges.

[35] In line with the reasonable assumption that corrections categorized under each level can account for that exceedance percentage, which would not have likely been fully remediated under a lower correction level.

equivalent costs of level one actions and discuss the potential of additional costs qualitatively later in this section.

Applying the analysis above as a screening tool, 661 unique permits were found with potential to exceed the adopted criteria (out of a total of roughly 6,650 total permits), and 972 unique exceedances when broken out by criteria (Table 3). Note that copper and zinc in Table 3 make up the majority of most criteria exceedances with 392 in copper and 485 in zinc.[36] Also note that based on this analysis, general permit holders only had the propensity for level 3 corrections based on copper and zinc.

Table 3. Maximum Corrective Action Level by Permit-Criteria and Permit

Criteria	Permit Actions	Estimated Level 1	Estimated Level 2	Estimated Level 3
Arsenic	4	4	0	0
Cadmium	22	22	0	0
Chromium VI	2	2	0	0
Copper	392	327	52	13
Cyanide	17	17	0	0
Nickel	29	29	0	0
Pentachlorophenol	4	4	0	0
Silver	19	19	0	0
Zinc	485	313	137	35
Total (permit-criteria)	**972**	**735**	**189**	**48**
Total (permit-level)[1]	**662**	**462**	**161**	**39**

Note[1]: totals are less than the sum of columns due to some permittees predicted to require corrective actions based on more than one criteria (i.e. a permittee triggering corrective actions for both copper and zinc at level 3).

This likely overstates the potential for future permit violations (particularly level 2 and level 3 violations), because the permittees would normally have responded to preceding level 1 (and level 2) violations and conducted the corresponding corrective actions.

[36] See Appendix B for additional permit-criteria breakouts

3.2.2 Arsenic (freshwater acute and chronic)

Adopted rule amendments regarding arsenic represent a total of 4 level 1 violations. Level 1 corrective actions include moving materials out of the path of stormwater, checking the operation and maintenance of any treatment already installed, and source tracing.

The primary cost of level 1 corrective actions is staff time. We assume 1-2 hours of labor by staff to complete these tasks. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour.[37] This yields an expected cost of $38.88 to $77.76 per level 1 violation for a total cost estimate of $156 to $311 for arsenic. We assume this work would be done by existing staff.

3.2.3 Cadmium (freshwater acute and chronic)

Adopted rule amendments regarding cadmium represent a total of 22 level 1 violations. Level 1 corrective actions include moving materials out of the path of stormwater, checking the operation and maintenance of any treatment already installed, and source tracing.

The primary cost of level 1 corrective actions is staff time. We assume 1-2 hours of labor by staff to complete these tasks. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour[38]. This yields an expected cost of $38.88 to $77.76 per level 1 violation for a total cost estimate of $855 to $1,477 for cadmium. We assume this work would be done by existing staff.

3.2.4 Chromium VI (freshwater acute and chronic)

Adopted rule amendments regarding Chromium VI represent a total of 2 level 1 violations. Level 1 corrective actions include moving materials out of the path of stormwater, checking the operation and maintenance of any treatment already installed, and source tracing.

The primary cost of level 1 corrective actions is staff time. We assume 1-2 hours of labor by staff to complete these tasks. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour.[39] This yields an expected cost of $38.88 to $77.76 per level 1 violation for a

[37] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.
[38] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.
[39] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.

total cost estimate of $78 to $156 for Chromium VI. We assume this work would be done by existing staff.

3.2.5 Copper (freshwater acute and chronic)

Adopted rule amendments regarding copper are estimated to create a total of 327 level 1 violations, 52 level 2 violations, and 13 level 3 violations. Note that a level 2 violation is assumed to have created a level 1 violation prior and a level 3 violation is assumed to have created both a level 1 and a level 2 violation prior.

Level 1 corrective actions include:

- moving materials out of the path of stormwater,
- checking the operation and maintenance of any treatment already installed, and
- source tracing.

Level 2 corrective actions include:

- creation and implementation of a source control plan, possibly including
    - covering materials,
    - installing berms to move stormwater,
    - removing copper piping, and
    - coating copper piping.

Level 3 corrective actions include some or all of the following:

- catch basin inserts with metalzorb,
- biofiltration,
- bioretention,
- enhanced chitosan treatment,
- flocculation,
- filtration,
- or any combination of these.

The primary cost of level 1 corrective actions is staff time. We assume 1-2 hours of labor by staff to complete these tasks. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour[40]. This yields an expected cost of $38.88 to $77.76 per level 1 violation for a

[40] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.

total cost estimate of $15,241 to $30,482 for level 1 violations for copper. We assume this work would be done by existing staff.

Level 2 corrective actions include development and implementation of a Source Control Plan. Developing the plan is estimated to take 40 hours of an Environmental Engineering Technician's time. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour[41]. This yields an expected cost of $1,555 per level 2 violation, for a total estimated cost of $101,088 for level 2 violations for copper.

Level 3 corrective actions for copper are site specific and depend on many qualifying variables, including, but certainly not limited to:

- What is the site surface – dirt, gravel or hard surface?
- How much square footage is being treated and what are the flow rates?
- Does the site have one or multiple discharge points?
- Are they using a passive or active treatment approach?
- Is the property of the permittee leased or owned?
- What is the source of the Cu? Can it be managed with source control best management practices (BMPs) or do they need treatment?
- As with most treatment systems the major cost is infrastructure improvements and constructability. There is a huge difference in someone dropping a catch basin insert in Cu removing media to someone investing in a 500 GPM ATS system.
- What natural state is the Cu in -dissolved or adhered to the sediment?
- If they were under benchmark before and then trigger a new Level 3 would be different than someone already in a Level 3 with a technology that needs to be amended to meet a lower standard.

[41] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.

Given the extreme variability and site-specific nature of level 3 corrective actions, we used an estimated range of $250,000 to $750,000 per level 3 violation[42], for a total estimated cost of $3.25 million to $9.75 million for level 3 violations for copper.

3.2.6 Cyanide (freshwater acute and chronic)

Adopted rule amendments regarding cyanide represents a total of 17 level 1 violations. Level 1 corrective actions include moving materials out of the path of stormwater, checking the operation and maintenance of any treatment already installed, and source tracing.

The primary cost of level 1 corrective actions is staff time. We assume 1-2 hours of labor by staff to complete these tasks. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour[43]. This yields an expected cost of $38.88 to $77.76 per level 1 violation for a total cost estimate of $661 to $1,322 for cyanide. We assume this work would be done by existing staff.

3.2.7 Nickel (freshwater acute and chronic)

Adopted rule amendments regarding nickel represents a total of 29 level 1 violations. Level 1 corrective actions include moving materials out of the path of stormwater, checking the operation and maintenance of any treatment already installed, and source tracing.

The primary cost of level 1 corrective actions is staff time. We assume 1-2 hours of labor by staff to complete these tasks. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour[44]. This yields an expected cost of $38.88 to $77.76 per level 1 violation for a total cost estimate of $1,128 to $2,255 for nickel. We assume this work would be done by existing staff.

3.2.8 Pentachlorophenol (freshwater acute and chronic and saltwater chronic)

Adopted rule amendments regarding pentachlorophenol represents a total of 4 level 1 violations. Level 1 corrective actions include moving materials out of the path of stormwater, checking the operation and maintenance of any treatment already installed, and source tracing.

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[42] For additional discussion of the costs of level 3 corrective action, please see Appendix C.
[43] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.
[44] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.

The primary cost of level 1 corrective actions is staff time. We assume 1-2 hours of labor by staff to complete these tasks. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour[45]. This yields an expected cost of $38.88 to $77.76 per level 1 violation for a total cost estimate of $156 to $311 for pentachlorophenol. We assume this work would be done by existing staff.

3.2.9 Silver (all)

Adopted rule amendments regarding silver represents a total of 19 level 1 violations. Level 1 corrective actions include moving materials out of the path of stormwater, checking the operation and maintenance of any treatment already installed, and source tracing.

The primary cost of level 1 corrective actions is staff time. We assume 1-2 hours of labor by staff to complete these tasks. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour[46]. This yields an expected cost of $38.88 to $77.76 per level 1 violation for a total cost estimate of $739 to $1,477 for silver. We assume this work would be done by existing staff.

3.2.10 Zinc (freshwater acute and chronic)

Adopted rule amendments regarding zinc are expected to create a total of 313 level 1 violations, 137 level 2 violations, and 35 level 3 violations. Note that a level 2 violation is assumed to have created a level 1 violation prior and a level 3 violation is assumed to have created both a level 1 and a level 2 violation prior.

Level 1 corrective actions include:

- moving materials out of the path of stormwater,
- checking the operation and maintenance of any treatment already installed, and
- source tracing.

Level 2 corrective actions include:

- creation and implementation of a source control plan, possibly including
    - covering materials,
    - If dissolved faction coat the source material (roof, gutters, fence),

[45] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.
[46] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.

- remove fencing,
- cover or coat galvanized equipment,
- reroute stormwater away from sources,
- installing berms to move stormwater.

Level 3 corrective actions include some or all of the following:

- catch basin inserts with metalzorb,
- biofiltration,
- bioretention,
- enhanced chitosan treatment,
- flocculation,
- filtration,
- or any combination of these.

The primary cost of level 1 corrective actions is staff time. We assume 1-2 hours of labor by staff to complete these tasks. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour[47]. This yields an expected cost of $38.88 to $77.76 per level 1 violation for a total cost estimate of $18,857 to $37,714 for level 1 violations for zinc. We assume this work would be done by existing staff.

At a minimum, level 2 corrective actions include development and implementation of a Source Control Plan. Developing the plan is estimated to take 40 hours of an Environmental Engineering Technician's time. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technologists and Technicians, valued at $38.88 per hour[48]. This yields an expected cost of $1,555 per level 2 violation, for a total estimated cost of $213,062 for level 2 violations for Zinc.

Level 3 corrective actions for zinc closely match those for copper. Please see section 3.2.4 and Appendix D for a discussion of costs. Given the extreme variability and site-specific nature of level 3 corrective actions, we used an estimated range of $250,000 to $750,000 per level 3 violation, for a total estimated cost of $8.75 million to $26.25 million for level 3 violations for zinc.

[47] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.
[48] Bureau of Labor Statistics (2023). Washington - May 2023 OEWS State Occupational Employment and Wage Estimates (bls.gov) for occupation 17-3025 Environmental Engineering Technologists and Technicians. Accessed July 5, 2024.

3.2.11 6PPD-quinone (freshwater acute)

Municipal stormwater permittees, including the WA State Department of Transportation, are currently not required to sample their stormwater discharges but many pay into and participate in Ecology's Stormwater Action Monitoring (SAM) program, as well as other stormwater receiving water and BMP effectiveness research projects, which have begun to include 6PPD-q sampling and analysis. Adding 6PPD-q sampling costs to these existing monitoring programs would be negligible but they would still need to compare those sample results to the new criteria. This analysis may indicate the future need for permittees to implement corrective actions such as stormwater source control or retrofit requirements in watershed areas with 6PPD-q impairment.

