DEPARTMENT OF
ECOLOGY
State of Washington

# Final Cost-Benefit and Least-Burdensome Alternative Analyses

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

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# Final Cost-Benefit and Least-Burdensome Alternative Analyses

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


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# Department of Ecology Determination

The Administrative Procedures Act requires state agencies to conduct a Cost Benefit Analysis (CBA) to determine if the probable benefits resulting from a rule outweigh its probable costs. Based on analysis by our economist (attached) it is not clear whether the actual environmental benefits of this rule will exceed the costs.

The state Administrate Procedures Act, RCW 34.05.328(1)(d), directs Ecology to consider qualitative and quantitative benefits and costs, as well as "the specific directives of the statute being implemented." The statute being implemented in this case is 90.48 RCW, in which the state legislature has directed Ecology to "preserve and vigorously exercise 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 90.48.010. Maintaining state control over the development of water quality standards for the State of Washington is a significant, qualitative benefit to the State consistent with the directive of the APA.

In the absence of a state developed rule, EPA is required to adopt a rule for the state. The Environmental Protection Agency is currently being challenged in federal court to adopt human health criteria for Washington State. Based on the rule that EPA has put out for public review it is likely that a considerable number of the criteria will be lower (more stringent) than the state-developed rule and will therefore be at least as costly to implement as the state developed rule. The costs described in the CBA, while accurate and appropriate for their purpose, do not consider the unavoidable costs associated with suspending the state rule. Considered in this broader context, there is no net additional cost of a state rule.

Given the broader context and the directives of the statute being implemented, the Department of Ecology is making the determination that the probable benefits of the human health criteria adopted by Ecology are greater than the probable costs.

# Executive Summary

The Washington Administrative Procedure Act (APA; RCW 34.05.328) 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."

The APA also requires Ecology to "determine, after considering alternative versions of the rule…that the rule being proposed 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 173-201A WAC, Water Quality Standards for Surface Waters of the State of Washington establishes human health criteria (HHC) that must be met to comply with Washington's water quality standards. The rule amendments:

- Update the scientific values for:
    - Toxicity factors – reflecting current research
    - Body weight representative of current population mean – 80kg, up from 70kg
    - Drinking water intake – 2.4 L/day
- Change the level of protectiveness:
    - Fish consumption rate – 175 g/day, up from 6.5 g/day
- Do not change the excess cancer risk level of one in one million from the previous rule.
- Do not change polychlorinated biphenyl (PCB) criteria from current National Toxics Rule (NTR) levels
- Set the arsenic criteria to the Safe Water Drinking Act regulatory level

The rule also updates implementation tools that can be used to meet Washington water quality standards:

- Removing the time limit on compliance schedules
- Allowing intake credits where there is no net addition of pollutants
- Establishes a public, technical, and timed process for variances

Analyzing the HHC, using existing data and sampling techniques, Ecology expects the following from the rule amendments:

**Likely costs**

- Two industrial facilities may incur additional unquantifiable costs:
    - Costs of compliance actions if action required to comply with Hazardous Waste regulations was insufficient to also meet the amended HHC.
    - Costs of compliance actions if a facility chooses to continue operations rather than curtailing them.
- Quantifiable capital cost to facilities to comply with amended standards for phthalates: $10.6 thousand
- Unquantifiable costs of Cleanup Action Plan implementation, and compliance schedule or variance acquisition costs if the amended HHC cannot be met using the Cleanup Action Plan.
- Possible unquantifiable sampling and testing costs, as well as costs of more stringent requirements and BMPs at some in-water construction sites seeking Section 401 Certification, if Ecology determines turbidity is not a sufficient proxy for the likelihood of contaminating the water column.
- Possible incremental cleanup costs to some sediment cleanup sites, determined on a site-specific basis.
- Potential compliance costs to a hypothetical unrepresented discharger, cleanup site, or in-water construction project, to control chemicals not currently observed in samples.

**Likely benefits**

- Unquantifiable positive but likely small reduced cancer risk associated with bis(2-ethylhexyl) phthalate, resulting in reduced:
    - Mortality
    - Treatment costs
    - Income loss
    - Other financial and non-money costs relating to quality of life
- Unquantifiable positive but likely small reduced non-cancer illness risk.
- Potential reduced compliance costs to existing and future dischargers discharging to 57 waterbody assessment units changing from impaired to unimpaired.
- Potential future reduced costs of complying with less stringent HHC for:
    - 23 chemicals in freshwater
    - 11 chemicals in marine waters
- Increased protectiveness against hypothetical future discharges of chemicals not represented in current sampling.
- Retention of the state's ability to develop regulation appropriate for the people and businesses of the state.

Analysis of the implementation tool changes expects:

**Likely benefits**

- A predictable regulatory environment.
- Reduced likelihood of multiple compliance schedules or variance applications.

If, in the future, there are improvements in sampling coverage and sensitivity, this analysis expects:

**Possible costs under improved sampling**

- Equipment capital costs
- Operation and maintenance costs
- Monitoring costs
- Timing costs of interim limitations on chemicals discharged
- Remediation costs

**Possible benefits under improved sampling**

- Avoided property value impacts.
- Cancer risk reductions resulting in reduced mortality.
- Avoided cancer treatment costs.
- Reduced exposure to non-carcinogenic toxic chemicals, reducing risk of experiencing health impacts associated with endocrine disruptors and developmental toxicants.
- Reduced losses to income, debt, and non-pecuniary quality of life measures.
- Preservation of tribal values for cultural, treaty, and maintenance or improvement of tribal lifeways.
- Preservation of general non-use values.
- Reduced animal and plant health impacts from chemicals in the water.
- Prospective co-benefits to nutrition.

# Chapter 1: Introduction and Background

## 1.1 Introduction

This report describes two of the economic analyses performed by the Washington State Department of Ecology ("Ecology") to estimate the costs and benefits, and assess alternatives considered, of the adopted amendments to the Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC). These analyses – the Cost-Benefit Analysis (CBA) and Least-Burdensome Alternative Analysis (LBA) – are based on the best available information at the time of publication.

The Washington Administrative Procedure Act ("APA"; RCW 34.05.328) 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 through 8 of this document describe the costs and benefits of the rule, for a 20-year timeframe of impacts.

The APA also requires Ecology to "determine, after considering alternative versions of the rule…that the rule…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 9 of this document describes that determination.

## 1.2 Description of the rule amendments

The amended rule updates the levels at which toxic pollutants can be present in water and still protect human health. These levels, known as the human health criteria (HHC), are determined using the following Environmental Protection Agency (EPA) HHC equations:

- For Carcinogens:
  - Freshwater criterion = (RL x BW)/(CSF x [DWI + (FCR x BCF)])
  - Marine criterion = (RL x BW)/(CSF x FCR x BCF)
- For Non-Carcinogens:
  - Freshwater criterion = (RfD x RSC x BW)/[DWI + (FCR x BCF)]
  - Marine criterion = (RfD x RSC x BW)/(FCR x BCF)

For the above equations:

- RL: excess cancer risk level. The maximum allowable level of excess cancer.
- BW: body weight. The representative adult body weight for the population, as based on population attributes.

- CSF: cancer slope factor. A toxic-specific number representing the risk of cancer associated with exposure to a carcinogenic or potentially carcinogenic substance. A slope factor is an upper bound, approximating a 95 percent confidence limit, on the increased cancer risk from a lifetime of exposure to an agent by ingestion.
- DWI: drinking water intake. Typical drinking water intake, based on the existing National Toxics Rule (NTR) (EPA, 1992).
- FCR: fish consumption rate.
- BCF: bioconcentration factor. A chemical-specific number representing contaminant uptake.
- RfD: reference dose. A toxic-specific number representing a daily oral exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.
- RSC: relative source contribution. The RSC identifies or estimates the portion of a person's total exposure attributed to water and fish consumption and thereby accounts for potential exposure from other sources such as skin absorption, inhalation, other foods, and occupational exposures.

The adopted rule changes the human health criteria for water quality as follows:

- Updates to scientific values for:
    - Toxicity factors – reflecting current research
    - Body weight representative of current population mean – 80kg, up from 70kg
    - Drinking water intake – 2.4 L/day
- Changes to the level of protectiveness:
    - Fish consumption rate – 175 g/day, up from 6.5 g/day
- Sets the arsenic criteria to the Safe Drinking Water Act regulatory level

This rulemaking does not change:

- Polychlorinated biphenyl (PCB) criteria from baseline NTR levels
- Methylmercury criteria (none set) or change total mercury criteria established by the NTR

The adopted rule updates implementation tools that can be used to meet all Washington water quality standards:

- Removes time limit on compliance schedules
- Allows intake credits where there is no net addition of pollutants
- Establishes a public, technical, and timed process for variances

Each of these changes is described in more detail, and its impacts discussed, in subsequent Chapters of this analysis.

**It is important to note that this rulemaking is changing *real* cancer risk differently for different people, depending on their *real* fish consumption. The rule amendments do not assume *everyone* consumes 175 g/day of fish and shellfish. Similarly, the rule amendments do not assume everyone ingests 2.4 liters/day of water.** Actual likely impacts depend on actual fish consumption behavior.

# 1.3 Reasons for the rule amendments

The Federal Clean Water Act (CWA) directs states, with oversight by the Environmental Protection Agency (EPA), to adopt water quality standards (WQS) to protect the public health and welfare, enhance the quality of water, and serve the purposes of the CWA. Under section 303 of the CWA, states' water quality standards must include at a minimum:

1. Designated uses for all water bodies within their jurisdictions.
2. Water quality criteria sufficient to protect the most sensitive of the uses.
3. An antidegradation policy consistent with the regulations at 40 CFR 131.12.

States are also required to hold public hearings once every three years for the purpose of reviewing applicable WQS and, as appropriate, modifying standards. The results of this triennial review must be submitted to EPA, and EPA must approve or disapprove any new or revised standards. **Section 303(c) also directs the EPA Administrator to promulgate WQS to supersede state standards that have been disapproved, or in cases where the Administrator determines that a new or revised standard is needed to meet CWA requirements.**

As part of the triennial review, Ecology identified a need to adopt new HHC, based on more accurate numbers used in the EPA HHC equations for determining numeric chemical criteria. In this rulemaking, Ecology is adopting inputs and resultant criteria necessary to protect public health, safety, and welfare. Before the adoption of these new HHC, Washington State continued to use federal standards that do not reflect current science on protection from toxic chemicals, as well as past standards for levels of protectiveness of the population.[1]

Ecology also identified a need to update sections of the WQS that direct the implementation of the HHC and other water quality standards. The goal of revising these implementation tools is to provide clear and predictable regulatory requirements to help entities comply with regulatory requirements included in National Pollutant Discharge Elimination System (NPDES) permits, state waste discharge permits, and CWA section 401 water quality certification. The implementation tools also address legislation (RCW 90.48.605) obligating Ecology to amend water quality standards to allow compliance schedules in excess of ten years under certain circumstances for permitted dischargers.

[1] The new HHC cannot be implemented until approved by the EPA.

## 1.4 Document organization

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

- Baseline (Chapter 2): Description of the baseline for comparison in this analysis (what would occur in the absence of the updated rule).
- Rule amendments (Chapter 3): Discussion of the rule amendments adopted.
- Who is prospectively impacted (Chapter 4): Description of determining the entities impacted (positively or negatively) by the rule amendments.
- Likely costs of the rule amendments (Chapter 5): Analysis of the types and size of costs we expect impacted entities to incur as a result of the rule amendments. Costs are qualitative and quantitative.
- Likely benefits of the rule amendments (Chapter 6): Analysis of the types and size of benefits we expect impacted entities to receive as a result of the rule amendments. Benefits are qualitative.
- Costs and Benefits under Improved Sampling (Chapter 7): Discussion of costs and benefits that are likely to occur as a result of the rule amendments, allowing for long-run improvements in sampling and sample sensitivity.
- Cost-benefit summary (Chapter 8): Summary of the complete implications of the rule amendments.
- Least-burdensome alternative analysis (Chapter 9): Analysis of considered alternatives to the contents of the adopted rule.

# Chapter 2: Baseline

## 2.1 Introduction

In this Chapter, we describe the baseline to which the rule amendments are compared. The baseline is the regulatory context in the absence of the rule amendments. Alternately, one can think of the baseline as what the world would look like if Ecology did not adopt these amendments.

**This analysis does not consider proposed EPA human health criteria (HHC) as part of the baseline at this time, as they are not yet finalized.** We note, however, that the inputs to the EPA criteria are largely similar to those underlying the HHC in the amended rule, though they differ in HHC for special cases such as arsenic and PCBs.

The revised state rule becomes effective 31days after the rule adoption. However, the revised state water quality standards must first be approved by EPA to determine that the revisions comply with the federal Clean Water Act before Ecology can use them for federal actions. EPA's Clean Water Act review may require Endangered Species Act (ESA) consultation on portions of the rule revisions that could affect ESA-listed aquatic species. The revised rule language cannot be used for Clean Water Act-based actions until EPA approves the revisions.

EPA can take one of the following courses of action on the state's new rule:

1. Approve within 60 days of submittal
2. Disapprove within 90 days of submittal
3. Partially approve or partially disapprove portions of the revised rule

Currently the Environmental Protection Agency is being challenged in federal court to adopt human health criteria for Washington State.

## 2.2 What is the baseline?

The baseline generally consists of a collection of existing rules and laws, and their underlying assumptions. For economic analyses, the baseline necessarily also includes the implementation of those regulations, including the guidelines and policies that result in behavior and real impacts. This is what allows us to make a consistent comparison between the state of the world with or without the rule amendments. For this rulemaking, we discuss the baseline below, grouped into existing:

- Rules and laws
- National Toxics Rule (NTR) criteria assumptions[2]
- Permitting guidelines
- 303(d) listing policy
- Compliance behavior
- Growth trajectories
- Allowance for compliance schedules
- Intake credits
- Allowance for variances

This section contains descriptions of baseline attributes.

### 2.2.1 Existing rules and laws

The underlying elements of the baseline are existing state and federal laws and rules. Relevant local regulations are included when applicable.

#### 2.2.1.1 Federal requirement

Clean Water Act 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 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.

#### 2.2.1.2 State requirements

In addition to the federal requirements the Department of Ecology is required under State Statute to "retain and secure high quality waters", and to "vigorously exercise state power" to do so at the state level. (Author's bolding, below.)

**Water Pollution Control Act – RCW 90.48.010 Policy enunciated**

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

[2] The Federal Register (FR) citation for the human health criteria are from two sources. 57FR60848 is the National Toxics Rule (NTR) which was issued by EPA in 1992. 64 FR 61182 is a revision to the NTR that changed the PCB criteria from individual aroclors to total PCBs. The NTR can be found at 40 CFR 131.36.

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**.

**Water Pollution Control Act – RCW 90.48.035 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.

**Water Pollution Control Act – RCW 90.48.260 Federal Clean Water Act – Department designated as state agency, authority – Delegation of authority - Powers, duties and functions.**

The Department of Ecology is hereby designated as the State Water Pollution Control Agency for all purposes of the federal clean water act as it exists on February 4, 1987, and is hereby authorized to participate fully in the programs of the act.

**Water Resources Act of 1971 – RCW 90.54.020 General declaration of fundamentals for utilization and management of waters of the state.**

(b) **Waters of the state shall be of high quality**. Regardless of the quality of the waters of the state, all wastes and other materials and substances proposed for entry into said waters shall be provided with all known, available, and reasonable methods of treatment prior to entry. **Notwithstanding that standards of quality established for the waters of the state would not be violated, wastes and other materials and substances shall not be allowed to enter such waters which will reduce the existing quality thereof**, except in those situations where it is clear that overriding considerations of the public interest will be served.

### 2.2.2 The National Toxics Rule criteria assumptions

The values for inputs into the equation for the baseline (existing rule and NTR, 40CFR131.36) criteria are listed below. These are inputs into the EPA human health criteria (HHC) equations that calculate the HHC levels for surface waters. Under the baseline, Ecology used these inputs to the HHC equations:

- Excess cancer risk level = 10-6 (one in one million; "RL" in EPA HHC equations below)
- Relative source contribution = 1.0 ("RSC" in EPA HHC equations below)
- Hazard quotient = 1.0 (an underlying factor of "RfD" below)
- Body weight = 70 kg ("BW" in EPA HHC equations below)
- Drinking water intake = 2 L/day ("DWI" in EPA HHC equations below)
- Fish consumption rate = 6.5 g/day for chemicals excluding mercury ("FCR" in EPA HHC equations below)
- Fish consumption rate for mercury = 18.7 g/day

The EPA HHC equations using these inputs are:

- For Carcinogens:
    - Freshwater criterion = (RL x BW) / (CSF x [DWI + (FCR x BCF)])
    - Marine criterion = (RL x BW) / (CSF x FCR x BCF)
- For Non-Carcinogens:
    - Freshwater criterion = (RfD x RSC x BW) / [DWI + (FCR x BCF)]
    - Marine criterion = (RfD x RSC x BW) / (FCR x BCF)

These HHC equations are discussed in more depth in section 5.2 of this document.

### 2.2.3 Existing permitting guidelines

Permitting guidelines help permit writers translate the requirement to meet water quality criteria for protection of human health to permittee-specific requirements. While not a legal requirement, guidance informs how HHC 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, 2015) for technical guidance when developing wastewater discharge permits. 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 human health-based effluent limits necessary to meet water quality standards
- Derivation of monitoring requirements and other special conditions
- Review process for the draft or proposed permit
- Issuance of the final permit decision

For example, within the complex process of National Permit Discharge Elimination System (NPDES) permit writing, a step includes determination of whether toxic pollutants are present in the effluent. Next, the permit writer must determine the best methods of controlling the levels of those toxic pollutants. Using existing technology-based guidelines, or developing them using best professional judgment, a reasonable potential determination is made based on modeling as to whether technology-based controls are sufficient to meet water quality standards. If not, water quality-based limits are developed.

The basic requirements and process for developing permits will not change under the rule amendments. Extensive discussion of all of the considerations made during the permitting process can be found in WA Department of Ecology, 2015.

### 2.2.4 Existing 303(d) impaired waterbody listing policy

The federal Clean Water Act's section 303(d) established a process to identify and clean up polluted waters. Every two years, all states are required to perform a water quality assessment of surface waters in the state, including all the rivers, lakes, and marine waters where data are available. Ecology compiles its own water quality data 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 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 Clean Water Act, 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; revised July 2012). 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.[3] 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.

Ecology periodically revises the Water Quality Assessment Policy based on new information and updates to EPA guidance. Each revision includes a public review process. Ecology submitted a revised 303(d) list to EPA in 2015 and we expect approval from the EPA in early 2016, therefore Ecology used the revised list for the analysis included in this section.

## 2.2.5 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.

## 2.2.6 Past or existing 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.
- Future TMDLs.

The regulatory environment that current and future dischargers would encounter under the baseline would include the elements of the baseline described above, as well as any change in TMDLs.

### 2.2.6.1 Growth in TMDLs

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.

[3] 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").

#### 2.2.6.2 Growth in dischargers

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.

## 2.2.7 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.

Under the baseline, compliance schedules may last up to ten years. Under the baseline, compliance schedules are not available to new or expanding dischargers.

## 2.2.8 Existing intake credits

An intake credit is a procedure that allows permitting authorities to conclude that a permittee does not cause, have the reasonable potential to cause, or contribute to an excursion above water quality standards when he or she returns an unaltered intake water pollutant to the body of water it was taken from under identified circumstances. In other words, when effluent has the same contaminants and concentrations as water taken in, an intake credit allows authorities to not assign responsibility for those contaminant concentrations to the discharger.

Washington's baseline water quality standards do not allow intake credits.

## 2.2.9 Existing allowance for variances

A variance is a time-limited designated use and criterion for a specific pollutant(s) or water quality parameter(s) for a single discharger, a group of dischargers, or stretch of waters. Variances establish a set of temporary requirements that apply instead of the otherwise applicable water quality standards and related water quality criteria. A variance may be considered when the standards are expected to be attained by the end of the variance period or the attainable use cannot be reliably determined. Variances can be targeted to specific pollutants, sources, and/or stretches of waters.

The US Environmental Protection Agency (EPA) has dictated that state variance procedures, as part of state water quality standards, must be consistent with the substantive requirements of 40 CFR 131.14. EPA has approved state-adopted variances in the past and has indicated that it will continue to do so if:

- Each variance is adopted into rule as part of the water quality standard.
- The state demonstrates that meeting the standard is unattainable based on one or more of the grounds outlined in 40 CFR 13 1.10(g) for removing a designated use. Note:

EPA's new water quality standards regulation makes this requirement only applicable to Clean Water Act 101(1)(2) uses (the "fishable/swimmable" uses of the Clean Water Act), which is Ecology's intent also. Variances for other uses must include consideration of the "use and value" of the water. (Please see 40CFR131.14 for new federal requirements.)

- The justification submitted by the state includes documentation that treatment more advanced than that required by sections 303(c)(2)(A) and (B) has been carefully considered, and that alternative effluent control strategies have been evaluated.
- The more stringent state criterion is maintained and is binding upon all other dischargers on the stream or stream segment.
- The discharger who is given a variance for one particular constituent is required to meet the applicable criteria for other constituents.
- The variance is granted for a specific period of time and can be renewed upon expiration.
- The discharger either must meet the standard upon the expiration of this time period or must make a new demonstration of "unattainability."
- Reasonable progress is being made toward meeting the standards.
- The variance was subjected to public notice, opportunity for comment, and public hearing. The public notice should contain a clear description of the impact of the variance upon achieving water quality standards in the affected stretch of waters.

The temporary requirements established through a variance are only effective for the life of the variance. Because a variance establishes a temporary set of requirements that apply instead of the underlying water quality criteria, EPA has specified that variances for the Clean Water Act 101(a)(2) fishable/swimmable uses are appropriate only under the same circumstances required in federal rule to undertake a Use Attainability Analysis (UAA), used to change a designated use for a water body. Also, variances can be granted when they are needed to undertake restoration activities.

The above describes the circumstances under which Ecology might have a variance approved under the baseline. Under the baseline, variances are not available to new or expanding dischargers.

# Chapter 3: Rule Amendments

## 3.1 Introduction

In this Chapter, we describe the rule amendments, and identify which changes will likely result in costs or benefits (or both). Here, we also address complexities in the scope of analysis, and indicate how costs and benefits are addressed in Chapters 5 and 6 of this document.

## 3.2 Analyzed changes

In this analysis, we evaluated the elements of the rule amendments discussed in the following subsections.

**Note that elements of the human health criteria (HHC) values that do not change (e.g., excess cancer risk, relative source contributions) are not discussed in this analysis, as the previous values of these variables in the criteria calculations are not changing in the amended rule.**

### 3.2.1 Body weight

The HHC in the amended rule are based on an assumed body weight of 80 kg (approximately 176 lbs.) as a revised input into the criteria equation. This body weight is higher than the baseline weight of 70 kg, and is a more accurate representation of the general adult population nationally, as well as for two tribal populations near Puget Sound. While all of the changes to the equation inputs in the amended rule work in combination to affect criteria, in and of itself, this body weight increases (makes less protective) criteria values as compared to the baseline.

Ecology determined 80 kg was the appropriate body weight to adopt based on its survey of guidance and studies of body weight, including both local data and federal guidance.