Industrial Stormwater permit holders currently sample their discharges for a variety of stormwater pollutant parameters, but not 6PPD-q. Industrial sectors with onsite sources of tire rubber may be required to sample for 6PPD-q in future (5-year) permit cycles to ensure that existing BMPs prevent discharges that cause or contribute to violations of the new criteria. There are currently 1,660 entities covered by industrial stormwater permits (combined individual and general). Lab costs for each sample are assumed to be $600 per sample. Assuming one sample quarterly for the 20-year timeframe for rule amendments yields a NPV of $44,144[49] per covered entity. Alternatively, if quarterly sampling for 8 consecutive quarters yields zero violations, permittees are allowed to sample annually from that point on. These scenarios yield an estimated cost range of $22.4 million to $67.2 million in NPV over the 20-year timeframe.

Note that the science around 6PPD-q is still evolving. It is likely that the lab costs for testing for 6PPD-q will decrease over time as the science improves and the number of labs accredited to conduct the needed testing increases.

At this time, there is no way of knowing how many (if any) potential violations of each type will occur at these criteria levels. Additionally, corrective actions needed for violations of each type for this criteria have yet to be determined and will be site specific once they are. These uncertainties should clear somewhat once the quarterly sampling and testing begins. Therefore, treatment costs beyond monitoring are possible, but will remain uncertain until sufficient data is collected.

3.2.12 Perfluorooctanoic Acid (freshwater acute and chronic and saltwater acute)

Permit holders impacted by this criteria are assumed to already be monitoring monthly. Sampling costs in this case would be negligible, however they would still need to test those samples for the new criteria.

[49] Using a 0.9% discount rate.

This criteria is expected to impact wastewater treatment permittees. There are currently 226 wastewater treatment facilities covered by permits. Lab costs for each sample are assumed to be $500 per sample. Assuming quarterly sampling for the 20-year timeframe for rule amendments yields a NPV of $36,787[50] per covered entity for a total estimated cost of $8 million. Alternatively, if no violations are found in the initial 8 quarters of sampling, sampling would be done until something changed. This yields an estimated range of costs of $900,000 to $8 million over the 20-year timeframe.

Note that the science around PFOA is still evolving. It is likely that the lab costs for testing for PFOA will decrease over time as the science improves and the number of labs accredited to conduct the needed testing increases.

At this time, there is no way of knowing how many (if any) potential violations of each type will occur at these criteria levels. Additionally, corrective actions needed for violations of each type for this criteria have yet to be determined and will be site specific once they are. These uncertainties should clear somewhat once the quarterly sampling and testing begins. Therefore, treatment costs beyond monitoring are possible, but will remain uncertain until sufficient data is collected.

3.2.13 Perfluorooctane Sulfonate (freshwater acute and chronic and saltwater acute)

Permit holders impacted by this criteria are assumed to already be monitoring monthly. Sampling costs in this case would be negligible, however they would still need to test those samples for the new criteria.

This criteria is expected to impact wastewater treatment permittees. There are currently 226 wastewater treatment facilities covered by permits. Lab costs for each sample are assumed to be $500 per sample. Assuming quarterly sampling for the 20-year timeframe for rule amendments yields a NPV of $36,787[51] per covered entity for a total estimated cost of $8 million. Alternatively, if no violations are found in the initial 8 quarters of sampling, sampling would be done until something changed. This yields an estimated range of costs of $900,000 to $8 million over the 20-year timeframe.

Note that the science around PFOS is still evolving. It is likely that the lab costs for testing for PFOS will decrease over time as the science improves and the number of labs accredited to conduct the needed testing increases.

At this time, there is no way of knowing how many (if any) potential violations of each type will occur at these criteria levels. Additionally, corrective actions needed for violations of each type for this criteria have yet to be determined and will be site specific once they are. These uncertainties should clear somewhat once the quarterly sampling and testing begins.

[50] Using a 0.9% discount rate.
[51] Using a 0.9% discount rate.

Therefore, treatment costs beyond monitoring are possible, but will remain uncertain until sufficient data is collected.

3.3 Total Cost Estimates

3.3.1 Quantitative Cost Estimates

Table 4: Estimated Total Cost for Level 1 Corrective Actions

Criteria	Estimated Level 1 Violations	Low Cost Estimate	High Cost Estimate
Arsenic	4	$ 156	$ 311
Cadmium	22	$ 855	$ 1,711
Chromium VI	2	$ 78	$ 156
Copper	392	$ 15,241	$ 30,482
Cyanide	17	$ 661	$ 1,322
Nickel	29	$ 1,128	$ 2,255
Pentachlorophenol	19	$ 739	$ 1,477
Silver	485	$ 18,857	$ 37,714
Zinc	4	$ 156	$ 311
Total	**974**	**$ 37,869**	**$ 75,739**

Note: totals are less than the sum of rows due to some permittees predicted to violate in more than one criteria (i.e. a permittee violating in both copper and zinc at level 1).

Table 5: Estimated Total Cost for Level 2 Corrective Actions

Criteria	Potential Level 2 Violations	Estimated Cost
Copper	52	$ 80,870
Zinc	137	$ 213,062
Total	**161**	**$ 250,387**

Note: totals are less than the sum of rows due to some permittees predicted to violate in more than one criteria (i.e. a permittee violating in both copper and zinc at level 2).

Table 6: Estimated total cost for level 3 corrective actions

Criteria	Potential Level 3 Violations	Low Cost Estimate	High Cost Estimate
Copper	13	$ 3,250,000	$ 9,750,000
Zinc	35	$ 8,750,000	$ 26,250,000
Total	**39**	**$ 9,750,000**	**$ 29,250,000**

Note: totals are less than the sum of rows due to some permittees predicted to violate in more than one criteria (i.e. a permittee violating in both copper and zinc at level 3).

Table 7: Estimated Present Value of Total Cost

Action Level	Low Cost Estimate	High cost Estimate
1	$ **37,869**	$ **75,739**
2	$ 250,387	$ 250,387
3	$ 9,750,000	$ 29,250,000
Action Cost	**$ 10,038,257**	**$ 29,576,126**
Monitoring costs[52]	$ 24,200,000	$ 83,200,000
Total Costs	**$ 34,238,257**	**$ 112,776,126**

Note: Discounting assumes capitol cost will occur upon permit renewal date. If renewal occurs prior to rule adoption (assumed 1/1/2025 in this analysis) capital costs are assumed to occur 5 years from the last known renewal date based on the typical permit cycle.

3.3.1 Qualitative Cost Estimates

- **Actions taken by individual permits beyond level 1 equivalents.** As discussed in section 3.2.1, we are unable to estimate individual permits actions greater than level 1 equivalents with any reasonable level of confidence. This is because compared to GPs, violations of IP limits are considered for correction on a case-by-case basis. Corrective actions depend on effluent variability, different sampling frequencies (daily, monthly, yearly etc.), and receiving water conditions and mixing—data we cannot predict in advance.

  This does not mean however that IPs could not incur additional costs because of the adopted rule. Ultimately, the response to individual permit violations is up to the discretion of the permit manager, compliance specialist, and supervisor team who can work with facilities to implement a variety of compliance schedules if needed.

- **Potential future actions surrounding new criteria.** Note that the science around 6PPD-q, perfluorooctanoic acid, and perfluorooctane sulfonate is still evolving. At this time, there is no way of knowing how many (if any) potential violations of each type will occur at these criteria levels. Additionally, corrective actions needed for violations of each type for these criteria have yet to be determined and will be site specific once they are. Therefore, treatment costs beyond monitoring are possible, but will remain uncertain until sufficient data is collected through quarterly sampling and testing.

- **Potential for additional contaminated site cleanup.** The amendments to the ALT criteria might impact some cleanups of contaminated sites where releases of hazardous substances impact, or are likely to impact, surface water (usually by migration through

[52] Note that it is likely that the lab costs for testing for these criteria will decrease over time as the science improves and the number of labs accredited to conduct the needed testing increases.

soil and groundwater). Impacts include the potential for additional cleanup costs, but depend on a host of site-specific conditions, additional analysis, and investigation that is not reasonable or feasible to predict in advance.[53] See Appendix D of this document for additional discussion.

[53] Note that the adopted rule will generally not affect sites that were contaminated but have completed cleanup (WAC 173-340-702(12)(c))).

Chapter 4: Likely Benefits of the Adopted Rule Amendments

4.1 Introduction

We analyzed the likely benefits associated with the adopted rule amendments, as compared to the baseline. The adopted rule amendments and the baseline are discussed in detail in Chapter 2 of this document.

4.2 Benefits Analysis

To the degree that the adopted rule reduces toxic releases into known water bodies containing aquatic life, social benefits are generated by improved habitat suitability for plant and animal species. Benefits associated with aquatic life can be further broken out into use and non-use values.

Use values include but are not limited to:

- Plant and animal consumption
- Recreational fishing and aquaculture
- Property value impacts
- Tourism and travel activities
- Education

Non-use value include, but are not limited to:

- Existence (simply knowing environmental good exists)
- Bequest (passing environmental goods to future generations)
- Altruistic (enjoyment from knowing others derive use values)
- Cultural / Religious (e.g., existence makes up part one's worldview)

As a general description, entities with potential use value can include the public, Tribes, residents, and owners and employees (charters, tourist, equipment manufactures, etc.) that are nearby or have access to affected waterbodies. Non-use value can exist for any entity irrespective of their proximity or access to the affected aquatic life.

The remainder of this chapter is as follows:

- Section 4.2.1 reprints this rulemaking's scope criteria.
- Section 4.2.2 translates our analytical scope into permits that possess a reasonable potential to exceed criteria.
- Section 4.2.3 summarizes key habitat in proximity to potentially impacted permits.

- Section 4.2.4 illustrates a conservative estimation of value from estimates in a State-specific willingness to pay study.
- Section 4.2.5 discusses qualitative values and limitations.

4.2.1 Scope

Reprinted from Section 2.4. Note that since EPA criteria recommendations are in this rulemaking's baseline, benefits discussed in this section are limited to new or existing aquatic life criteria that:

1. Differ from WAC 173-201A-240 (Table 240) **and**
2. Differ from EPA's 304(a) national recommendations for aquatic life and related derivation methods (due to Ecology concerns over ESA protection, new science, and/or having no EPA recommendation)

Applying this filter (**see Table 16 in Appendix B** for illustration and additional information), this analysis is left with:

Analytical Scope

- Arsenic (freshwater acute and chronic)
- Cadmium (fresh water acute and chronic)
- Copper (freshwater acute and chronic)
- Chromium III (freshwater acute and chronic)
- Chromium VI (fresh water acute and chronic)
- Nickel (fresh water acute and chronic)
- Silver (all)
- Zinc (fresh water acute and chronic)
- 6PPD-quinone (freshwater acute)
- Cyanide (freshwater acute and chronic)
- Pentachlorophenol (freshwater acute and chronic and saltwater chronic)
- PFOS (freshwater acute and chronic and saltwater acute) [54]
- PFOA (freshwater acute and chronic and saltwater acute) [55]

[54] At the time of this writing, federal guidelines for PFOS are in a draft stage awaiting adoption. For this reason, this analysis will not consider Federal criteria in its baseline (i.e. included in analytical scope) to be conservative.
[55] At the time of this writing, federal guidelines for PFOA are in a draft stage awaiting adoption. For this reason, this analysis will not consider Federal criteria in its baseline (i.e. included in analytical scope) to be conservative.

Minor, non-substantive edits to rule language in WAC 173-201A-240 to correct typographical, calculation, and formatting errors associated with the list above.