### 3.2.2 Fish consumption rate

The HHC in the amended rule are based on an assumed fish consumption rate of 175 g/day. This fish consumption rate is higher than the baseline rate (a national general population average of 6.5 g/day), and reflects average values of highly-exposed populations that consume fish and shellfish in Washington. While all of the changes to the criteria equation inputs in the rule work in combination to affect criteria, in and of itself, this fish consumption rate decreases criteria values as compared to the baseline.

Ecology is adopting the use of a FCR of 175 g/day for calculating the HHC, based on a state-specific risk management decision. The new fish consumption value is representative of average FCRs for highly exposed populations that consume both fish and shellfish from Puget Sound waters (“all fish and shellfish” including all salmon, restaurant, locally caught, imported, and from other sources). 175 g/day is also considered an “endorsed” value. Groups endorsing the use of this numeric value include the EPA and several tribes. This numeric value was also used by the Oregon Department of Environmental Quality to calculate HHC in a 2011 rulemaking.

Average FCR values for various highly exposed groups that harvest both fish and shellfish from Puget Sound waters are found in the Fish Consumption Rates Technical Support Document (Ecology, 2013).

### 3.2.3 Drinking water intake

The amended rule increases the drinking water intake component of the HHC equations to 2.7 L/day, from the existing level of 2.0 L/day. Drinking water use only applies to freshwater, therefore the drinking water intake is only considered in the freshwater HHC equation. This change is based on the revised 2015 EPA value.

The drinking water intake approach included in the 1992 National Toxic Rule (NTR), EPA's 2000 guidance, and EPA's published recommended Clean Water Act 304(a) national criteria values uses an approximate 90$^{th}$ percentile adult exposure value in the HHC calculation. The drinking water intake historically used in EPA guidance and regulation is 2.0 L/day.

EPA's most recent Exposure Factors Handbook[4] provides examples of updated 90$^{th}$ percentile adult (ages 18 – 65) drinking water intake values between 2.1 and 3.1 L/day, based on national data. These values are for direct and indirect consumption of water. EPA released supplemental guidance in 2014 including drinking water intake of 2.5 L/day. EPA's newest revised 2015 drinking water intake is 2.4 L/day.

### 3.2.4 Compliance schedules

The amended rule includes changes to compliance schedules, including the definition of a "Compliance Schedule" or "Schedule of Compliance". It deletes the specific period of time for the compliance schedule (ten years under the baseline), and adds language to describe circumstances when a compliance schedule can go beyond the term of a permit. The amended rule seeks to ensure compliance is achieved as soon as possible.[5] It also includes language to authorize compliance schedules for longer periods of time in accordance with RCW 90.48.605 (which allows longer compliance schedules for compliance with TMDLs), as well as language addressing circumstances when more time is needed and a TMDL does not exist.

Ecology based this change on 2009 legislation that recognized there are circumstances where extending a compliance schedule would be appropriate.

[4] U.S. Environmental Protection Agency (2011). EPA exposure Factors Handbook – 2011 edition. EPA 600/R-090/052F. Available at http://www.epa.gov/ncea/efh/pdfs/efh-complete.pdf. Tables 3-10, 3-26, and 3-27.
[5] The portion of the adopted rule that discusses compliance schedules for TMDLs has changed from using "practicable" to "possible", to match legislation. For the purposes of this analysis, the two words are treated as synonymous.

Compliance schedules must still meet requirements in state National Pollutant Discharge Elimination System (NPDES) regulations, which include specific timeframes within the schedule of compliance and enforceable provisions. RCW 90.48.605 focuses on instances when a TMDL exists on the receiving water, and describes a four-part test that must be met:

1. The permittee is meeting its requirements under the TMDL as soon as possible.
2. The actions proposed in the compliance schedule are sufficient to achieve water quality standards as soon as possible.
3. A compliance schedule is appropriate.
4. The permittee is not able to meet its waste load allocation solely by controlling and treating its own effluent.

### 3.2.5 Intake credits

The rule amendments add a new section to the rule that addresses intake credits allowed when facilities bring in high levels of background pollutants in intake water and discharge those same pollutants back into receiving waters. The amended rule is intended to clarify conditions where intake credits will be allowed for determining reasonable potential and water quality-based effluent limits (WQBEL) that account for pollutants already present in the intake water, and will only be allowed when the mass of pollutant in the effluent is the same or less than that of the intake water, and there is "no net addition" of the pollutant.

An intake credit is a tool that is intended to be used in the NPDES Permit Program, in specific circumstances where the discharger is not contributing any additional mass of the identified intake pollutant in its wastewater, thereby having "no net addition" of the pollutant. Examples of pollutants already found in the intake water include naturally-occurring or legacy pollutants that are outside of the control of the facility. This implementation tool will not impact Washington's water quality and public health because it will not be granted unless the facility meets the requirements for "no net additions" of the pollutant.

The following conditions typically must be met for an intake credit to apply:

- Intake water must come from the same body of water to which the facility effluent is discharged.
- The facility must not contribute any additional mass of the identified intake pollutant to its wastewater unless an equal or greater mass is removed prior to discharge.
- The facility must not alter the identified intake pollutant chemically or physically in a manner that would cause adverse water quality impacts to occur that would not occur if the pollutants were left in-stream.
- The facility must not increase the identified intake pollutant concentration at the point of compliance, as compared to the pollutant concentration in the intake water.
- The timing and location of the discharge must not cause adverse water quality impacts to occur that would not occur if the identified intake pollutant were left in-stream.

Intake credits are not available to new or expanding dischargers.

### 3.2.6 Variances

The rule amendments include changes to the use of variances, including the definition of "Variance". The revised language establishes minimum qualifications for granting variances for individual dischargers, stretches of waters, or application to multiple dischargers. The process for considering a variance includes:

- A public process, including tribal notification, rulemaking, and EPA approval.
- The time period for when a variance will be in effect, generally not to exceed the term of the permit, but longer under certain circumstances, in as short a time as possible.
- Requirements for interim numeric and narrative requirements that reflect the highest achievable water quality, as soon as possible, during the term of the variance.
- Requirements for a pollutant minimization plan, intended to show that progress is being made to work towards meeting the original criteria.
- Requirements for a mandatory five-year review if the variance extends beyond the term of a permit.
- Requirements for a watershed assessment or TMDL to identify responsible sources, for variances that apply to more than individual sources.
- Conditions under which a variance will be shortened or terminated, and when renewal will be considered.

Ecology's changes to the variance provisions are intended to provide a means of authorizing sources to work toward achieving compliance as soon as possible rather than having facilities in long-term or indefinite noncompliance. Ecology recognizes that the changes to the HHC result in decreased (more protective) limits for some pollutants, and those decreased limits may be difficult to meet in situations where:

- Technology is not yet available or feasible to remove the pollutant, or
- A persistent pollutant resides and is cycling within the aquatic ecosystem of the water body and cannot be removed without degrading the system, or
- The main sources of the pollutant are not within the scope of the state's jurisdiction to control through water quality protection.

The EPA has advised states that a variance should be used instead of removal of a designated use where the state believes the standard can ultimately be attained. By maintaining the designated use rather than changing it, the state will ensure that further progress is made to improve water quality and attain the standard. With a variance, NPDES permits may be written to include discharger requirements based on interim criteria such that the discharge remains in compliance with the Clean Water Act and the discharger maintains reasonable progress toward attaining the applicable water quality standards.

With these factors in mind, Ecology is adopting rule amendments that use variances with the goals of:

- Providing accountability
- Extending timeframes where necessary
- Using resources efficiently

### 3.2.7 Toxicity factors

The amended rule includes updated toxicity factors for various chemicals, reflecting current research on toxic chemicals and their impacts. The updated toxicity factors are largely from EPA's Integrated Risk Information System (IRIS), and depending on the chemical, the values included in the chemical-specific criteria calculations may be higher (less protective) or lower (more protective) than under the baseline.

### 3.2.8 Special case for arsenic

An exception to the HHC in the rule amendments is arsenic. Arsenic is ubiquitous in the state environment, due to natural sources and widespread historic contamination. Because of the pervasive nature of arsenic in Washington State, Ecology is adopting the HHC for arsenic at the Safe Drinking Water Act (SDWA) Maximum Contaminant Level (MCL) regulatory concentration for total arsenic. The baseline NTR criteria are based on inorganic arsenic. Ecology's decision is consistent with other states' management of this issue.[6] This arsenic requirement is coupled with the existing requirement to determine and eliminate non-natural sources of arsenic in facility effluent (see WAC 173-201A-240).

Ecology is adopting the following specific rule amendments for arsenic:

- Setting the HHC for total arsenic at the SDWA MCL of 10 µg/L, based on:
    - A consideration of the continuing uncertainty around the long-term reassessment of the EPA IRIS cancer potency factor for arsenic.
    - EPA's CWA-approval of the SDWA MCL for arsenic for other states.
    - The presence of naturally occurring arsenic in Washington.
- Adding a requirement to minimize anthropogenic inputs of arsenic in discharges to surface waters.

Ecology has determined that use of the EPA cancer potency factor to develop HHC for arsenic would introduce a significant amount of uncertainty:

- The inorganic arsenic cancer potency factor has been under reassessment for many years, and a date for finalization is not available.
- EPA did not use the 1998 IRIS cancer potency factor in their development of the new SDWA MCL of 10 ppb promulgated in 2001, nor did they depend on this value in their promulgation of the HHC for the state of California in 2000. In the 2000

[6] See Ecology (2016). Washington State Water Quality Standards: Human health criteria and implementation tools. Overview of key decisions in rule amendment. Ecology publication no. 16-10-006.

California Toxics Rule, EPA expressed their finding of uncertainty around the effects of arsenic, and did not use the newer 1998 cancer potency factor. EPA used an older cancer potency factor (1.75 per (mg/kg)/day) derived from the drinking water unit risk (5 x 10-5 per (ug/L)) that was used to calculate the NTR arsenic criteria in its 1998 and 2002 national recommended guidance criteria calculations, but not as the basis of new regulations in either the 2000 CTR or the new 2001 MCL for arsenic.

- Using either of these older cancer potency factors injects a high degree of uncertainty into the criteria calculation for a regulatory level, especially given that EPA has not depended on either of these values as the basis of more recent regulations.

After review of other states' methods to set HHC for arsenic, with subsequent approval by EPA, and consideration of naturally high concentrations of arsenic in Washington, Ecology determined that use of the SDWA MCL for arsenic is appropriate for Washington on the following basis:

- Use of the MCL has been approved by EPA widely across the nation. In particular, several other western states that have high levels of natural arsenic in the environment have proposed the SDWA MCL and are successfully applying it for the protection of human health.

Adopting new arsenic criteria, that reflect both a change in the chemical form (from inorganic arsenic to total arsenic), and a higher concentration, has prompted Ecology to address implementation to ensure that unforeseen industrial discharges of arsenic are controlled and reduced. Ecology developed the following language to address discharges of arsenic from industrial sources to waters with the designated use of "domestic water supply." [7]

**WAC 173-201A-240 Toxic substances.**

When the Department determines that an indirect or direct industrial discharge to surface waters designated for domestic water supply may be adding arsenic to its wastewater, the Department will require the discharger to develop and implement a pollution prevention plan to reduce arsenic through the use of AKART [all known, available, and reasonable methods of prevention, control, and treatment]. Indirect discharges are industries that discharge wastewater to a privately or publicly owned wastewater treatment facility.

Ecology is therefore adopting a dual arsenic standard: numeric arsenic criteria matching the SWDA MCL of 10 ug/L, paired with narrative pollution minimization requirements for arsenic. These two parts of the arsenic standard are both contained in the toxics criteria table in WAC 173-201A-240.

[7] Washington state waters designated for domestic water supply include all freshwater lakes, river, and streams, except those brackish waters in river estuaries and a few stretches of waters noted in Table 173-201A-602.

### 3.2.9 Special case for PCBs

The amended rule does not change requirements for PCBs from the baseline. Ecology is adopting HHC for total polychlorinated biphenyls (PCBs) of:

- 0.00017 µg/L for most freshwaters (drinking surface waters and ingesting fish and shellfish)
- 0.00017 µg/L for marine and estuarine waters and a limited number of fresh waters for which drinking water is not a designated use (fish and shellfish ingestion only).

For ease of reference, these different exposure routes are called fresh and marine for the remainder of this discussion. This decision on criteria concentrations is based on a chemical-specific state risk management decision and is in conformance with EPA historic and recent HHC development guidance.

Baseline criteria for PCBs are based on revisions to the 1992 NTR. The 1992 rule included HHC for individual Aroclors that were calculated by using a cancer potency factor of 7.7 per mg/kg-day (EPA, 1992). EPA reassessed the cancer potency of PCBs in 1996 (EPA, 1996) and adopted an approach that distinguishes among PCB mixtures by using information on environmental mixtures and different exposure pathways. Based on this reassessment, EPA derived a new cancer potency factor of 2 per mg/kg-day. EPA revised the NTR human health criterion for PCBs in 1999 (EPA, 1999) to incorporate this new science. The newer NTR criterion (baseline) is 0.00017 µg/L for the protection of human health from consumption of aquatic organisms and water, and the consumption of aquatic organisms only.

Ecology is adopting HHC for total PCBs based on an approach that is consistent with EPA's 2000 Human Health Criteria Guidance (EPA, 2000) and that also provides a high level of protection for Washingtonians. Ecology will use a state-specific risk level exclusively for PCBs. The criteria values calculated from this risk level are then overlain by a chemical-specific risk management decision that *the new PCB criteria concentrations should be no less protective than the existing NTR criteria concentrations*. The adopted criteria for PCBs based on this decision are equal to the NTR criteria.

State-specific risk management decisions on chemical-specific risk levels are consistent with EPA HHC guidance as well as with precedent from other states. For example, EPA approved inorganic arsenic criteria adopted by the Oregon Department of Environmental Quality (ODEQ) based on $1x10^{-4}$ and $1x10^{-5}$ risk levels, even though risk levels for other chemicals were set to $10^{-6}$ (ODEQ, 2011). This criteria development approach combines the baseline cancer-based calculation with a state-specific risk level. All other variables in the HHC equations for PCBs will remain the same.

Since the bioconcentration factor for PCBs is very large, exposure through drinking water is negligible. The calculated values for exposure routes with and without drinking water are virtually the same, as are the calculated criteria values. The calculated total PCB criteria using this approach are 0.00029 µg/L. When these calculated values are compared to the NTR values, they default downward to the NTR values of 0.00017 µg/L.

# Chapter 4: Initial set of Prospectively Impacted Entities

## 4.1 Introduction

In response to the complexities of this rule, its application, and the entities that prospectively incur costs and/or receive benefits, we describe in this Chapter the entities identified as prospectively impacted by the rule amendments.

Chapters 5 and 6 identify specific behavioral impacts that are likely to result in costs or benefits given current practices, approved methods, and data. The entities described in Chapter 4 are prospectively impacted under these current practices, as well as a hypothetical future data scenario (including currently unapproved methods) that is discussed in Chapter 7.

## 4.2 Prospectively impacted entities

As a general description, entities prospectively impacted by the amended rule are listed as follows, in the categories discussed further in the following subsections. Analysis of costs and benefits to these entities follows in Chapters 5 and 6 given existing data, and in Chapter 7 under a hypothetical increase in information and improvement in technology and methods.

Possibly impacted general groups are as follows:

- The public and Tribes:
    - Fish and water consumers.
    - Water users who value water quality as an attribute of direct interaction with water.
    - Non-users holding existence and cultural values for water quality itself.
    - Property owners, residents, and employees of contaminated properties adjacent to surface waters.
- Dischargers:
    - Existing dischargers of chemicals for which water quality criteria change as a result of the rule amendments.
    - Future dischargers of chemicals for which water quality criteria change as a result of the rule amendments.
- Liable parties at cleanup sites:
    - Existing soil and groundwater cleanup sites adjacent to surface waters.
    - Future soil and groundwater cleanup sites adjacent to surface waters.
- The environment:
    - Animals exposed to waters of the state.
    - Plants exposed to waters of the state.

## 4.2.1 The public and Tribes

The members of the public and Tribes that are prospectively impacted by the rule amendments may fall into one or more of these categories:

1. Fish/shellfish and water consumers
2. Water users
3. Non-water-users
4. Property owners, residents, and employees of some contaminated properties

We discuss the attributes of these categories below.

#### 4.2.1.1 Fish/shellfish and water consumers

Changing water quality criteria potentially impacts all fish and shellfish consumers to some degree, depending on their consumption rates. Tribe populations, Asian and Pacific Islanders, and subsistence fishermen have been found to have higher than average consumption rates. To attempt to better reflect tribal values where likely impacted under the hypothetical scenario discussed in Chapter 7 of this document, we incorporated language from tribe members regarding the value of safe fisheries and clean waters.

Stakeholders also suggested that there would be impacts to local fisheries, due to changes in demand caused by perceptions of the quality and safety of the fish supply. As a standard practice, however, the Cost-Benefit Analysis considers only first-round impacts, and does not include secondary impacts such as these. Therefore, this analysis includes costs and benefits arising from the rule amendments, but does not analyze costs and benefits resulting from changes in supply and demand (movements along supply curves and demand curves resulting from spending changes, or shifts in those curves resulting from changes in perception, context, or technology).

#### 4.2.1.2 Water users

People that use the state's waters for purposes other than drinking or as a fish/shellfish source are also prospectively impacted by the amended rule. Surface waters are used for on-water and near-water recreation, for example, and individuals value those uses. As the amended rule affects a number of different water quality criteria levels, and because it is difficult to quantify people's value for water quality for activities like catch-and-release sport fishing, swimming, boating, or riparian recreation, we did not quantify the impacts to this group. In Chapter 7 we include a qualitative description of benefits to this group, under the hypothetical data, methodology, and information context discussed in that Chapter.

#### 4.2.1.3 Non-water-users

Individuals and communities hold various values for clean or high-quality waters, even without using them. These values include cultural values, existence values, and bequest values for water quality (for clean water) itself. We did not quantify these values, as they are difficult or impossible to quantify with a significant degree of certainty.[8]

[8] This is because of the myriad implicit attributes that any given individual or community might value water quality for, even within the three categories of cultural, existence, and bequest. Additionally, where a particular value is held by a relatively small population or has no proxy, related behavior, or even hypothetical behavior that includes

While we could not quantify impacts to non-water-users, we did, however, generally identify the types of individuals and groups that hold these values. While all three values, cultural, existence, and bequest values, can be held by any person in the state, we note that cultural values in particular (overlapping with bequest values) are held by the populations of tribes in the state. There are 29 federally-recognized tribes in Washington, as well as tribes that are not federally-recognized but include members who also hold cultural values. In Washington State, 1.9 percent of individuals in 2013 identified themselves as American Indian or Alaska Native alone (we could not identify from the data the percentage of those identifying as two or more races that included American Indian or Alaska Native)(US Census, 2013).

#### 4.2.1.4 Property owners, residents, and employees of some contaminated properties

The rule amendments would prospectively impact cleanup of soil and groundwater contamination, as the HHC are incorporated into cleanup requirements for sites that are likely to impact surface waters via groundwater contamination. More stringent HHC would potentially trigger larger or more comprehensive cleanup activities. That, in turn, potentially benefits the owners of the properties, in terms of property value. It also potentially benefits residents and employees of formerly contaminated sites, through lower risk of exposure to toxic chemicals through contact or vapor.

## 4.2.2 Dischargers

#### 4.2.2.1 Existing Dischargers

The rule amendments prospectively impact dischargers in various ways. We used existing permit data on effluent to determine existing permittees that might be impacted, based on whether they currently discharge chemicals that have changing or new human health criteria (HHC) limits under the rule amendments. We began with effluent data for 1,294 matched combinations of facilities and chemicals, representing 150 individual facilities (some of which have existing permit restrictions, while others do not). This was the universe of prospectively impacted facilities considered in this analysis. Within this group, we identified likely impacted entities, as well as those entities which were likely not impacted, using the process described in Section 5.2. The overall universe of prospectively impacted existing entities spanned 115 specific facility types, of diverse sizes and in 55 diverse private and public industries, including treatment works (at the 4-digit North American Industry Classification System level; US Census, 2012).

#### 4.2.2.2 Future Dischargers

In addition, where we identified likely impacted industries (see section 4.2.2.1, above), we estimated future growth (during the 20-year timeframe of this analysis) in dischargers (new and expanded) for a given industry, where the chemicals typically found in the industry's effluent will encounter changed or new criteria restrictions when the dischargers (or expansions) come to exist. We based likely future behavior of dischargers on the attributes and behavior of current dischargers.

We also considered possible expansions of Publicly Owned Treatment Works (POTWs) due to population growth, and discussed with permit managers the effects of the rule amendments (changes to criteria values and/or new 303(d) listings), and the findings for existing POTWs in

quantifiable values, survey or revealed-preference mechanisms fail to accurately (or at all) derive non-use values for non-users in the case of water quality.

the analysis. See sections 5.2.6 and 5.4.1 of this document, for discussion of criteria-change impacts to POTW expansions, and listing-change impacts to POTWs, respectively.

## 4.2.3 Liable parties at cleanup sites

The rule amendments prospectively impact future cleanup sites, through the incorporation of the HHC into cleanup requirements for sites likely to contaminate surface waters via soil and groundwater contamination. We began with the universe of identified cleanup sites, and filtered them by type of contamination, concentrations, site status, and proximity to surface water (less than 1/8 mile).

## 4.2.4 The Environment

### 4.2.4.1 Animals

Just as the rule amendments prospectively impact human health, they may have impacts on animal health. The rule may impact animals living in water, and animals drinking water. Since animal health impacts vary across animals, and we have little or no information concerning these impacts, we could not quantify these impacts. Additionally, due to the broad array of animals living in or drinking surface waters of the state, we do not list them here, but instead discuss the affected population qualitatively and categorically. Affected animals may include at least fish (the means by which they affect human health), orca whales, seals and sea lions, amphibians, and water birds.

### 4.2.4.2 Plants

Where the rule amendments change criteria for chemicals that may also impact plant health, we consider it likely that the amended rule will impact plant health in or near water bodies. Similarly to determining impacts to animal health, it is difficult to determine which or how plants might be impacted. As a result, we discuss this impacted population descriptively as well.

# Chapter 5: Likely Costs of the Rule Amendments

## 5.1 Introduction

We analyzed the likely costs associated with the rule amendments, as compared to the baseline described in Chapter 2 of this document, and with changes discussed in Chapter 3. Any costs found are incurred by some of the entities discussed in Chapter 4.

In this Chapter, we discuss the following steps to the analysis:

- Impacts of the change in criteria: How many dischargers are prospectively impacted, and for what chemicals in their effluent.
    - Permit and effluent review
    - Existing permit limits
    - Reasonable potential analysis
    - Facility data and site-manager review
    - Costs to permittees
    - Conclusions – changes in criteria
    - Criteria changes, future facilities, and expansions
- Impacts to cleanup sites
- Impacts to in-water construction
- Impacts of a change in waterbody listing status.
    - Change in listing status
    - Likely impacted existing facilities
    - Likely costs to existing facilities
    - Future TMDLs for existing facilities
- Future growth, 303(d) listings, and TMDLs.
    - New or expanded dischargers on waterbodies with new 303(d) listings
    - Future TMDLs completed on waterbodies that become 303(d) listed
    - Future 303(d) listings resulting from new samples or sample sensitivity
- Potential costs to a hypothetical unrepresented discharger

## 5.2 Impacts of change in criteria for dischargers

We determined likely existing impacted entities, as well as forecasts of entities likely affected in the next 20 years. For costs, the rule amendments are likely to affect dischargers that are discharging a specific toxic chemical where a criterion will become more restrictive for that chemical, and result in compliance behaviors that are more costly than current compliance behaviors.