4.2.2 Permits with Reasonable Potential to Exceed Criteria

Benefits would originate from permit holders (in most cases, facilities) that change behavior in compliance with the adopted Rule. However, many permits do not process the materials or operate equipment that would lead to any exceedance, or already report effluent numbers below those that would trigger future violation(s). Therefore, benefits do not exist from all permits and all current criteria.

As discussed in Section 3.2.1 above, we assume that exceedance and magnitude of exceedance of the adopted rule in recent historical monitoring data is a reasonable proxy for corrective actions needed to avoid future exceedance. For general permits quarterly frequency and magnitude of exceedance are used to estimate the size of potential action ranging from "level 1" corrections to larger changes in behavior required in level 2 and 3.

Provided that individual permits are monitored at frequencies ranging from daily to yearly and will be evaluated on a case by case basis, we assume any IP with the potential to violate the adopted criteria will take actions at least similar to level 1, and discuss the benefits of larger, but unknown corrections that could take place qualitatively in section 4.2.5.

Additionally, new criteria within our analytical scope (6PPD-quinone, PFOS, and PFOA) are not included directly in reasonable potential to exceed criteria estimates, as many have not been monitored for in historical effluent. These are discussed qualitatively in section 4.2.5.

4.2.3 Potential Habitat Impacts

This section summarizes habitat affected by facilities with reasonable potential to exceed criteria limits. Specifically we provide descriptive information about the relative value of impacted habitat near and downstream of impacted facilities, and a list of species known to reside in affected rivers.

This spatial analysis was performed using the following data and steps:

- We extracted the outfall location(s) of permits with reasonable potential to exceed criteria from PARIS. If a permit listed one or more active outfalls with location (latitude and longitude) information, outfall location(s) were substituted for the facility location. If the permit did not report separate outfall(s), the facility location was used. Latitudes and longitudes were then converted to a spatial layer of potential discharge points (Figure 1).
- Discharge points were intersected with 2 ancillary data sources describing fish habitat and quality respectively:

- **Statewide Washington Integrated Fish Distribution** (SWIFD).[56] A National Hydrography Dataset (NHD) event layer (line segments) for the state of Washington describing streams and know connections between non-adjacent streams, containing anadromous and resident fish, previously mapped by Northwest Indian Fisheries Commission (NWIFC) or Washington Department of Fish and Wildlife (WDFW).

  In many instances permit outfall locations were provided in PARIS, but water body names or identification numbers were not. Therefore, instead of attempting a relational join, we spatially joined SWIFD attributes based on falling within a 500 meters buffer around an outfall for completeness.[57]

- **The Puget Sound Watershed Characterization (PSWC)**.[58] A spatially explicit set of analysis units (polygons) within the Puget Sound drainage area from the Olympic Mountains to the Cascades that characterize the most important areas to protect and restore. The main products of the assessments are maps describing the relative value of small watersheds or marine shorelines. The index, "sum of freshwater index components", used here has three components: the density of hydrogeomorphic features, local salmonid habitats, and the accumulative downstream habitats. [59]

  This PSWC index "sum of freshwater index components" is originally represented as a normalized index of habitat value ranging from 0 to 1, where higher numbers correspond to a higher value. Based on WDFW literature, we broke the index into tertials, with areas <0.3 corresponding to meaningfully "lower" value, and areas >0.7 considered "high" value habitat.

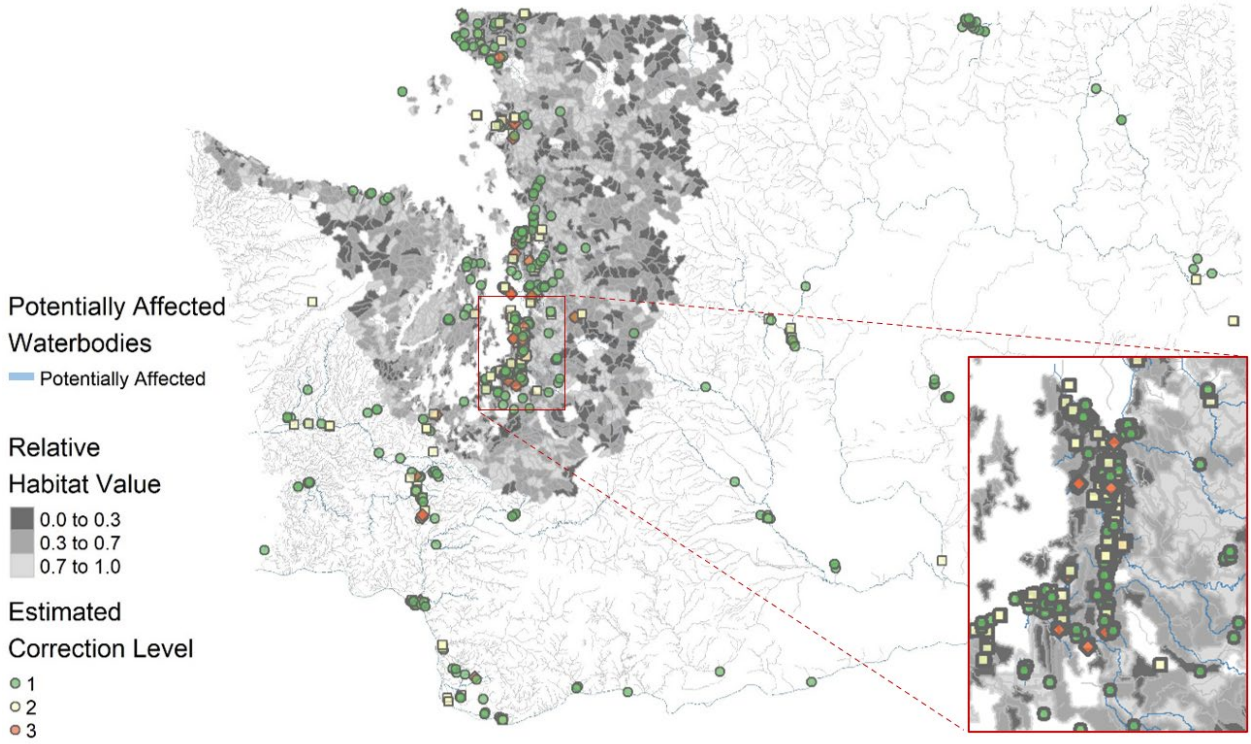
[56] https://geo.wa.gov/datasets/wdfw::statewide-washington-integrated-fish-distribution/about

[57] Note this join reports all species associated with the SWIFD waterbody of which a facility is located (e.g. not only species associated with the subsection that it joins to). This ensures that species reported along other segments of waterbody, including downstream resident species, are accounted for.

[58] https://ecology.wa.gov/water-shorelines/puget-sound/watershed-characterization-project

[59] In particular, the relative value of a small watershed is based on: (1) the density of wetlands and undeveloped floodplains inside it, (2) the quantity and quality of salmonid habitats inside it, and (3) the quantity and quality of salmonid habitats downstream of it. Quantity and quality of habitats were assessed for eight salmonid species.

Figure 1. Facility Outfalls by Potential Correction Level, Relative Habitat Value, and Associated Waterbodies



For each unique permit, we summarize the list of affected species in intersecting waterbody or waterbodies, along with the maximum potential correction level of the facility and relative PSWC value (Table 8).[60] For example, among affected facilities, the top row in Table 8 suggests 12 permits have at least 1 outfall located in a high value watershed and the propensity for level 3 correction (improvement). The 5th row in Table 8 suggests 25 permits have at least 1 outfall located in a high value watershed and the propensity for level 2 correction. These changes represent the largest potential improvements in aquatic life given available data and assumptions. Facilities outside of the Puget Sound region are listed under "unknown" in the relative habitat value column since similar habitat quality data was not available for these areas. Note that despite a lack of information, habitat in the unknown category should be considered qualitatively valuable to species survival.

We further sort columns in Table 8 by effected species across the top row to illustrate in part the preponderance of salmon habitat improvements from the rule amendments. For example, among 9 permits in the top row, 7 are likely to reduce toxic discharge into the vicinity of high

[60] Permits with multiple outfalls could potentially receive difference PSWC values. In that rare case, we take the highest PSWC value.

value Chinook salmon habitat because of the adopted rule, 7 into Coho habitat, 7 into Steelhead habitat, 6 into Chum habitat, 4 into sockeye, and 4 into pink.[61]

[61] Despite other life considered in setting Rule criteria, this descriptive analysis is limited to fish species reported in SWIFD.

Table 8. Known Species Habitat by Expected Correction Level and Habitat Quality

Expected Correction (Improvement) Level	Relative Habitat Value	Count	Chinook Salmon	Coho Salmon	Steelhead Trout	Chum Salmon	Cutthroat Trout	Pink Salmon	Sockeye Salmon	Bull Trout	Rainbow Trout	Brown Trout	Burbot	Eastern Brook Trout	Green Sturgeon	Kokanee Salmon	Largemouth Bass	Mountain Whitefish	Pygmy Whitefish	Smallmouth Bass	Walleye	Westslope Cutthroat Trout	White Sturgeon
3	**High**	9	7	7	7	6	6	4	4	3	2	0	0	0	0	0	0	0	0	0	0	0	0
3	**Average**	7	5	5	5	5	5	3	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0
3	**Low**	15	10	11	11	10	5	6	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0
3	**Unknown**	8	4	5	5	3	4	2	1	1	5	1	1	2	1	1	2	2	1	2	1	0	1
2	**High**	25	23	25	24	21	22	6	6	6	3	0	0	0	0	2	0	0	0	0	0	0	0
2	**Average**	42	35	36	36	30	34	21	27	25	17	0	0	0	0	5	2	0	0	0	0	0	0
2	**Low**	29	16	20	18	17	14	11	2	4	1	0	0	0	0	1	0	0	0	0	0	0	0
2	**Unknown**	53	21	25	23	16	19	6	4	9	23	3	3	4	2	4	9	9	2	4	3	2	3
1	**High**	55	40	45	41	41	38	15	9	13	4	0	0	0	0	2	3	0	0	0	0	0	0
1	**Average**	92	69	76	74	64	65	45	40	39	17	0	0	0	0	10	1	0	0	0	0	0	0
1	**Low**	63	34	39	39	32	37	26	15	23	2	0	0	0	0	4	2	0	0	0	0	0	0
1	**Unknown**	140	50	66	61	37	53	15	15	24	48	7	7	12	5	10	13	16	6	10	7	5	6

Note: This table describes the number of waterbodies with known fish habitat impacted by the adopted rule. Columns describing species are ordered from high-to-low from left-to-right based on the first row. Cells reporting greater than 0 waterbodies are shaded and become relative darker as numbers increase. Key takeaways are that salmon (chinook and coho) along with steelhead and cutthroat trout habitats are generally the most affected across all correction and value levels. Also note that 9, 25, and 55 waterbodies have high value habitat adjacent to expected level three, level two, and level one corrections, respectively. It is generally true that salmon dominate the conversation surrounding conservation issues in Washington State. [62] At the time of this writing, 14 population groups including chinook, coho, chum, and sockeye salmon in Washington State are listed as threatened or endangered under the Endangered Species Act, and none have yet to be removed (Governor's Salmon Recovery Office, 2024).[63]