We began by reviewing existing discharger effluent data, including dischargers that have permit restrictions and those that do not (Permitting and Reporting Information System (PARIS), 2014; permit factsheets). For the criteria levels resulting from the rule amendments, we determined which of these entities were likely to be affected by changing criteria based on their existing reasonable potential determination, which is a calculation and comparison that determines whether a discharger has a reasonable potential to cause an exceedance of the criterion for a given chemical.

A reasonable potential determination compares the concentration of a chemical at the edge of the appropriate site-specific mixing zone, to the human health criteria (HHC) value for that chemical. It determines whether a facility's effluent has a reasonable potential to cause an exceedance of HHC. We analyzed existing effluent data from facilities and sites with NPDES permits to perform a Reasonable Potential analysis to determine if effluent limits will likely be required as a result of changes to the HHC in the rule amendments.[9] We eliminated from consideration those facilities whose priority pollutant scan information will not exceed the HHC as well as those facilities whose exceedances will fall below the detection limits for the affected chemicals.

### 5.2.1 Permit and effluent review

We reviewed all fact sheets available for individual permits listed in Ecology's PARIS as of April 2014. The most recent Fact Sheets were used in lieu of previous versions. In the few cases where Fact Sheets were unavailable, Fact Sheet Addenda, Public Notices, Compliance and Enforcement Reports, and/or Permits were reviewed to get needed information. We also gathered all Priority Pollutant Scan data received by Ecology more recently than data available in active permit fact sheets. This ensured the inclusion of recently collected data for permits that were in development or were in the process of renewal as of December 2015.

**The review was limited to active industrial and municipal NPDES individual permits. General permits do not currently include numeric effluent limits based on HHC, and were therefore not included in this analysis.**

[9] This process was also followed for the special case of arsenic, using the drinking-water criteria in the rule amendments.

Table 1: Number of permits reviewed by type

| Type | Number of Permits |
|---|---|
| Industrial | 179 |
| Municipal | 229 |
| **Total** | **408** |

We attempted to collect the following information for each permit:

- Facility/Permit Name
- Permit Number
- Permit Type
- Permit Status
- Document Reviewed (via hyperlink)
- Ecology Contact
- Date Received
- Administrative Region
- Type of Facility/Operation
- Human Health Criteria (HHC) chemicals detected in final effluent
- Maximum Concentrations at the Edge of Chronic Mixing Zones (MCECMZs)
- Results of Reasonable Potential Analyses (RPAs)
- Technology-Based Effluent Limits (TBELs)
- Water Quality-Based Effluent Limits (WQBELs)
- Receiving Water Types (fresh or marine)
- Additional notes to assist with interpretation of the information

In some cases, information from the Fact Sheets was incomplete or unclear. For example, there were a number of instances where maximum concentrations at the edge of the mixing zone (MCECMZs) were apparently truncated and reported as 0.0 or 0.00 µg/l. In other instances, it was unclear whether permit limits were technology-based effluent limits (TBELs) or water quality-based effluent limits (WQBELs). In addition, there were concerns that impending permit issuances were not being included.

To address these uncertainties and concerns, water quality permit writers from Ecology's regional offices and Industrial Section were consulted. Their responses to questions about specific permits and information on permit updates were incorporated into the set of information collected from the Fact Sheets.

Information was collected for all chemicals for which there are previous or amended HHC. If permit limits for these chemicals were lower than the amended HHC, the content of those chemicals in effluent was not likely to be impacted by the rule amendments. The special case of a 10 ug/L criteria value for arsenic was also accounted for.

HHC chemicals were detected in 150 of the permitted facilities. One-half of the facilities with detected HHCs were wastewater treatment plants (WWTPs), which treat domestic wastewater. The most common types of industrial facilities with detected HHCs were pulp and paper mills, metals manufacturers, shipyards, and bulk petroleum storage terminals and related activities.

Table 2: Summary of facility types with detected HHC chemicals and commonly detected HHC chemicals

| Permit Type | Facility Type | Number of Facilities with Detected HHC Chemicals | Total Instances of HHC Chemical Detections | Five Most Detected HHC Chemicals Across Facilities (in order of prevalence) |
|---|---|---|---|---|
| Municipal | WWTPs | 75 | 784 | Zinc, Nickel, Mercury, Bis(2-ethylhexyl) phthalate, Arsenic |
| Industrial | Pulp and paper mills | 18 | 154 | Nickel, Zinc, Phenol, Arsenic, Mercury |
| | Metals manufacturing | 8 | 47 | Zinc, Nickel, PCBs, Arsenic, Cyanide |
| | Shipyard | 8 | 13 | Zinc, Arsenic, Nickel |
| | Bulk petroleum storage terminals and related activities | 8 | 34 | Benzene, Ethylbenzene, Toluene, Zinc, Arsenic |
| | Resource extraction | 6 | 145 | Zinc, Mercury, Selenium, Arsenic, Nickel |
| | Groundwater remediation | 6 | 17 | Chloroform, Trichloroethylene, 1,1-Dichloroethylne, Vinyl Chloride, Benzene |
| | Other remediation sites | 3 | 27 | Fluoranthene, Acenaphthene, Nickel, Benzene, Chrysene |
| | Landfill | 2 | 4 | Zinc, Selenium, Nickel, Phenol |
| | Other | 16 | 69 | Zinc, Nickel, Arsenic, Selenium, Copper |
| **TOTAL** | **--** | **150** | **1294** | |

In all, 95 different HHC chemicals were detected in effluent. This list of chemicals includes 83 in the National Toxics Rule (NTR) for which criteria will change, and 12 additional chemicals in Ecology's amended HHC for which the state does not have baseline pollution limits under the NTR. Three of the ten most commonly detected HHCs at both municipal and industrial facilities were metals. Three of the four most commonly detected organic chemicals – phenol, chloroform, and toluene – were among the top ten detected chemicals for both industrial and municipal permits.

### 5.2.2 Existing permit limits

Of the 150 facilities that had HHC chemical detections, 136 of those facilities had effluent limits for HHC chemicals. Those limits would be based on HHC, or aquatic life criteria. According to our initial data, 32 facilities had WQBELs, 17 had TBELs, and the remainder were unspecified. Of those facilities having WQBELs, 81percent were industrial and 19 percent were municipal. WQBELs were most commonly placed on zinc (aquatic-life-based) and benzene (HHC-based). All facilities with a TBEL were industrial. TBELs were most commonly placed on zinc, PCBs, and ethylbenzene.

### 5.2.3 Reasonable potential analysis

From the list of HHC chemical detections at facilities, we conducted a reasonable potential analysis to determine if effluent limits will likely be required as a result of HHC in the rule amendments. Specifically, all of the available human health MCECMZs were compiled and compared to HHC resulting from the rule amendments, as well as the existing HHC. Where the MCECMZ exceeded the HHC, the Reasonable Potential Analysis result was “YES” (there is a reasonable potential to exceed water quality standards). Where the MCECMZ was at or below the HHC, the Reasonable Potential Analysis result was “NO”.

Using the reasonable potential analysis as an initial screening tool, we found that 64 instances of chemical detections, discharged by 36 different facilities, had reasonable potential to exceed the standard under the rule amendments, but did not under the baseline. Each facility had existing water-quality or technology-based effluent limits in their permit.

The identified facilities with possible reasonable potential under the amended rule, but not under the baseline, included:

- Wastewater Treatment Plants (WWTP) (18)
- Pulp and paper mills and wood product manufacturing (5)
- Petroleum storage, distribution, and related activities (3)
- Groundwater remediation sites (3)
- Other remediation sites (2)
- Resource extraction (2)
- Metals manufacturing (1)
- Other industrial (1)
- Other municipal (1)

### 5.2.4 Facility data and permit-manager review

We then discussed 36 facilities and 64 instances of chemical detections that triggered a reasonable potential to exceed the adopted standard, with the relevant Ecology permit managers to determine what, if any, impact will be expected under the rule amendments. These evaluations looked at facility attributes, performance, discharge locations, and other contextual information. In discussing the rule amendments and the changes to criteria values with facility site managers, we encountered the following results. Note that five facilities fell within multiple categories, as they discharged multiple chemicals triggering reasonable potential.

Table 3: Summary of the impacts to facilities of complying with the rule amendments

| Cost Determination | Reason for Determination | Total Number of Facilities | Types of Facilities and Number Affected |
|---|---|---|---|
| No costs | Received newer data | 7 | WWTP (3), Resource extraction (1), Pulp and paper mill and wood products (1), Other industrial (1), Groundwater remediation (1) |
| | Error in initial data | 7 | WWTP (2), Groundwater remediation (2), Resource extraction (2), Bulk petroleum storage terminal and related activities (1) |
| | No further action required | 8 | Pulp and paper mill and wood products (2), Bulk petroleum storage terminal and related activities (2), WWTP (2), Metals manufacturing (1), Other municipal (1) |
| | No cost to further action | 4 | Other remediation site (2), Pulp and paper mill and wood products (1), WWTP (1) |
| Costs | Possible costs due to bis(2-ethylhexyl) phthalate | 13 | WWTP (11), Pulp and paper mills and wood products (2) |
| | Possible costs due to other chemical detections | 1 | Groundwater remediation (1) |

**No Costs—received newer data (seven facilities)**
In discussion with permit managers, we encountered seven facilities for which the site data used in the initial screening was outdated. For six of these facilities, data from the most recent Priority Pollutant Scan provided by the permit managers showed non-detection of the chemicals and therefore did not trigger reasonable potential. For one of these six facilities, even where the facility found to discharge the chemical in exceedance of the rule amendments, no additional costs will accrue to the facility because it discharges to a waterbody with an existing Total Maximum Daily Load (TMDL). Ecology will not be revising existing TMDLs as a result of this rulemaking and load allocations will not change. For the final facility, the most recent data showed that the facility currently operates under a zero discharge permit and therefore did not trigger reasonable potential.

**No Costs—error in initial data (seven facilities)**
In discussion with permit managers, we found that our initial data for seven facilities did not correctly reflect the discharge concentrations. For six of the seven facilities, the correct data showed consistent non-detection of the chemicals at these facilities, thereby not triggering reasonable potential. For the remaining facility, the true concentration of the chemical did not trigger reasonable potential.

**No Costs—no further action required (eight facilities)**
For one facility, a pulp and paper mill, reasonable potential was initially triggered by a detection of Dioxin in the discharge. This facility also discharges to a waterbody with an existing TMDL and has a TMDL-based limit and monitoring requirements for Dioxin. Under the amended rule, dioxin HHC become less stringent and will not result in additional costs.

The second facility, a cleanup discharger, is discharging benzene in a concentration that occasionally exceeds its permit limit. The facility has recently requested to use an additional substance in their activities that will result in its wastewater containing emulsified oil. Combined, these factors make it such that the facility will have to undertake significant technological improvements to comply with the existing baseline standards. In response, the facility recently decided to segregate their contaminated water and pay to have it hauled offsite, therefore precluding them from treating the wastewater to meet the existing or amended standards. The decision to haul contaminated water offsite was driven by the need to comply with the baseline standard and will occur regardless of the rule amendments; therefore, we do not attribute these costs to this rulemaking. Should the facility rethink how they deal with their wastewater and choose to process it onsite, the amended standard will likely require that they install additional technology above what will be necessary under the baseline. Given their current plan, however, we do not expect the facility to incur costs as a result of the rule amendments.

The third facility is a metals manufacturing facility that discharges Benzo (a) Anthracene in levels that exceed both the baseline and new standards. Last year, Ecology required that the facility do an AKART analysis investigate the best method to reduce their discharge concentration and come into compliance with the standard. The facility decided to install a new cooling system technology to eliminate the discharge altogether. This move was driven in part by needing to comply with the baseline standard and in part by a larger goal to move towards zero discharge. The installation of the new technology will allow the facility to comply with the new rule amendments at no additional cost.

The remaining five facilities in this category prompted reasonable potential due to chemical detections in their stormwater discharge. Because most HHC are based on lifetime exposures, direct comparisons of receiving water criteria with pollutant concentrations in intermittent stormwater discharges are not appropriate. This, and the high variation in stormwater pollutant concentrations and discharge volumes between storms and during a single storm, make the application of HHC to stormwater particularly problematic. Based on the authority of 40 CFR 122.44(k)(3), Ecology instead requires the implementation of Best Management Practices (BMPs) to control or abate pollutants in stormwater discharges, as it is not feasible to derive appropriate numeric effluent limits for the HHC.

- The first facility discharging stormwater, a bulk petroleum storage terminal and related activities site, already uses Granulated Activated Carbon technology. It is

unlikely that further treatment is necessary, therefore it is unlikely that Ecology will require additional treatment technology or BMPs in response to the rule amendments; thus, the facility is unlikely to incur additional costs above the baseline.

- The second facility, also a bulk petroleum storage terminal and related activities site, already uses AKART treatments (all known, available, and reasonable methods of prevention, control, and treatment), including oil-water separation, and pressurized sand filtration followed by carbon absorption. It is unlikely that further treatment is necessary, therefore it is unlikely that Ecology will require additional treatment technology or BMPs in response to the rule amendments; thus, the facility is unlikely to incur additional costs above the baseline.
- For the third facility, a pulp and paper mill and wood product manufacturer, it is unlikely that further treatment is necessary, therefore it is unlikely that Ecology will require additional treatment technology or BMPs in response to the rule amendments; thus, the facility is unlikely to incur additional costs above the baseline.
- Data for the fourth and fifth facilities show recent and new MCECMZ detection of chemicals that falls under the baseline rule, but will be in exceedance of the amended standards. Under the rule amendments, Ecology will have the facilities continue to monitor with Priority Pollutant Scans to confirm a persistent presence and concentration of the chemical. As this monitoring already occurs with the routine Priority Pollutant Scans, there will be no additional monitoring cost to either facility to comply with the rule amendments.

If further sampling indicated a consistent presence of the chemical in exceedance of the rule amendments, Ecology will not establish numeric limits in the permit. Both facilities are combined sewer overflow (CSO) facilities and discharge only during heavy rain events. The influent to these facilities is highly variable in frequency, volume, duration, and pollutant concentration. As such, it is not feasible to derive numeric effluent limits for HHC. Ecology will instead follow permitting guidelines and 40 CFR 122.44(k)(3) and apply narrative limitations, which include but are not limited to, BMPs. It is unclear at this time whether additional limitations will be necessary, and if so, what they will entail. Therefore, we are currently unable to assess the certainty, magnitude, or timing of potential costs to these two facilities.

**No Costs—no cost to further action (four facilities)**
Data for each of four facilities showed that the facility might discharge a chemical in exceedance of the amended rule. However, in speaking with the permit managers, they report that Ecology will respond by requiring continued monitoring of the chemical, which will occur both under the baseline and the amended rule. Therefore, the facility will incur no additional costs as a result of the rule.

The first facility, a WWTP, triggered reasonable potential under two chemicals, chlordane and bis(2-ethylhexyl) phthalate. For chlordane, data showed one sample that detected the chemical, while four other samples were non-detections. The one detection had concentrations below the baseline standard, but in exceedance of the rule amendments. As chlordane typically originates from use of a pesticide that is no longer widely used, Ecology believes this detection was an anomaly. Furthermore, the equation used to calculate chlordane concentration did not use dilution factors specific to HHC; Ecology believes that using dilution factors specific for HHC

chemicals will not yield RPA for this outfall. Under the rule amendments, Ecology will have the facility continue with quarterly monitoring under their Priority Pollutant Scan to determine whether the chemical is present in a consistent set of samples and if so, in what concentration. As this monitoring will occur within existing Priority Pollutant Scans, no additional costs will accrue to the facility in result of the rulemaking for chlordane. The costs for discharging bis(2-ethylhexyl) phthalate are discussed later in this section.

The second facility, a pulp and paper mill and wood product manufacturer, triggered a reasonable potential for Heptachlor Epoxide. The most recent data for this facility showed a detection of the chemical; however, all previous samples were non-detections. The one detection showed MCECMZ below the baseline concentration standard, but in exceedance of the standard set forth in the rule amendments. Under the rule amendments, Ecology will have the facility continue with quarterly Priority Pollutant Scan monitoring to confirm a persistent presence and concentration of the chemical. As this monitoring will occur within existing Priority Pollutant Scan requirements, no additional costs will accrue to the facility as a result of this rulemaking. In the event that subsequent testing confirmed detections of the chemical that exceed the rule amendments, Ecology will work with the facility to address the pollution source. At this time, Ecology expects that the chemical originates in the facility's use of pesticides. To comply with the rule amendments, the facility may have to switch to a different type of pesticide, a move that would bear small but positive costs.

Data for the third facility, a remediation site, showed one sample of benzene that will exceed the amended HHC at MCECMZ. The permit manager reported that over the last five years, 90 percent of the samples fell well below the amended standards. Under the baseline, Ecology will likely remove the permit limit on this pollutant for this facility, but continue to require monitoring of pollutant concentrations. With the rule amendments, however, Ecology will likely maintain the limit and continue to require monitoring of pollutant concentrations. As this monitoring will exist within the baseline Priority Pollutant Scans (which will stay in place whether they had the limit for benzene or not), no additional costs will accrue to the facility due to the continued permit limit.

Data for the last facility, also a remediation site, did not correctly reflect the current discharge concentrations. Current data shows that over the last five years, the facility has consistently reported non-detection results for the chemical, thereby not triggering reasonable potential. Under the baseline, Ecology will likely remove the permit limit on this pollutant for this facility. With the rule amendments, however, Ecology is likely to keep the limit and continue monitoring pollutant concentrations. As this monitoring will occur within existing Priority Pollutant Scans (which will stay in place whether they had the limit or not), no additional costs will accrue to the facility of maintaining the permit limit.

**Costs—possible costs due to bis(2-ethylhexyl) phthalate (13 facilities)**
Thirteen facilities were found to discharge *bis(2-ethylhexyl) phthalate* (phthalates) in a concentration that is in compliance with the baseline criteria, but will exceed the standards in the rule amendments. Phthalates are both a common sampling and laboratory contaminate and a pollutant that is frequently detected in wastewater effluent. In 2006, a multiagency work group was formed to investigate the sources and possible control strategies for phthalates. The Phthalate Workgroup found that phthalates are plasticizers widely used in consumer and building products; they are pervasive in the environment and are contained in hundreds of common products found in everyday life. They enter the environment (and subsequently into waters) through many pathways; identifying precise sources of contamination is difficult, making them virtually impossible to control.

If phthalates are detected in effluent, Ecology will first require permittees to re-sample their effluent to confirm that the detection of phthalates are not a result of sampling or laboratory contamination. If the phthalates are confirmed to be in the effluent, facilities will have to develop and implement a Source Control Plan. The Source Control Plan is designed to identify and remove any distinct phthalates sources within the collection system or processes and to confirm that any residual phthalates in the discharge are associated with diffuse 'nonpoint' sources.

A detailed description of what specific actions this will require of facilities and the resulting costs is located in Section 5.2.5.

**Costs—possible costs due to other chemicals (one facility)**
One facility may incur costs to comply with the rule amendments that are not associated with the discharge of phthalates. This facility is a groundwater remediation site and is currently regulated under a limit set forth by Hazardous Waste regulations.[10]

Reasonable potential was initially triggered by end-of-pipe detections that fell below its current standard, but possibly in exceedance of the rule amendments. In discussions with the permit manager, it appears that the facility should currently be able to meet the rule amendments using their existing technology, thereby not triggering any additional costs. However, Ecology's Hazardous Waste program recently required the facility to install additional extraction wells; the wells began operation in February 2016. The change caused the facility to extract more groundwater and consequently, treat a higher flow rate.

Currently, the facility's discharge is in compliance with the amended rule; however, as operations continue and the facility conducts more testing, it is possible that the chemical concentration of the groundwater influent could necessitate additional treatment technology. Further testing could indicate that the chemical concentration of the groundwater takes one of three forms:

1. Chemical concentrations will comply with the standards of both the existing rule and the rule amendments;
2. Chemical concentrations will not comply with both the existing and amended standards; or,
3. Chemical concentrations will comply with the standards of the existing rule, but not comply with the rule amendments.

[10] Chapter 173-303 WAC.

In case number one, the facility will face no additional costs of treating the new influent in accordance with the amended rule. In case number 2, the facility will have to install new technologies under both the baseline and the rule amendments; the cost of the rule will come from the additional technology they will have to install to comply with the amended standards above that of the baseline. Finally, in case number three, the facility will not be required to install new technology under the baseline, but will have to under the rule amendments. This third hypothetical represents the case with the greatest cost to the facility.

Were the influent concentrations high enough to trigger additional treatment, as in cases number two and three, it could require the facility to retrofit the existing air stripper trays, or in more extreme cases, install an additional air stripper unit or discharge to a local publically-owned treatment works. The cost of installing additional treatment would depend on influent concentrations, flow rate, and the technology chosen; for example, adding a new air stripper could have a capital cost of $400,000.

As the current limited testing has not triggered reasonable potential, we do not expect the facility to face additional costs to comply with the rule amendments. Should further testing show that they are not in compliance, we are currently unable to determine whether the facility will need additional treatment, and if so, what type of technology it would need and the extent to which it would need it. In addition, we are unable to determine whether the facility will need additional treatment under the baseline or only in response to the rule amendments. Therefore, any attempt to assign a monetary cost of the amended rule to the facility would be speculative.

### 5.2.5 Costs to permittees

From our review with permit managers of facilities that triggered reasonable potential to exceed the revised water quality criteria, we determined that 13 facilities are likely to incur costs to comply with the new standard above what it will cost them to meet the baseline standard. All 13 of these facilities will face costs due to their discharge of phthalates.

An additional two facilities may incur additional costs to comply with the rule amendments, however the certainty and magnitude of those costs are too speculative for us to accurately quantify. In this section, we outline and monetize those costs to facilities that are quantifiable.

For the 13 facilities discharging phthalates, costs will come in two phases: Phase one requires the facility to evaluate whether phthalates are originating from sampling or laboratory contamination. If testing does not confirm that phthalates are attributable to sampling contamination, the facility will be required to move on to Phase two, which requires developing and implementing a Source Control Plan.

All 13 facilities will be required to conduct testing for Phase one. We expect this to necessitate the following steps and costs:

1. *Replace tubing in the sampling area with tubing made without plasticizers.* We estimate this to cost facilities between $3.00 and $10.00 to replace the tubing in the sampling equipment, with a median cost of $6.50.
2. *Clean the sampling area*. We estimate this task to require 1 hour of time for an Environmental Engineering Technician. For purposes of this analysis, we use the Bureau of Labor Statistics median pay for Environmental Engineering Technicians, valued at $23.16 per hour.[11]
3. *Retest for phthalates in the next Priority Pollutant Scan (PPS).* This will not incur any additional costs, as testing will occur within the existing PPSs and regardless of the rule amendments.
4. *Call the laboratory to check whether phthalates could be due to laboratory contamination.* We conservatively estimate this to cost 0.5 hours of staff time for an Environmental Engineering Technician.