Two criteria we know would be reduced from many facilities in this adopted rule amendment—copper and zinc (see section 4.2.1)—are well known for direct and indirect salmonid mortality (NMFS, 2016). For example, dissolved copper impairs salmon and steelhead's ability to detect odors. Impairment of smell interferes with environmental cues and certain behaviors such as predator detection and avoidance, social interaction, prey detection, and orientation, thereby affecting survival, distribution, and reproductive success (Baldwin et al. 2003, 2011).[64,65,66] Elevated copper levels have also been found to influence immune systems and vulnerability to disease and cellular damage (Hansen et al. 1999).[67] While zinc is an essential micronutrient for most living organisms, elevated zinc concentrations in the environment causes toxicity in aquatic organisms through the water column or consumption of zinc containing particles in sediment. Zinc toxicity in fish and invertebrates often manifests through effects to osmoregulation and gill structure that results in changes to growth, survival, and reproduction (Eisler, 1993).[68]

4.2.4 Quantitative Estimates of Social Value

This section illustrates one possible quantification of value associated with adopted rule amendments. We use a technique well known in the field of economics as benefit transfer from stated preference studies (see Dumas and Whitehead, 2005 for detailed discussions of stated preferences and benefit transfer in water quality).[69]

In a stated preference study, respondents (typically households) are asked to express their willingness to pay for some improvement in ecosystem goods and services because of a policy. These might range from protecting some number of a single species, to overall air and water quality. Conceptually, survey responses in willingness to pay studies capture both use and non-

[62] Note that other non-salmonoids, including steelhead and bull trout, are also threatened, and additionally important to Washington state's conservations efforts.
[63] https://stateofsalmon.wa.gov/executive-summary/salmon-status/#:~:text=Today%2C%2014%20population%20groups%20of,under%20the%20Endangered%20Species%20Ac
[64] https://media.fisheries.noaa.gov/dam-migration/stormwater_fact_sheet_3222016.pdf
[65] https://pubmed.ncbi.nlm.nih.gov/14551988/
[66] https://www.sciencedirect.com/science/article/abs/pii/S0166445X10003450
[67] https://www.noaa.gov/sites/default/files/legacy/document/2020/Oct/07354626365.pdf
[68] https://www.usgs.gov/index.php/publications/zinc-hazards-fish-wildlife-and-invertebrates-a-synoptic-review
[69] https://ideas.repec.org/p/apl/wpaper/04-12.html

use values. When distributed randomly and in large enough numbers, stated preferences can describe the value of ecosystem services to an entire city, state, or in some cases the country.

Fielding a survey is cost and time prohibitive in the context of this analysis. Provided that primary data is unavailable, we defer to a benefit transfer approach commonly developed for situations where resource constraints prevent original study. In benefit transfer, estimates from an existing case study are spatially (from one place/scale to another), temporally (to a different time), or spatiotemporally (over space/scale and time) applied to new policy arena focused on a similar environmental change.

We consider the validity of transferring benefits from any one study to this Rulemaking policy site based in part from the foundational work by Brouwer (2000)[70], who suggests that candidate studies should:

- Be theoretically and methodologically valid (large sample size, high return rate, carefully administered and analyzed).
- Focus on a similar population to the policy site (e.g., Washington state).
- Focus on similar environmental characteristics (e.g., aquatic life in surface water).
- Capture the likely difference between pre- and post-policy quality (or quantity) levels of the policy (e.g., small percentage improvements).

Based in part on these criteria, we chose to adopt benefit estimates from Layton et al. (1999)'s "Valuing Multiple Programs to Improve Fish Populations". To our knowledge, Layton et al. fielded the latest statewide survey (n=1611 complete, usable responses) that was representative of Washington households. In the survey, participants were asked about their willingness to pay a fixed monthly cost for 20 years for a program that improves fish population. Depending on one of 5 fish populations in questions (e.g. freshwater fish in western Washington) options ranged from "no improvement" for $0 to 150% improvement for $75.

The instrument choice and model features chosen by Layton et al. help generalize their findings to our adopted Rule's wide geographic and taxonomic range. This is opposed to studies commonly describing species-by-program-by-river values. Willingness to pay for aquatic life in percentage improvements over a baseline is also a useful quantity to generalize to any potential improvements in aquatic life—such as those from the adopted rule expressed in similar terms.

The remaining subsections in this chapter discuss the various assumptions and estimates that result from applying Layton et al. to the present policy case.

Policy Assumptions

In contrast to the full range of potential habitat impacts described in section 4.2.2, we only consider benefit transfers from facilities in the first and fifth rows in Table 8. These represent a

[70] Brouwer, R. (2000). Environmental value transfer: state of the art and future prospects. Ecological economics, 32(1), 137-152.

known potential for reduced discharge into the most sensitive habitats, or in other words, contribute to the largest potential improvements in aquatic life under the adopted rule and available data. This conservative assumption excludes habitat improvements outside of the Puget Sound area, and surface waters where a level two or three correction is not expected to occur.

Functional Assumptions

Layton et al. estimated 5 functions in their research, representing 2 geographic areas (Eastern and Western Washington) and three groupings of fish types (Freshwater, Migratory, and Saltwater). Each function is estimated in such a way that, for a given percentage improvement from baseline levels, per household, per month, willingness to pay is the output and additive. That is adding results from all 5 functions provides willingness to pay for some percentage improvement in all fish statewide.

- In the current analysis we only calculate value from Western Washington Freshwater and Western Washington Migratory functions to match this section's focus on Puget sound permits. Even though the adopted rule is protective of saltwater life, we omit these values to remain conservative given that the degree of connection between affected facilities and the universe of saltwater animals could be less direct. The rule is also protective of migratory and freshwater species in Eastern Washington. However note that we omit related value functions in our main specification to remain conservative provided that there is limited uniform data on habitat quality for non-Puget Sound regions.
- We assume a modest 1% increase in aquatic life (fish, directly or indirectly) would be realized in affected water bodies because of updates to the adopted rule amendments, compared to the current baseline.

Spatial Assumptions

Functions in Layton et al. 1999 implicitly provide impacts for all relevant water bodies in Washington State. We apportion these values downward by selecting only waterbodies in SWIFD data impacted by facilities reported in the first and fifth rows of Table 8. These waterbodies are those that have:

- At least 1 discharging permit expected to undergo the equivalent of a level 2 or 3 correction (e.g., where we strongly suspect toxic chemical reductions),

  AND

- Have at least 1 outfall from the discharging permit located in "relatively high" value habitat as defined by the WDFW's Watershed Characterization Project.

We calculate the distance in kilometers of the selected waterbodies (and straight line distances through lakes and other water bodies separating two connected but non-adjacent segments) and divide by the length of all waterbodies in the state from the same SWIFD database. This apportionment leads to impacts from about 4% of all WA waterbodies.

Temporal Assumptions

Willingness to pay from Layton et al.'s functions are in 1998 dollars, per month, per household. We convert these values, adjusted as described above, to the total present value of a 20-year stream of benefits in 2023 dollars using the following steps:

- Multiply value by 12 (months).
- Multiply by an adjustment factor based on the ratio of 2022 median Washington household income ($89,430) to 1998 median Washington household income ($47,420).[71]
- Multiply by the number of households in Washington state in 2022 (2,979,272).[72]

Benefits from the adopted rule amendments would theoretically phase in as permits are renewed, and at which point realized annually in perpetuity (or for as long as the rule amendments remain in effect). However, Ecology assesses a 20-year horizon from the beginning of rule implementation, and therefore benefits are calculated as the present value of a 20-year stream.[73]

In addition, since it is not clear how benefits would scale with staggered renewals, we conservatively assume that no benefits are realized until after 6 years of the adopted rule being in effect. This allows sufficient time for all affected permits to be renewed, and assumes one additional year to elapse before facility changes are made.

Results

Table 9 provides the quantifiable present value of Washington's estimated willingness to pay for water quality improvements from the adopted Rule on Anadromous fish populations in western Washington. Based on these most conservative assumptions from above, results suggest that this range of benefits to society is from $76.7 to $136.3 million following the upper and lower 95% confidence intervals of Layton, et al. functions.[74]

Table 9. Estimated Present Value of Quantifiable Benefits

Low Estimate	High Estimate
$76,706,731	$136,269,961

Result Sensitivity

The range of quantitative benefit estimated in this section represent a lower boundary by design. Relaxing the most conservative assumptions or adjusting for data limitations in these calculations produces a larger stream of benefits associated with the adopted rule; but may be

[71] https://fred.stlouisfed.org/series/MEHOINUSWAA646N
[72] https://www.census.gov/quickfacts/fact/table/WA/PST045222
[73] Discounted at 0.9%, the 20-year average of fixed real annual rates. Fixed rate of return to inflation-indexed I-Bonds by US Treasury Department (https://www.treasurydirect.gov/savings-bonds/i-bonds/i-bonds-interest-rates/)
[74] Confidence intervals were calculated using parametric bootstrapping techniques (see Krinsky and Robb 1986, 1990; Hole 2006).

less precise on account of introducing new assumptions in the place of missing or incomplete information.

For example, making potential corrections within the Puget Sound drainage area (see Figure 1) in "average" quality habitat as determined by the PSWC, would expand our low and high benefits estimates to $105.2 and $187 million respectively. Further including benefits from non-Puget sound regions, including eastern Washington and the Columbia River, produces a low estimated benefit of $163.3 million and a high estimate of $315.1 million. Finally, every percent in salmonoid recovery beyond the one percent assumed in the exercise above would double expected benefit estimates until a 5 percent species improvement is realized—at which point stepwise functions in Layton et al. (1999) suggest that marginal willingness to pay continues to increase, but at a decreasing (logarithmic) rate.

Note that even after adjustments for time and spatial scale, willingness to pay estimates presented in Table 9 are still determined by the thoughts and opinions of Washington state households toward fish habitat in 1998. The degree that population pressure, environmental education, and an overall awareness of ecological issues has grown within the state's culture is just one more degree by which quantitative estimates in Table 9 will be underestimated (are lower than in today's reality).

4.2.5 Qualitative Benefits

Other use and non-use values, unlikely to be fully captured quantitatively include, but are not limited to:

- **Values from protecting non-fish aquatic life**. Layton's survey described in section 4.2.4 was also limited to describing the willingness to pay for fish species. The adopted rule goes well beyond fish to cover all aquatic life in Washington state—the balance of which holds additional use and non-use values. For example, the adopted rule will likely have positive impacts on Washington state's $100 million per year aquaculture industry, along with the commercial and recreational harvest of crabs, clams, mussels, shrimp, abalone, and various others that use nearshore ecosystems for part or all their life histories (Dethier, 2006, Puget Sound Partnership, 2022).[75,76]
- **Values to Tribes and indigenous peoples**. Additional and unquantifiable benefits from this rulemaking likely exist through the protection, maintenance, or recovery of subsistence hunting and gathering, culture lifeways, and economic activity of Tribes and indigenous people including but not limited to shellfisheries, traditional foods, and medicines. It is especially true of impacts to salmon and the at least 138 wildlife

[75] https://wdfw.wa.gov/publications/02437#:~:text=Economically%2C%20nearshore%20shellfish%20in%20Puget,crabs%2C%20clams%2C%20and%20mussels.
[76] https://vitalsigns.pugetsoundinfo.wa.gov/VitalSignIndicator/Detail/9[77]
https://magazine.wsu.edu/2023/04/24/the-salmon-king/#:~:text=The%20iconic%20and%20symbolic%20salmon,of%20Pacific%20salmon%20for%20food.

species—including seagulls, eagles, and orcas—that depend on them for food (Janovich, 2023).[77] From the Governor's Salmon Recovery Office[78]: "Pacific Northwest people have identified themselves with salmon since time immemorial. The state's first inhabitants–Native American tribes–define themselves as Salmon People. Salmon are woven throughout tribal lives as a source of food, income, art, literature, heritage, and celebration."