If the phthalates are confirmed to be in the effluent, facilities will have to move to Phase two and develop and implement a Source Control Plan. For purposes of this analysis, we estimate that 50 percent of industries and 90 percent of municipalities will confirm phthalates in their effluent. This estimate is based on the professional opinion of Ecology permit managers.

If a facility moves on to the Source Control Plan phase, we estimate that developing the plan will require a one-time cost of 40 hours of staff time for an Environmental Engineering Technician. For industrial facilities, developing this plan will require examining how they process and use plastics and looking for sources such as leaking electrical transformers and maintenance yards (which may be a source of hydraulic fluid or other lubricants containing phthalates). For municipalities, developing a Source Control Plan will involve looking for phthalates in industrial facilities that discharge to their area and possibly having industries conduct additional sampling. The table below summarizes the costs facilities will face to comply with the rule amendments regarding phthalates. All costs will be one-time capital costs.

Table 4: Summary of costs to a facility

| Phase | Task | Cost | Projected Number of Facilities Facing Cost |
|---|---|---|---|
| Phase One | Replace testing tubing | $6.50 | 13 |
| | Clean testing area (1 hour staff time) | $23.16 | 13 |
| | Check for laboratory contamination (0.5 hours staff time) | $11.58 | 13 |
| Phase Two | Develop a Source Control Plan (40 hours staff time) | $926.40 | 10.9 [12] |

[11] Bureau of Labor Statistics (2016). "Occupational Outlook Handbook, 2016 – 2017, Environmental Engineering Technicians." Bureau of Labor Statistics, U.S. Department of Labor. Accessed January 15, 2016 from: http://www.bls.gov/ooh/architecture-and-engineering/environmental-engineering-technicians.htm

[12] This is based on the assumption explained above that 50 percent of industrial facilities and 90 percent of municipal facilities discharging phthalates will have to develop a Source Control Plan.

The total quantifiable cost likely to be incurred by facilities to meet the revised bis(2-ethylhexyl) phthalate HHC is nearly $11 thousand.[13]

We are unable to estimate the cost incurred if a facility finds an on-site or influent source responsible for the phthalates and has to implement their Source Control Plan, as the action required will be unique to the facility and is not generalizable. However, we expect it unlikely that facilities will find obvious sources of phthalates —sources are already highly controlled in stormwater and wastewater permits and therefore, facilities have most likely already taken action to reduce discharge of other known pollutants.

In addition, overseeing and monitoring the development of Source Control Plans at facilities will require Ecology permit managers to spend additional time on permit management. It is likely, however, that this work will be absorbed into existing hours and schedules.

During the public process, commenters expressed concern that the revised rule will result in many dischargers being required to install tertiary treatment. In contrast, Ecology will use the following tiered approach. This will be implemented sequentially through each permit cycle:

1. Require the facility to employee clean monitoring/testing methods. Phthalates are used as a plasticizer and may be found in sample collection and analytical equipment causing elevated sample results. This step is to verify the concentration of phthalate in effluent.
2. If the facility continues to show phthalates in their discharge after a comprehensive implementation of using clean monitoring techniques then they will be required to develop a Source Control Plan. This plan will have the facility look at all other sources of potential phthalate contamination.
3. The plan will then be implemented to determine the phthalate source and then implement necessary action to eliminate or reduce the source of phthalates.
4. If the source control plan is implemented and there continue to be phthalates in the effluent at levels above effluent limits then the facility will look at process enhancements that could be put into place at the facility to address the phthalates.
5. Implement process enhancements that will help with phthalate removal.

If process improvements are unable to meet phthalate effluent limits a facility may decide to seek a variance to the criteria for phthalates or a use change to the beneficial use. This decision is highly dependent on the work above. Also any decision for a variance or use change will have to meet federal criteria and go through a subsequent rule change and approval by the Environmental Protection Agency.

[13] The calculated value is $10,633.88.

### 5.2.6 Conclusion – changes to criteria

After reviewing, filtering, and assessing real cases of existing effluent data for dischargers using existing analytical methods and permitting practices, we conclude that, based on the reasonable potential analyses using revised HHC, the majority of facilities will not be impacted. To be impacted, a facility must have the following attributes:

- Discharge a chemical for which criteria values will change as a result of the rule amendments.
- Discharge that chemical in quantities greater than the detection limits for that chemical using required test methods. If a facility uses the required sufficiently sensitive test method, a non-detect in an effluent sample generally means the discharge has no reasonable potential to violate standards.
- Discharge that chemical in quantities such that the concentration at the edge of the chronic mixing zone exceed the relevant criteria value.
- Not be in an existing TMDL, as Ecology will not be revising TMDLs as a result of this rulemaking.
- Have samples that consistently indicate the presence of the chemical.
- Have a continuous discharge (i.e., *not* be an intermittent discharge, such as stormwater or CSO).

and potentially:

- Discharge to sediments of concern for the chemicals of concern in the discharge, at rates in excess of sediment concentrations, as this may violate nondegradation requirements.

Note that for chemicals with both baseline and revised HHC below the quantitation limit, the amended rule will not impose additional costs compared to the baseline.

Some facilities, however, are likely to incur costs under the amended rule:

- One industrial facility may incur additional unquantifiable costs of compliance actions if action required to comply with Hazardous Waste regulations was insufficient to also meet the revised HHC.
- Quantifiable capital cost to facilities to comply with revised standards for phthalates: $10.6 thousand
- Unquantifiable costs of Source Control Plan implementation, and compliance schedule or variance acquisition costs if the revised HHC cannot be met using the Source Control Plan.

Note that this section describes the general result, including baseline 303(d) listings and TMDLs. Discussion of the impacts of changes in listing status is in section 5.3, below. Discussion of the impacts of various trajectories for future industry growth, 303(d) listings, and TMDLs is in section 5.4. **General permits do not include numeric effluent limits based on HHC, and were therefore not included in this analysis.**

### 5.2.7 Human health criteria (HHC) changes, future facilities, and expansions

The two facilities that are likely to incur costs and are not POTWs are both pulp and paper cleanup sites using pump and treat technology to remediate groundwater contamination. This unique attribute (and the fact that other dischargers in the pulp and paper industry were not identified as likely to be impacted) makes it unlikely that growth in the industry will result in additional sites incurring costs under the amended rule.

Expansions of POTWs (e.g., due to population growth) are not likely to cause POTWs to incur additional costs in future, as the types of costs estimated are not a function of wastewater volume.
For remaining facilities similar to the majority of facilities that are not likely to be impacted by the amended rule, Ecology has no reason to assume that future facilities in any given industry will discharge chemicals in quantities exceeding those currently discharged (whether with or without permit limits). Similarly, any permit limits set for future dischargers are likely to be similar to those set for current dischargers in the same industry, and thus will impose no costs resulting from the rule amendments.

The exception is one groundwater cleanup site that Ecology has identified as a future facility potentially impacted. This cleanup site has a draft permit that Ecology expects to issue by summer 2017. Chemical testing from a pilot study showed one sample with concentrations below baseline standards but in exceedance of the amended rule; all other samples and the sample average fell below limits of the rule amendments. From this data, we think it is likely that the facility will be able to comply with the revised standards without further action. It is possible, though, that further sampling will show chemical concentrations that exceed revised standards, thereby necessitating the facility to install additional technology. However, as the facility is not yet in operation and only has limited data from the pilot study, we are unable to assess probable impacts of the adopted amendments. At this time, trying to project the marginal cost of complying with the new standard above that of the baseline is too speculative as to assign a monetary cost.

Using the same reasoning as for future facilities, we determined that facility expansions will not be impacted by the adopted amendments to HHC values for existing industry types not impacted by the amended rule. The concentrations of pollutants discharged by the expansions will likely be similar to the concentrations of pollutants discharged by existing facilities, and will have similar baseline attributes such as mixing zones, control technology, and permit limits. Therefore, we do not expect most other future facility expansions to be impacted by the adopted changes to the HHC.

## 5.3 Impacts of change in criteria on cleanup sites

Soil and groundwater cleanup sites contaminated with toxic chemicals incorporate surface water quality standards in their required cleanup levels when sites are proximal and likely to contaminate surface waters via soil and groundwater contamination. Ecology uses the HHC and a model of transport through soils and groundwater to surface waters, when determining some cleanup levels, accounting also for groundwater quality standards and soil cleanup standards governed by the Model Toxics Control Act (MTCA).

MTCA, like CERCLA, requires that site cleanups meet applicable or relevant and appropriate requirements (ARARs) of federal or state environmental or facility siting laws. Applicable requirements are those that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at the site. Even if a requirement is not specifically “applicable”, it may still be relevant and appropriate. Relevant and appropriate standards are those that address problems or situations sufficiently similar to those encountered at the cleanup site, even if the standards may not meet jurisdictional prerequisites for applicability.

In addition to the broad use of ARARs as defined by CERCLA, MTCA has specifically incorporated CWA Section 304 Water Quality Criteria as ARARs by rule. The recently updated (2015) Federal water quality criteria are ARAR by rule according to chapter 173-303 WAC. Though some of the adopted standards are more protective, the difference between the recently published Federal Water Quality Criteria for protection of aquatic life and human health, and the amended state water quality standards will be unlikely to cause additional cleanup and associated costs. Remedies employed to comply with the federal ARARs will likely address the adopted requirements.

## 5.4 Impacts of change in criteria on in-water construction

Per the federal Clean Water Act (CWA) projects that need a federal permit or license and may result in a discharge into waters of the United States, including wetlands must obtain a Section 401 Water Quality Certification from the State. Issuance of a Section 401 Certification means that Ecology has reasonable assurance that the applicant's project will comply with state water quality standards and other aquatic resources protection requirements. The Section 401 Certification can cover both the construction and the operation and maintenance of a proposed project. Conditions of the Section 401 Certification become conditions of the Federal permit or license.

The rule amendments to the HHC may increase costs for some Section 401 projects with in-water activities that involve sediment. This might include projects with routine in-water activities in generally clean sediment areas such as bridge building, navigation dredging, bulkhead building, and installation or removal of pilings. For these routine in-water activities, Ecology estimates that a small percentage of these types of projects may be in areas with contaminated sediment and may be impacted by the adopted rule. The remaining routine in-water activity projects are not likely to be impacted by the amended rule because the sediments are not contaminated with the chemicals of concern in the amended rule. Projects that do not

require a Section 401 and include non-routine in-water activities, such as construction at sediment cleanup sites, may be impacted by the amended rule. However, developing a specific metric of projects impacted is not possible. This is because standards can vary by region, so determining if a project has contaminated sediment is a site-specific decision.

A measure of turbidity is used as a proxy to determine whether projects with in-water work are likely to disturb contaminated sediments to a degree that risks significantly contaminating surface waters. Where the HHC become more stringent under the amended rule, and contaminated sediments are impacted by disturbing the sediment, Ecology may need to determine whether turbidity is still a reasonable surrogate measure of likelihood of surface water contamination. If it is not, additional sampling and testing may be necessary, as well as more stringent requirements and best management practices (BMPs) may be triggered where previously not required.

## 5.5 Impacts on sediment cleanup

Cleanup of contaminated sediment sites is regulated under the Sediment Management Standards, WAC 173-204 (SMS) and the Model Toxics Control Act Chapter 79.105D (MTCA). The SMS and MTCA require that sediment standards be in compliance with applicable or relevant and appropriate requirements (ARARs), including the WQS rule. The new WQS rule may impact some sediment cleanup sites in terms of requiring 1) more stringent sediment standards as cleanup levels to protect more stringent surface WQS, and 2) more stringent source control requirements to protect sediment sites more stringent cleanup levels.