- **Spillover into human health**. This rulemaking may present indirect benefits to human health by reducing bioaccumulation of toxic chemicals and metals suspected of developmental and cancer-causing impacts to humans through consumption of aquatic life.
- **Cost savings from less stringent Chromium VI and Silver criteria**. The adopted rule would make Chromium VI (freshwater acute) and Silver (saltwater acute) criteria 20% and 21% less stringent, respectively. Less stringent acute limits would allow for future permittees to take less corrective action under the adopted rule and accrue a potential cost savings.[79]
- **Reduction in discharge from individual permits beyond level 1 actions.** as discussed in section 4.2.2 and elsewhere in the document, we are unable to confidently identify individual permits that have potential actions greater than a level 1 action. This does not mean however corrections, and in turn larger reductions in discharge of the adopted criteria, will not occur.

  For illustration, benefits estimated in Table 9, section 4.2.4, are derived from 83 general permits with potential corrections beyond level 1 and discharging to relatively valuable habitat. This breaks out to a benefit of roughly $927,000 to $1.6 million per affected permit of this type. While there are fewer individual permits than general permits potentially affected by the rule, being typically larger facilities, any individual permits that materially reduce discharge through level 2 and 3 equivalents would likely accrue additional benefits at least as large as those generated by GPs on average.
- **Monitoring and potential future actions surrounding new criteria**. Without historical monitoring data, this analysis cannot identify the extent of potential violations, corrections, or related benefits of new criteria introduced by this rulemaking directly. However, monitoring for relevant discharge for these toxic chemicals following rule

[77] https://magazine.wsu.edu/2023/04/24/the-salmon-king/#:~:text=The%20iconic%20and%20symbolic%20salmon,of%20Pacific%20salmon%20for%20food.
[78] https://stateofsalmon.wa.gov/executive-summary/why-recover-salmon/#:~:text=Pacific%20Northwest%20people%20have%20identified,define%20themselves%20as%20Salmon%20People.&text=Salmon%20are%20woven%20throughout%20tribal,literature%2C%20heritage%2C%20and%20celebration.
[79] While incorporating new science led to a criterion adjustment, aquatic life protection levels are considered the same. Therefore, we do not expect new costs from a material change in related ecosystem services. We emphasize that if an existing permittee has limits for discharge and is currently meeting those limits, then they will not be afforded a less stringent limit due to federal backsliding laws.

adoption will provide Ecology with information on their magnitude, frequency, and spatial distribution, as well as the development of appropriate BMPs. In this way testing should help avoid the cost of additional blanket requirements or missing important permit-level nuance (a benefit).

Where data leads to future restrictions, testing requirements are also partially responsible for gains in aquatic life associated with new toxic chemicals adopted by this rulemaking:

- **6-PPD-quinone:** 6PPD-quinone is typically released into the environment as tires wear down while driving, and stormwater carries the chemical into nearby rivers and streams. 6PPD-quinone has been linked to damaging effects on adult coho salmon (Tian et al. 2021), chinook salmon (Lo et al. 2023), and various trout species (Brinkmann et al. 2022) among others (Bohara et al. 2024).[80,81,82,83]

  Because 6PPD-quinone primarily comes from tire residual and carried to water bodies in runoff. Additional positive benefits are likely to accrue from behavioral changes made by stormwater permits meeting new criteria in the adopted rule—the degree of which is however uncertain until a monitoring schedule is established.

- **PFOS and PFOA:** According to the EPA, the draft criteria for these chemicals are based on observed effects of PFOA and PFOS to the survival, growth, and reproduction of aquatic organisms. Ecology would expect positive benefits from these criteria, in part from behavioral changes made by municipal wastewater permits to meet the adopted rule—the degree of which is however uncertain until a monitoring schedule is established.

- **Potentially improved cleanup of contaminated sites:** The degree that the adopted rule leads to additional remediation and improved aquatic life habitat where the release of hazardous substances impact, or are likely to impact, surface water, is one degree to which additional benefits from the rule would accrue. Contaminated sites taking on additional remediation compared to baseline could generate community benefits through increased property value, and lower exposures to contaminants while living, working on, or visiting contaminated sites. See Appendix D for additional discussion.

[80] https://doi.org/10.1126/science.abd6951
[81] https://doi.org/10.1002/etc.5568
[82] https://pubs.acs.org/doi/10.1021/acs.estlett.2c00050
[83] https://www.sciencedirect.com/science/article/abs/pii/S0269749123018304

Chapter 5: Cost-Benefit Comparison and Conclusions

5.1 Summary of costs and benefits of the adopted rule amendments

Costs reprinted from Section 3.3:

Table 10: Estimated Present Value of Total Quantitative Cost

Action Level	Low Cost Estimate	High cost Estimate
1	$ **37,869**	$ **75,739**
2	$ 250,387	$ 250,387
3	$ 9,750,000	$ 29,250,000
Action Cost	**$ 10,038,257**	**$ 29,576,126**
Monitoring costs	$ 24,200,000	$ 83,200,000
Total Costs	**$ 34,238,257**	**$ 112,776,126**

Note: Discounting assumes capital cost will occur upon permit renewal date. If renewal occurs prior to rule adoption (assumed 1/1/2025 in this analysis) capital costs are assumed to occur 5 years from the last known renewal date to account for a typical permit cycle.

As discussed in Section 3.3.1, additional qualitative costs include but not limited to:

- Cost to individual permits beyond level 1 correction equivalent.
- Potential future actions surrounding new criteria.
- Potential for additional contaminated site cleanup.[84]

Quantifiable benefits summary table from Section 4.2.4:

Table 11. Estimated Present Value of Quantifiable Benefits

Low Estimate	High Estimate
$76,706,731	$136,269,961

As discussed in Section 4.2.5, additional qualitative benefits include but not limited to:

- Values from protecting non-fish aquatic life
- Values to Tribes and indigenous peoples.
- Human health spillover.

[84] The adopted rule will generally not affect sites that were contaminated but have completed cleanup (WAC 173-340-702(12)(c))). See Appendix D for additional discussion.

- Cost savings from less stringent Chromium (VI) criteria and Silver criteria.
- Reduction in discharge from individual permits beyond level 1 correction equivalents.
- Protection from new criteria (6PPD-quinone, PFOS, PFOA, FW and SW silver).
- Benefits associated with monitoring and testing costs highlighted in Table 10.[85]
- Potentially improved cleanup of contaminated sites.

5.2 Conclusion

We note that estimated costs in this analysis are higher than estimated in the Preliminary Regulatory Analyses for this rulemaking (Publication 24-10-009) largely due to revised monitoring costs based on input received during the public comment period. This results in overlapping ranges of quantified costs and benefits.

Under the APA, we consider quantified and qualitative costs and benefits, and have clarified qualitative benefits of monitoring throughout. We also note that currently some lab costs are particularly high (6ppd-q) due to a limited number of accredited labs able to perform this work, and we expect these costs to fall as the supply of labs increases.

We remind readers that quantitative benefits described in Table 11 represent a lower boundary by design. Relaxing the most conservative assumptions or adjusting for data limitations in these calculations produces a larger stream of benefits associated with the adopted rule; but may be less precise on account of introducing new assumptions in the place of missing or incomplete information.[86]

Taking the qualitative benefits above, conservative nature of quantitative benefits, and a likely downward shift in lab costs into consideration, we conclude, based on a reasonable understanding of the quantified and qualitative costs and benefits likely to arise from the rule amendments, as compared to the baseline, that the benefits of the rule amendments are likely greater than the costs.

[85] Monitoring for relevant discharge for these toxic chemicals following rule adoption will provide Ecology with information on their magnitude, frequency, and spatial distribution, as well as the development of appropriate BMPs. In this way testing will help avoid the cost of additional blanket requirements or miss important permit-level nuance (a benefit). Testing requirements under the adopted rule are also partially responsible for any gains in aquatic life associated in future reductions to new toxic chemicals adopted by this rulemaking.

[86] For example, after allowing for impacts on lower, or unknown quality habitat and expanding impacts into non-Puget Sound regions, benefits range from $163 million to $315 million. To be additionally conservative, no estimate includes benefits from reductions associated with level 1 corrections. See Result Sensitivity in Chapter 4 for additional discussion.

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 must determine that the requirements 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 adopted rule amendments were the least burdensome to those required to comply with them.

6.2 Goals and objectives of the authorizing statute

The authorizing statute for this rule is Chapter 90.48 RCW, Water Pollution Control. Its goals and objectives include the state of Washington's policy of maintaining the highest possible standards to ensure the purity of all waters of the state consistent with public health, public enjoyment, the protection of wildlife, and the industrial development of the state. This requires the use of all known available and reasonable methods to prevent and control the pollution of the waters of the state of Washington.

RCW 90.48.035, Rule-making authority, specifically authorizes Ecology to promulgate, amend, or rescind rules and regulations as deemed necessary to maintain the highest possible standards of all waters in the state. Its goals and objectives include but are not limited to rules relating to standards of quality of waters of the state and regulating substances discharged into them.

6.3 Alternatives considered and why they were excluded

We considered the following alternative rule requirements, and did not include them in the adopted rule amendments. This list includes alternatives that were suggested by the public during development of the rule, with the intent of mitigating negative impacts, including environmental harms, on vulnerable populations and overburdened communities, and equitably distributing benefits. Each section below explains why we did not include these alternatives.

- Adopt EPA recommendations for all chemicals.
- Review new science for all toxics.
- Apply new science for all toxics and the 1st percentile of the toxicity data distribution for toxics that do not meet ESA requirements.
- Not update aquatic life toxics criteria.

6.3.1 Adopt EPA recommendations for all chemicals.

We considered adopting EPA recommendations for all aquatic life toxics criteria to ensure consistency with the Clean Water Act. However, we have evidence from the National Marine Fisheries Service and US Fish and Wildlife Service biological opinions in Oregon and Idaho that EPA recommendations are not sufficient to protect the endangered species and their populations that are also listed as endangered in Washington. Adopting this strategy would likely result in disapproval of criteria by the EPA due to endangered species protection concerns. This would not meet the goals and criteria of the authorizing statute of maintaining the highest possible standards of water quality to ensure the protection of wildlife. We therefore had to consider new science and/or higher protection levels for some aquatic life toxics criteria.

6.3.2 Review new science for all toxics.

We considered reviewing new science for all toxics instead of only updating criteria that have been demonstrated to not be protective of Washington endangered species and their populations. States typically rely on EPA to update their Clean Water Act recommendations using new science. However, EPA has not updated some criteria for several years and Endangered Species Act consultation in the Northwest suggests that EPA recommendations are not always adequate for protection of endangered species and their populations. In these instances, we applied an alternative derivation method that protects 99 percent of genera

when new science alone was not adequate to protect endangered species. Using only new science as recommended by the EPA for every criterion would not meet the goals and criteria of the authorizing statute of maintaining the highest possible standards of water quality to ensure the protection of wildlife and would result in adopted criteria not likely to be approved during ESA consultation for some criteria with jeopardy calls. Furthermore, the burden to update EPA's CWA national recommendations is not the states'. Thus, we only updated criteria that present concerns for endangered species protection in Washington.

6.3.3 Apply new science for all toxics and the 1st percentile of toxicity data distribution for toxics that do not meet ESA requirements.

We considered applying both new science and the 1st percentile of the toxicity data distribution for all toxics that do not meet ESA requirements. This alternative would provide full protection but is not necessary because only a select number of EPA's criteria are not protective of endangered species and their populations in Washington and adopting EPA recommendations for those that are protective meets Clean Water Act requirements. Updating criteria for toxics that are not currently considered harmful to aquatic life and are consistent with CWA recommendations would potentially result in lower criteria that would put an undue burden on dischargers that receive water-quality based limits. Furthermore, incorporating new science into the criteria often satisfied protection levels necessary for endangered species and their populations and therefore, applying the 1st percentile method was not required in all instances. The burden to update EPA's CWA recommendations is not the states'. Rather, we updated select toxics to protection levels deemed necessary to protection Washington endangered species and their populations.

6.3.4 Not update aquatic life toxics criteria.

We considered not updating the aquatic life toxics criteria, however, previous litigation with the EPA resulted in a settlement agreement that EPA evaluate Washington's criteria to determine if their aquatic life toxics criteria are consistent with the Clean Water Act. A determination was made for a subset of criteria that we are inconsistent with the Clean Water Act and future evaluations would occur in 2024. Not moving forward with this rulemaking would subject us to EPA promulgation of federal criteria. Some federal criteria would not be approved through Endangered Species Act consultation and therefore, EPA would need to develop state-specific criteria for Washington. Remaining inconsistent with the Clean Water Act would not meet the goals and criteria of the authorizing statute of RCW 90.48 maintaining the highest possible standards of water quality to ensure the protection of wildlife.

6.3.5 Criteria levels reflected in the rule proposal

We considered alternative criteria limits during the CR102 proposal phase (See Publication 24-10-009 for values) of this rulemaking for:

- Arsenic (saltwater acute and chronic)

- Copper (freshwater acute and chronic)
- Chromium III (freshwater acute and chronic)
- Chromium VI (freshwater chronic)
- Nickel (freshwater acute and chronic)
- Silver (freshwater acute and chronic)
- Zinc (freshwater acute and chronic)
- 6PPDQ (freshwater acute)
- Cyanide (freshwater acute and chronic)
- Pentachlorophenol (freshwater acute and chronic)

In response to new science and information that emerged between the proposal and adoption phase of the rulemaking, we determined that some of these limits either did not meet the goals and objectives of the rule because they did not reflect updated science and information. Other criteria were revised upward on account of new science and in turn this reduce compliance burden (whilst still meeting goals and objectives of the rule). Final values for these criteria can be found in Chapter 2 of the Final Regulatory Analysis, and additional discussion in the Concise Explanatory Statement (CES) (24-10-033).

6.4 Conclusion

After considering alternatives, within the context of the goals and objectives of the authorizing statute, we determined that the adopted rule represents the least-burdensome alternative of possible rule requirements meeting the 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 adopted 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 adopted 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 adopted 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 adopted rule amendments, based on the costs estimated in Chapter 3 of this document. In this section, we estimate compliance costs per employee.

The average affected small business likely to be covered by the adopted rule amendments employs about 19 people. The largest ten percent of affected businesses employ an average of 4,622 people. These estimates were generating by cross referencing permit addresses with Dun and Bradstreet data on global employment.[87] Based on cost estimates in Chapter 3, we estimated the following compliance costs per employee over a 20-year horizon.

[87] https://www.dnb.com/

Table 12: Compliance costs over 20-year horizon

Type of cost (or total cost)	Small Businesses	Largest 10% of Businesses
Average employment	19	4,622
Compliance costs per entity (low)	$ 17,256	$ 218,818
Compliance costs per entity (high)	$ 53,089	$ 667,621
Cost per employee (low)	$ 889	$ 47
Cost per employee (high)	$ 2,736	$ 144

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

7.3 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 adopted 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.

Modifying regulatory requirements, changing reporting requirements, reducing the frequency of inspections, delaying compliance timetables, or modifying fine schedules would not meet statutory objectives or are not feasible and within the scope of this rulemaking.[88] This

[88] The Preproposal Statement of Inquiry (often referred to as the "CR-101") form discusses the rulemaking scope. https://ecology.wa.gov/getattachment/ad55ad81-0ae6-49f8-8be9-abe698752adf/WSR-22-14-001.pdf

rulemaking was initiated specifically to amend WAC 173-201A-240 aquatic life toxics criteria (and make necessary supporting changes), while not amending other aspects of requirements and implementation of broader surface water quality standards.

It was not feasible in the adopted rule amendments to directly mitigate disproportionate impacts to small businesses, however, multiple elements of the baseline rule already in place serve to mitigate compliance costs for small businesses:

- WAC 173-224-090 may reduce fees for all small businesses holding or applying for a state waste discharge or NPDES permit issued by Ecology.
- WAC 173-224-090 allows small businesses to receive a fee reduction of fifty percent, but not less than the minimum permit fee of $150, if they are determined to be eligible under the following criteria:
    1. Be a corporation, partnership, sole proprietorship, or other legal entity formed for the purpose of making a profit;
    2. Be independently owned and operated from all other businesses (i.e., not a subsidiary of a parent company);
    3. Have annual sales of $1,000,000 or less of the goods or services produced using the processes regulated by the waste discharge or individual stormwater discharge permit (we identified 605 small business permittees in Washington that meet this definition); and
    4. Have an original annual permit fee assessment totaling $500 or greater.
- In addition to the small business fee reduction, any small business with annual gross revenue totaling $100,000 or less from goods and services produced using the processes regulated by the discharge permit may apply for an extreme hardship fee reduction. If the permit holder is determined eligible, the annual permit fee is reduced to the minimum annual permit fee of $150.

7.4 Small business and government involvement

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

- Public webinars in October 2022, April 2023, and October 2023.
- Public workshop with Q&A on the proposal in March 2024
- Tribal webinars in April 2023 and October 2023.
- Presentations to Northwest Indian Fisheries Commission, Coalition for Clean Water, Puget Sound Partnership, and Washington State Water Resources Association.

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

Based on our analysis in Chapter 3, businesses that hold permits potentially affected by the adopted rule fall within the following industry categories. Note that associated NAICS codes and definitions are discussed further at https://www.census.gov/naics/.

Table 13 Industries and their associated NAICS codes that are impacted by the rule.[89]

NAICS Code	Description
111x	Crop Production
112x	Animal Production and Aquaculture
113x	Forestry and Logging
114x	Fishing, Hunting and Trapping
221x	Utilities
236x	Construction of Buildings
237x	Heavy and Civil Engineering Construction
238x	Specialty Trade Contractors
311x	Food Manufacturing
312x	Beverage and Tobacco Product Manufacturing
314x	Textile Product Mills
321x	Wood Product Manufacturing
322x	Paper Manufacturing
324x	Petroleum and Coal Products Manufacturing
325x	Chemical Manufacturing
326x	Plastics and Rubber Products Manufacturing
327x	Nonmetallic Mineral Product Manufacturing
331x	Primary Metal Manufacturing
332x	Fabricated Metal Product Manufacturing
333x	Machinery Manufacturing
334x	Computer and Electronic Product Manufacturing
335x	Electrical Equipment, appliance, and Component Manufacturing
336x	Transportation Equipment Manufacturing
337x	Furniture and Related Product Manufacturing

[89] The x in the 4-digit NAICS codes listed in the table represent subcategories within the NAICS codes that are described. The analysis was done using 6-digit NAICS codes.

NAICS Code	Description
339x	Miscellaneous Manufacturing
423x	Merchant Wholesalers, Durable Goods
424x	Merchant Wholesalers, Nondurable Goods
441x	Motor Vehicle and Parts Dealers
444x	Building Material and Garden Equipment and Supplies Dealers
445x	Food and Beverage Retailers
455x	General Merchandise Retailers
457x	Gasoline Stations and Fuel Dealers
458x	Clothing, Clothing Accessories, Shoe, and Jewelry Retailers
459x	Sporting Goods, Hobby, Musical Instrument, Book, and Miscellaneous Retailers
481x	Air Transportation
482x	Rail Transportation
484x	Truck Transportation
485x	Transit and Ground Passenger Transportation
488x	Support Activities for Transportation
492x	Couriers and Messengers
493x	Warehousing and Storage
522x	Credit Intermediation and Related Activities
524x	Insurance Carriers and Related Activities
531x	Real Estate
532x	Rental and Leasing Services
533x	Lessors of Nonfinancial Intangible Assets (except Copyrighted Works)
541x	Professional, Scientific, and Technical Services
561x	Administrative and Support Services
562x	Waste Management and Remediation Services
621x	Ambulatory Health Care Services
624x	Social Assistance
713x	Amusement, Gambling, and Recreation Industries
722x	Food Services and Drinking Places
811x	Repair and Maintenance
928x	National Security and International Affairs

7.6 Loss of sales or revenue and impacts on jobs

Businesses that would incur costs could experience reduced sales or revenues if the adopted 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. Finally, overall shifts in economic activity in the state, including competition within markets and attributes of the labor market simultaneously adjust in response to changes in compliance costs.

Similarly, employment within directly impacted industries, other industries in Washington, the labor market within and outside of the state, and in the state as a whole would also adjust in response to a change in costs.

We used the REMI E3+ model for Washington State to estimate the impact of the adopted rule amendments on directly affected markets, accounting for dynamic adjustments throughout the economy. The model accounts for variables including but not limited to: inter-industry impacts; price, wage, interstate and international trade, and population or labor market changes; and dynamic adjustment of all economic variables over time.

The results of the REMI E3+ model shows that the rule would impact a variety of industries (see Table 14 below), costing the Washington economy an estimated range between $19 million to $58 million in annual output at its peak (total amount of goods and services produced by Washington businesses) across all sectors.[90] For reference, in the first quarter of 2023, Washington state's annual GDP was estimated at $761 billion.[91] In percentage terms, this impact amounts to 0.003% and .008% of GDP for low and high estimates respectively.

Output losses are projected to begin in 2025 following the adopted rule implementation and increase as permits become renewed. These amount to a loss of roughly $6 million in the low-cost and high-cost scenario in the first year of the rule and increase to $19 million and $58 million for the low- and high-cost scenarios, respectively by 2030. Output losses slowly decrease after 2030, and by 2045 the output loss is projected to have declined under the low and high-cost scenarios to $2 million and $8 million, respectively.

Retail trade and construction is impacted the most among all industries, accounting for 14% to 18% each of the total output loss in high and low scenarios, followed by wholesale trade, real estate, and state and local government. Note that it is not unusual for the construction and retail industries to have high projected impacts from a rule as they are often quite sensitive to

[90] Range based on alternative options for capital improvements and criteria testing frequency, among other factors.

[91] GDP by State | U.S. Bureau of Economic Analysis (BEA)

any changes to the market in REMI models. The rule also impacts a breadth of affected industries, many of which indirectly support retail and construction activities.

Table 14: Modeled low-cost economic impacts to output (millions of $)

Industry	2025	2030	2035	2045
Whole state	-6	-19	-4	-2
Retail trade	-1	-2	0	0
Construction	-1	-2	0	0
Wholesale trade	-1	-2	-1	0
Real estate	-1	-2	0	0
State and Local Government	0	-1	0	0

Table 15: Modeled high-cost economic impacts to output (millions of $)

Industry	2025	2030	2035	2045
Whole state	-6	-58	-15	-8
Construction	-1	-7	0	0
Retail trade	-1	-7	-2	-1
Wholesale trade	-1	-6	-2	-1
Real estate	-1	-6	-1	0
State and Local Government	0	-3	-1	-1

The adopted rule would result in transfers of money within and between industries, as compared to the baseline. The modeled impacts on employment are the result of these transfers and the way in which REMI projects these transfers to be utilized within the broader economy as well as changes to prices and other economic variables across all industries in the state. REMI results project an immediate state-wide loss of 31 full-time equivalent positions (FTEs) under the low-cost scenario and 32 in the high-cost scenario in the year 2025. This loss increases over the next two years, peaking in 2030 with a projected loss of 92 and 282 FTEs, under the low-cost and high-cost scenarios, respectively. The statewide loss in FTEs is lessened after 2030 such that in 2045 the statewide projected loss is reduced to 6 FTEs in the low-cost scenario, and 23 FTEs in the high-cost scenario in 2045.

Industries that are most impacted are listed in Table below. The construction sector is projected to be the most heavily impacted industry, accounting for about 17% of the FTE loss from this rule statewide in 2030. Closely related to sensitivities in economic output discussed above, it is not unusual for the construction industry to have high projected job impacts from a rule as the construction industry is often quite sensitive to any changes in the market in REMI models. The next 4 sectors most heavily impacted in terms of projected job loss are retail trade, state and local government, wholesale trade, and real estate. While some of these sectors may not be as directly impacted from the rulemaking as others, note that the REMI model is sensitive to reductions in population growth compared to baseline, potentially leading to lower demand for retail goods, public services, and housing.

Table 16: Low-cost impacts on Jobs (FTEs)

Industry	2025	2030	2035	2045
Whole state	-31	-92	-14	-6
Construction	-6	-15	2	1
Retail trade	-4	-10	-1	0
State and local government	-2	-6	-2	-1
Wholesale trade	-2	-5	-1	0
Real estate	-2	-5	-1	0

Table 17: High-cost impacts on Jobs (FTEs)

Industry	2025	2030	2035	2045
Whole state	-32	-282	-56	-23
Construction	-6	-50	1	2
Retail trade	-4	-30	-5	-2
State and local government	-2	-18	-8	-4
Wholesale trade	-2	-16	-5	-2
Real estate	-2	-14	-2	-1

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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

Review is overseen by an independent third party.

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Internal peer review

Review by staff internal to Ecology.

n/a

External peer review

Review by persons that are external to and selected by Ecology.

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.

40 CFR Section 122

Chapter 173-200 WAC: Water quality standards for groundwaters of the state of Washington.

Chapter 173-201A WAC: Water quality standards for surface waters of the state of Washington.

Chapter 173-204 WAC: Sediment management standards.

Chapter 173-224 WAC: Water quality permit fees.

Chapter 173-226 WAC: Waste discharge general permit program.

Chapter 90.48 RCW: Water Pollution Control.

Independent data

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Records of the best professional judgment of Ecology employees or other individuals.

N/A

Other

Sources of information that do not fit into other categories.

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.

a) Adopt EPA recommendations for all chemicals and don't address endangered species concerns

b) Review new science for all toxics

Reviewing new science for all toxics would be a heavy burden of time and resources that is beyond the scope of this rule. States rely on EPA to update their Clean Water Act recommendations using new science. States typically follow EPA Clean Water Act recommendations for aquatic life criteria. However, EPA has not updated some criteria for several years and endangered species act consultation in the Northwest suggests that EPA recommendations are not adequate. Out of necessity for full protection of Washington aquatic species, we updated those criteria that have demonstrated not be protective in Washington but not all toxics. Furthermore, this alternative may not completely protect endangered species because new science was not adequate to protect endangered species for all chemicals and result in a disapproval for some criteria. In these instances, we applied an alternative derivation method that protections 99 percent of the species 99 percent of the time when new science alone was not adequate to protect endangered species. This alternative derivation method is not considered in this option.

c) Review new science for <u>all</u> toxics and apply 99th percentile for toxics not meeting ESA requirements while disregarding outdated EPA recommendations

Reviewing new science for all toxics would be a heavy burden of time and resources that is beyond the scope of this rule. States rely on EPA to update their Clean Water Act recommendations using new science. States typically follow EPA Clean Water Act recommendations for aquatic life criteria. However, EPA has not updated several criteria for over two decades and Endangered Species Act consultation in the Northwest suggests that EPA recommendations are not adequate for endangered species in WA. Out of necessity for full protection of Washington aquatic species, we updated those criteria that have demonstrated not be protective in Washington. This alternative would provide full protection but would be burdensome in that updating all criteria using new science is not

necessary because only a select number of criteria are not protective of endangered species. Many of EPA recommendations are consistent with the Clean Water Act requirements and thus, updating all toxics is not necessary. This alternative would extend this rulemaking timeline significantly, require additional resources, and potentially result in lower criteria that would put an undue burden on dischargers that receive water quality-based limits. Updating aquatic life toxics do not typically fall on states.

d) Do not update aquatic life toxics criteria.

There was litigation with EPA that resulted in a settlement agreement that EPA evaluate Washington's criteria to determine if their aquatic life toxics criteria are consistent with the Clean Water Act. A determination was made for a subset of criteria that we are inconsistent with the Clean Water Act and future evaluations will occur in 2024. Not moving forward with this rulemaking would subject us to EPA promulgation of federal criteria. Some federal criteria would not be approved through Endangered Species Act consultation and therefore, EPA would need to develop state-specific criteria for Washington.

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.

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

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. The revisions will help EPA with their obligations in litigation.

Appendix B: Additional Tables and Figures

In Table 16:

- A Yellow X highlights marks criteria that were set (for new criteria) or changed in the rulemaking to meet EPA recommendations. These remain in this PRA's Baseline.
- A Green Y indicates this PRA's scope—where changes in criteria were made beyond EPA recommendations for the ESA concerns or new state-specific science.
- Blank cells represent no substantive updates as a result of this rulemaking, shown with a "--".
- Criteria with no substantive updates as a result of this rulemaking, across all water categories, are not presented in the table below.

Table 16 Analytical Scope and Effective Differences Between Baseline and Rule for Metals

Criteria	FW Acute	FW Chronic	SW Acute	SW Chronic	Beyond Quantitation Limit?	FW Acute Diff	FW Chronic Diff	SW Acute Diff	SW Chronic Diff
Arsenic	Y	Y	--	--	--	-60	-60		
Cadmium	Y	Y	X	X	--	-2.4	-0.59	--	--
Chromium (III)	Y	Y	--	--	--	-80	-119	--	--
Chromium (VI)	Y	Y			FW Chronic	3	-3.3	--	--
Copper	Y	Y	--	--	--	NA	NA	--	--
Nickel	Y	Y	--	--	--	-1357	-146	--	
Selenium	X	X	--	--	--	--	--	--	--
Silver	Y	Y	Y	Y	--	-2.68	New	0.4	New
Zinc	Y	Y	--	--	--	-46	-81	--	--

Table 17. Analytical Scope and Effective Differences Between Baseline and Rule for Other Chemicals

Criteria	FW Acute	FW Chronic	SW Acute	SW Chronic	Beyond Quantitation Limit?	FW Acute Diff	FW Chronic Diff	SW Acute Diff	SW Chronic Diff
Acrolein	X	X		--	--	--	--	--	--
Aldrin	X	--	X	--	--	--	--	--	--
Carbaryl	X	X	X	--	--	--	--	--	--
Cyanide	Y	Y	--	--	FW Chronic	-13.8	-3.3	--	--
Demeton	--	X	--	X	--	--	--	--	--
Diazinon	X	X	X	X	--	--	--	--	--
Dieldrin	X	X	X	X	--	--	--	--	--
Endrin	X	X	X	X	--	--	--	--	--

Criteria	FW Acute	FW Chronic	SW Acute	SW Chronic	Beyond Quantitation Limit?	FW Acute Diff	FW Chronic Diff	SW Acute Diff	SW Chronic Diff
Guthion	X	--	X	--	--	--	--	--	--
Hexachlorocyclohexane	X	--	X	--	--	--	--	--	--
Malathion	X	--	X		--	--	--	--	--
Methoxychlor	X	--	X	--	--	--	--	--	--
Mirex	X	--	X	--	--	--	--	--	--
6PPD-quinone	Y	--	--	--	N/A	New	--	--	--
Pentachlorophenol (PCP)	Y	Y	Y	Y	N/A	-9	-7.6	--	-1.2
Perfluorooctane sulfonic acid (PFOS)	Y	Y	Y	--	New	New	New	--	--
Perfluorooctanoic acid (PFOA)	Y	Y	Y	--	New	New	New	--	--
Tributyltin	X	X	X	X	--	--	--	--	--

Table Note:

[1] Criteria values that were previously able to be quantified would no longer be able to be quantified using approved analytical methods. When permit limits are developed based on aquatic life numeric criteria, analytical test methods cannot always quantify the chemical at concentration as low as the criteria. In these instances, the quantitation limit is used to evaluate compliance because it is the lowest level that Ecology can quantitatively measure a chemical using approved analytical test methods.

[2] Represents the difference between rulemaking and baseline values. Where quantitation limits are exceeded, this number represents the difference between the quantitation limit and the baseline. Based on PARIS query, there is no information currently available on whether permit holders would be out of compliance by acute or chronic criteria. Since there are no quantitation concerns over acute criteria for criteria in the analytical scope, and acute values exist alongside chronic, we assume quantitation limits would have limit impact for the purposes of this analysis.

Table 18. Maximum Corrective Potential by Permit-Criteria

Permit Type	Criteria	Potential Violations	Estimated Level 1	Estimated Level 2	Estimated Level 3
Boatyard GP	Copper	8	7	1	0
Boatyard GP	Zinc	5	4	1	0
Construction SW GP	Cadmium	1	1	0	0

Permit Type	Criteria	Potential Violations	Estimated Level 1	Estimated Level 2	Estimated Level 3
Construction SW GP	Copper	2	2	0	0
Construction SW GP	Zinc	1	1	0	0
Industrial SW GP	Copper	334	270	51	13
Industrial SW GP	Zinc	427	256	136	35
Industrial SWDP IP	Arsenic	2	2	n/a	n/a
Industrial SWDP IP	Cadmium	20	20	n/a	n/a
Industrial SWDP IP	Copper	36	36	n/a	n/a
Industrial SWDP IP	Cyanide	16	16	n/a	n/a
Industrial SWDP IP	Nickel	27	27	n/a	n/a
Industrial SWDP IP	Silver	17	17	n/a	n/a
Industrial SWDP IP	Zinc	38	38	n/a	n/a
Industrial NPDES IP	Arsenic	2	2	n/a	n/a
Industrial NPDES IP	Cadmium	1	1	n/a	n/a
Industrial NPDES IP	Copper	12	12	n/a	n/a
Industrial NPDES IP	Cyanide	1	1	n/a	n/a
Industrial NPDES IP	Nickel	2	2	n/a	n/a
Industrial NPDES IP	Pentachlorophenol	4	4	n/a	n/a
Industrial NPDES IP	Silver	1	1	n/a	n/a
Industrial NPDES IP	Zinc	14	14	n/a	n/a
Total	n/a	971	734	189	48

Appendix C: Level 3 Corrective Actions

As stated in Section 3.2.4, Level 3 corrective actions include some or all of the following:

- catch basin inserts with metalzorb,
- biofiltration,
- bioretention,
- enhanced chitosan treatment,
- flocculation,
- filtration,
- or any combination of these.

Level 3 corrective actions for copper and zinc are extremely variable and site specific and depend on many qualifying variables, including, but certainly not limited to:

- What is the site surface – dirt, gravel or hard surface?
- How much square footage is being treated and what are the flow rates?
- Does the site have one or multiple discharge points?
- Are they using a passive or active treatment approach?
- Is the property of the permittee leased or owned?
- What is the source of the Cu? Can it be managed with source control BMPs or do they need treatment?
- As with most treatment systems the major cost is infrastructure improvements and constructability. There is a huge difference in someone dropping a catch basin insert in Cu removing media to someone investing in a 500 GPM ATS system.
- What natural state is the Cu in -dissolved or adhered to the sediment?
- If they were under benchmark before and then trigger a new Level 3 would be different than someone already in a Level 3 with a technology that needs to be amended to meet a lower standard.

Implementation of these treatment systems typically includes pollutant source investigations, preliminary alternatives analyses, pre-design activities (e.g., site surveys, pipe condition assessments, geotechnical investigations), engineering design and production of plans and specifications, permitting, and construction. These steps are also extremely variable and site specific.

In a general example, we made the following assumptions:

- Cu benchmark goes from 14 to 7 ug/L.
- Facility has one discharge point and no construction of infrastructure is required (no additional permitting, electrical, plumbing, structural reinforcement, etc) – Construction can be as little as 50% to as much as 2x multiplier of equipment capitalization cost with

all the permitting, construction materials, labor, etc. – comprising significant expense and time consumption for sites. If shutdown is necessary during construction, facilities may need to reduce or lose revenue-generating operations during that time.

- The site is all paved.
- Pollutant concentration is generally consistent and there are no large spikes of turbidity or TSS or change in pH.
- Relatively small site (less than 3 acres).
- Site is doing treatment for the first time (not amending and existing onsite treatment).
- They are not paying a consultant or engineer on a routine basis and they are managing the permit in-house.
- No costs are associated to loss of employee production to the company to respond to stormwater operations or hiring stormwater focused FTE.

Which yields the following cost estimates:

Table 19: Cost Estimates for level 3 corrective actions.

Cost Type	**Cost Range Estimate**	**Built in estimates to range**
Permit paperwork compliance – reports, engineering support, etc	$3-10K – upfront $1500 - $5 per year ongoing	Engr - $225-300/hr Other considerations – Treatability or treatment feasibility study, does the treatment achieve benchmark in first year
Good Housekeeping and Source Control – preventative maintenance, abatement coatings, increased sweeping, etc.	$3-8K per year	Vac truck - $500-600 per hr with 3 hr min + disposal (Capitalized - $250K for a junker $400K for top of line) Sweeper - $65-125 hr (Capitalized - $100K for poor quality $250K for top of line) Employee education and training Resurfacing of roofs or drivable surfaces
Passive Treatment: Media treatments – Downspout filters, bioretention facilities, CB Inserts with biochar, ion exchange, carbon or blended media	$5-150K upfront $2500 - $50k/per media replacement	Grattix box of enhanced media is about $2-3K Metals removal filters for WA - $1200-2000 per basin Blended media mixes - $150-200 per yard - I don't think I have a good sense of this cost right now – I think these are old considerations

Cost Type	Cost Range Estimate	Built in estimates to range
Active Treatment Flow through technology	50-250 GPM system $200-350K $15-100K per year of O&M –	Depends on technology, media, chemistry used, pretreatment storage, automations, operations, contact time requirements, etc. Consumables – power Operations – staff time, automations, etc. Chemistry - $800-2500 mo Media change-out: $470/filter pod/mo was an estimate for media replacement a 100 GPM System (3 pods) to address metals Maintenance and repair

A rough generalization is a $250k capital investment plus construction cost for a 250 GPM system.

Appendix D: Potential Effects on MTCA Cleanups of Contaminated Sites

The adopted rule amendments to aquatic life toxics criteria might impact some cleanups of contaminated sites where releases of hazardous substances impact, or are likely to impact, surface water (usually by migration through soil and groundwater). The adopted rule will generally not affect sites that were contaminated but have completed cleanup (WAC 173-340-702(12)(c))).

Background

Under the Model Toxics Control Act (MTCA) Cleanup Regulations, Chapter 173-340 WAC, the cleanup of a contaminated site must comply with cleanup standards for hazardous substances (cleanup levels and points of compliance) established for the site in each impacted environmental media (WAC 173-340-360(3)(a)(ii)). For surface water, a cleanup level must be at least as stringent as all the following:

- **Concentrations established under applicable state and federal laws**, including:
    - State water quality criteria in Chapter 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington.
    - Federal water quality criteria applicable to Washington state in 40 C.F.R. Section 131.45.
    - Federal water quality criteria based on the protection of aquatic organisms (acute and chronic criteria) and human health published under section 304 of the Clean Water Act, unless it can be demonstrated that such criteria are not relevant and appropriate for a specific surface water body or hazardous substance.
- **Concentrations that protect human health.**
    - For hazardous substances for which health-based concentrations have been established under applicable state and federal laws, the most stringent of those concentrations is used. If the most stringent concentration exceeds a cancer risk 1 in 100,000 (1 x 10-5) or the hazard quotient exceeds one (1), then the concentration needs to be adjusted downward to those risk levels using the equations provided in the regulation.
    - For hazardous substances for which health-based concentrations have not been established under applicable state and federal laws, a protective concentration must be calculated using the equations provided in the regulation.
- **Concentrations that protect the environment.**

- For hazardous substances for which environmental effects-based concentrations have been established under applicable state and federal laws, the most stringent of those concentrations is used.
- For hazardous substances for which environmental effects-based concentrations have not been established under applicable state and federal laws, a protective concentration must be established as provided in the regulation.

- **Concentrations based on drinking water beneficial uses, if surface water is classified as suitable for a domestic water supply.**
- If surface water is classified as suitable for use as a domestic water supply under state law (chapter 173-201A WAC), then the cleanup level must be at least as stringent as the potable groundwater cleanup level established under WAC 173-340-720 to protect drinking water beneficial uses.

See WAC 173-340-730. For additional explanation of how cleanup surface water cleanup standards are established under MTCA, see Ecology's Focus Sheet on Developing Surface Water Cleanup Standards under the Model Toxics Control Act, Publication No. 01-09-050.

Soil and groundwater cleanup levels must prevent exceedances of the surface water cleanup levels (WAC 173-340-720(1)(c), 173-340-740(1)(d), and 173-340-745(2)(c)).

Amended ALT criteria that could affect cleanups

An amended ALT criteria for a hazardous substance could only affect the cleanup of a contaminated site if it is the most stringent concentration used to establish a cleanup level for that substance under WAC 173-340-730. We determined that the amended ALT criteria for the following substances are the most stringent concentrations applicable to establishing surface water cleanup levels, and therefore could affect a cleanup:

- Cadmium (freshwater chronic)
- Chromium III (freshwater chronic)
- Copper (freshwater chronic)
- Cyanide (freshwater chronic)[92]
- Nickel (freshwater chronic)
- Silver (freshwater chronic)
- Zinc (freshwater chronic)

[92] Note that the amended ALT criteria for cyanide of 1.9 ug/l is below the practical quantitation limit (PQL) of 5 ug/l, which has previously been used at sites. The PQL is slightly below the old criteria of 5.2 ug/l. Surface water cleanup levels must be adjusted upward to the PQL (WAC 173-340-730(5)(c)). So the effect of the amended ALT criteria on cleanup levels may be limited.

In addition, we determined that we could not assess the effect of the amended ALT criteria for the following emerging contaminants because surface water cleanup levels for those contaminants are still being developed:

- 6-PPD-Quinone
- PFOS and PFOA

Evaluation of potential effect of more stringent ALT criteria on cleanups

Even if an amended ALT criteria affects the surface water cleanup level for a hazardous substance at a contaminated site, the potential effect of that change on the cleanup is highly site-specific and dependent on numerous factors. An amended ALT criteria would be more likely to affect the cleanup of a contaminated site if:

- **The hazardous substance is an indicator hazardous substance driving the cleanup;**

  A site may be contaminated by many hazardous substances (such as metals), which pose different threats to human health and the environment. We note that metals, in particular, tend to be co-located at contaminated sites. Hazardous substances posing a greater threat due to their toxicity, mobility, persistence, or frequency/location usually drive the cleanup. Changes to the cleanup levels of non-indicator hazardous substances may not have any effect on the cleanup.

- **The change to the cleanup level for the hazardous substance affects the extent of cleanup needed; and**

  Even if the hazardous substance is an indicator hazardous substance, the effect of the change is dependent on the degree of the change and whether that change could affect the extent of cleanup. Small changes to cleanup levels might not have any effect on the cleanup.

- **The change to the cleanup level affects the cleanup action selected for the contaminated site based on a disproportionate cost analysis.**

  Even if the change in cleanup level affects the extent of cleanup needed, the effect of the change still significantly depends on the cleanup action selected based on the feasibility study of cleanup action alternatives, which includes consideration of relative costs and benefits.

  At the end of that study, one must conduct an evaluation to determine which of the remaining alternatives (that meet all other cleanup action requirements) is permanent to the maximum extent practicable. A disproportionate cost analysis (DCA) is used to conduct that evaluation. The DCA involves a comparison of the relative costs and benefits of successively less permanent pairs of cleanup action alternatives. The costs

and five benefit criteria that must be considered in the DCA are specified in the rule. See WAC 173-340-360(3)(a)(x) and (5).

Based on a DCA, a change in a cleanup level does not necessarily result in an increase in costs. Such a change could ultimately result in the selection of a cleanup action that is either more costly, less costly, or has a different distribution of costs over time. For example, a lower (more stringent) cleanup level could make a more permanent alternative that relies on destruction (such as treatment) less cost-effective compared to a less permanent alternative that relies on containment. Likewise, a lower cleanup level could make a permanent alternative that relies more on active measures with shorter restoration time frames (such as treatment) less cost-effective compared to a permanent alternative that relies more on passive measures with longer restoration time frames (such as monitored natural attenuation).

It is not reasonable for Ecology to speculate on the potential costs of all future cleanups of contaminated sites where the specified amended ALT criteria may potentially affect the cleanup. Nor is it feasible or required to perform DCAs for all such sites as part of this rulemaking. Such analyses are dependent on the performance of site-specific remedial investigations for each site. A forecast of future costs would also be complicated by the changing nature of contamination and scientific understanding over time (e.g., legacy industrial contamination with historically significant contaminants vs. emerging contaminants from diverse or distributed sources).

Qualitative Benefits

Since Ecology cannot directly predict behaviors that would change for future cleanup sites under the proposed rule, and therefore cannot quantify benefits directly.

However, to the degree that the adopted rule leads to additional remediation and improved aquatic life habitat compared to baseline, is one degree to which additional benefits from the rule would accrue (see chapter 4 for general discussion of the social value of water quality improvements with respect to aquatic life). Contaminated sites required to take additional action in the future, compared to baseline, could generate community benefits through increased property value, and lower exposures to contaminants while living, working on, or visiting contaminated sites.

Quantitative and additional qualitative estimates of site-specific benefits would be determined at the time of a DCA.