To determine if sediment standards are in compliance with ARARs, a site specific determination is made due to the highly variable nature of sediment cleanup sites. While most sediment sites are not likely to result in exceedances of surface WQS, this potential is assessed during development of the conceptual site model and site requirements are appropriately conditioned. In general, the following factors are assessed to determine if a sediment cleanup site has potential to impact surface water quality:

- Insufficiently controlled sources such as stormwater discharges.
- Free-phase petroleum.
- Organic wastes.
- Sensitive biota.
- Large numbers of treated structures.
- Waterbodies with natural or anthropogenic impairments unrelated to contaminated sediment.
- High potential for sediment redistribution.

These types of sites may be impacted by the new WQS rule.

# 5.6 Impacts of change in waterbody listing status

The rule amendments are likely to result in a change in the listing status of some waterbodies. Ecology is not changing the policy and methods by which waterbody assessment units are listed as impaired as part of this rulemaking. Therefore, in this section, we address the issues of:

- Waterbodies likely to change from being unlisted to listed.
- Waterbodies likely to change from being listed to unlisted.
- The number and types of facilities on those waterbodies.
- The likely behaviors and costs resulting from the change in listing status.

## Waterbody listing policy change

It is important to note that, while it is not part of this rulemaking, the policy for listing waterbodies as impaired or unimpaired did change during the timeframe of this rulemaking. The change resulted in baseline and under-adoption listings that differ from previous assessments made for this rulemaking.

Ecology moved to using the National Hydrography Dataset (NHD) for delineating assessment units for streams and most rivers. NHD is used nationwide and is preferred by EPA as a "national" standard for mapping state water quality information. Washington State has adopted the NHD as the state standard hydrography, so other Ecology programs and State and federal agencies are also using the NHD map layers. Hydrologic reaches are likely to be more physically, chemically, and biologically homogenous than reaches defined by political boundaries; in this regard, delineating assessment units based on hydrologic units is more scientifically sound.

NHD water-based assessment units are delineated using the location of the boundaries of upstream and downstream tributaries, also referred to as a "confluence to confluence" approach. The previous segmentation system was based on the public land survey system (PLSS). Using the PLSS, the endpoints of an assessment unit were delineated as the points at which a stream entered/exited a unique township/range/section. For most streams, the NHD-based assessment units are now longer, but in some cases the assessment units have become shorter in length. Using the confluence-to-confluence approach creates a water-based segment that ensures that the water flowing within the segment is assumed to be homogenous, or similar in water quality attributes. When a stream flows into another stream, it potentially changes the water quality as the waters mix, and thus results in a reach whose water quality should be separately assessed.

A segment of a stream/river is a contiguous length of a waterbody to which the same water quality criteria apply, as defined in the Washington State water quality standards. A segment may be composed of one or more NHD reaches; in some cases, water quality criteria change along a given NHD reach, resulting in a segment endpoint that does not coincide with a reach endpoint. Assessment units for streams/rivers range in length from less than 0.1 mile to 17.7 miles, with an average length of approximately 1.6 miles.

Large river assessment units have been defined for the Columbia and Snake rivers. These assessment units are delineated by the location of dams and major tributaries, with the goal being to create assessment units that are relatively homogenous. The segment lengths on the Columbia and Snake rivers range from 1.1 – 19.4 miles. By comparison, in Oregon the Columbia River has assessment units that range from 35 to 197 miles, and in Idaho the Snake River has assessment units that range from 4 to 108 miles. The grid segment that was previously applied to large rivers was designed for waters without unidirectional flow (i.e. lakes, reservoirs, marine waters). Gridded segments represent a very small portion of the river and often do not connect to the shoreline, so using grid cells on large rivers can reduce the ability to accurately determine the influence of point and non-point sources upon the support of the waterbody's designated uses.

The comparisons made throughout this section regarding listings being added or removed under the amended rule are based on a consistent approach using the same new listing policy applied to both the baseline and amended rule analyses. This has resulted in baseline and change listings that differ from previous assessments made for this rulemaking.

### 5.6.1 Change in listing status

Using existing 303(d) listings and policy, the data used to develop those listings, and the changes to criteria resulting from the rule amendments, we determined which waterbody assessment units were likely to change status from being unimpaired to being 303(d) listed. Each 303(d) listing represents an impairment due to a particular chemical for a particular assessment unit of a waterbody. Some waterbody assessment units can have multiple listings for the number of chemicals that do not meet water quality standards.

Our statewide analysis identified:

- 306 listings that are likely to change from unimpaired to impaired due to more stringent and protective criteria.
- 57 listings that are likely to change from impaired to unimpaired due to less stringent and no-less-protective criteria (lower stringency coming from updated science on actual toxicity).

None of the 306 new listings (waterbody assessment unit and chemical pairings) will be in waterbody assessment units to which NPDES permittees discharge the relevant listed chemicals, so there will be no impact on any NPDES permits or their permitted facilities on those waterbodies.

Dischargers on waterbodies that are currently listed as impaired, but have no TMDL, might incur additional costs if a TMDL is completed and sets lower requirements for meeting the HHC as a result of the amended rule. Whether a TMDL is completed within the 20-year scope of this analysis, however, is determined by the process below.

### 5.6.2 TMDL process for dischargers

The degree of impact a facility experiences from finding itself on a listed waterbody depends on where the waterbody is in the process of moving toward an improvement plan, which might be a TMDL or other Water Quality Improvement project such as a Straight to Improvement plan. The basic notion of what happens on a 303(d) listed waterbody without a TMDL is covered by Ecology guidance for permit writing (Ecology, 2011).

This applies to future dischargers on newly listed assessment units under the amended rule, if they discharge the chemical(s) for which the assessment unit is listed. There are no such dischargers.

For developing a permit for a facility discharging chemicals to a waterbody listed for those chemicals, but not yet with a TMDL or other plan, the following sequence of questions is asked:

1. Can the effluent be treated or can the effluent or pollutant(s) be removed seasonally at a cost which is economically achievable or reasonable?
    a. If unsure: Permit has interim limit (no additional loading) and requires engineering report on options and cost.
    b. If yes: Final limits as the water quality criteria or lower, a compliance schedule is necessary, and interim limits based on current discharge.
    c. If no: Go to question 2.

2. Are there options for effluent trading or mitigation by treating uncontrolled sources?
    a. If yes: Permit contains final effluent limits as the water quality criteria, a compliance schedule to accommodate trading and meeting final limits, and interim effluent limits based on current discharge.
    b. If no: Permit contains interim and final limits to prevent an increase in loading. A TMDL is completed for the waterbody.

Effectively, the guiding principle is, “There can be no additional loading or higher concentration allowed for the listed pollutants at times of impairment until the TMDL is completed and it shows dilution available at full implementation of the TMDL.”

## 5.7 Future growth, 303(d) listings, and TMDLs

The rule amendments may result in a change in regulatory circumstances for future additional businesses, based on resulting changes in criteria. We discuss the following sets of likely impacts qualitatively, as they are multivariate in chemical, business, discharge, location, and TMDL context, and many of those variables are unknown at this time, such that we are not able to forecast them quantitatively with a great enough degree of confidence.

Overall, we consider these categories to reflect the likely impacts of future protectiveness resulting from the rule amendments.

- New or expanded dischargers on waterbodies with new 303(d) listings as a result of the rule amendments.
- Future TMDLs completed on waterbodies that become 303(d) listed because of the rule amendments.
- Future 303(d) listings resulting from the rule amendments, as new samples are taken, or sample sensitivity improves.

### 5.7.1 New or expanded dischargers on waterbodies with new 303(d) listings

The amended rule will likely result in 306 listings for assessment units without dischargers of the relevant listed chemicals. To be impacted by the amended rule, a new or expanded discharger facility will need to discharge to an impacted assessment unit, and discharge one of the three chemicals in question.

Data does not indicate a facility that discharges these chemicals to the impacted assessment units. Therefore, it is not likely that within the next 20 years a facility will discharge the chemicals for which the new listings are likely to the impacted assessment units. If there were such a facility, however, it will likely incur the costs of complying with permit limits for the relevant listed chemicals. We do not estimate the costs of the amended rule for this category, as we cannot quantify this with sufficient certainty, as we have no basis for assuming which industry, the type of facility, which chemical(s), and what concentrations in effluent might be involved. Based on existing facilities discharging to the assessment units in question, however, we do not consider it likely that new or expanded dischargers that incur costs will exist on these assessment units.

The above conclusion includes POTWs with expansions necessary due to population growth. No existing POTW discharges the chemicals for which listings (and therefore TMDLs) are likely to change due to the rule amendments, and taking the existing chemical mixture in effluent as an indicator of future discharge chemical mixtures (for current or expanded discharge volumes), we determined it is not likely that the future listings or TMDLs that are due to the rule amendments will impact expanded facilities with larger discharge volumes.

### 5.7.2 Future TMDLs completed on waterbodies that become 303(d) listed

As we discuss above in section 5.4.1, the amended rule is unlikely to impact new and expanded facilities locating on the assessment units that are likely to become 303(d)-listed as a result of the rule amendments. As a result, we do not consider any future TMDL on these assessment units, applying to the chemicals for which the additional listings occur, likely to impact new or expanded dischargers discharging effluent to the assessment units.

Ecology reviewed its process for developing TMDLs for these listings, and determined that it was not likely to develop TMDLs on them in the 20-year timeframe of this analysis, given other listed assessment units and priorities.

### 5.7.3 Future 303(d) listings as new samples are taken or sample sensitivity improves

This chapter focuses on costs in the context of known data and required sample methods. See Chapter 7 for discussion of costs and benefits of the rule amendments in the context of improved future sampling sensitivity and coverage.

## 5.8 Potential costs to a hypothetical unrepresented entity

The amended rule includes more stringent HHC for some chemicals that are currently unlikely to be detected in effluent, at cleanup sites, or at in-water construction sites at all. Should an entity discharging these chemicals exist in the future, the amended HHC could require it to reduce or remediate those chemicals to a greater degree than under the baseline. While this case is hypothetical, we note it as a potential cost associated with the amended rule's additional protectiveness against health impacts from chemicals that are not represented in existing data.

# Chapter 6: Likely Benefits of the Rule amendments

## 6.1 Introduction

We estimated the likely benefits associated with the rule amendments, as compared to the baseline described in Chapter 2 of this document, and with changes discussed in Chapter 3. These likely benefits would be received by entities as discussed in Chapter 4.

## 6.2 Potentially affected entities and benefits

As a general description, entities potentially benefitting from this rulemaking are listed as follows:

- Residents, owners, and employees on and near contaminated sites:
  - Property value impacts
  - Health impacts
- The public and tribes:
  - Fish/shellfish and water consumers.
  - Water users who value water quality as an attribute of direct interaction with water.
  - Non-water-users holding existence and cultural values for water quality.
- The environment:
  - Animals exposed to waters of the state.
  - Plants exposed to waters of the state.

### 6.2.1 Residents, owners, and employees on and near contaminated sites

Current and future users of contaminated and formerly-contaminated sites include those who would benefit from a reduction to the value impacts on property, as well as those who might be exposed to contaminants while living, working on, or visiting contaminated sites.

### 6.2.2 The public and tribes

The members of the public and tribes that are likely to benefit from the rule amendments may fall into one or more of three categories:

1. Fish/shellfish and water consumers,
2. Water users, and
3. Non-water-users.

### 6.2.3 The Environment

Just as the rule amendments are likely to impact human health, they may have impacts on animal health. Animals may be affected by living in water, as well as by consuming it. Since animal health impacts vary across animals, and we have little or no information concerning these impacts, we could not quantify these impacts. Additionally, due to the broad array of animals living in or drinking surface waters of the state, we do not list them here, but instead discuss the affected population qualitatively and categorically. Affected animals may include fish (the means by which they affect human health), orca whales, seals and sea lions, amphibians, and water birds, as well as animals drinking the water.

Where the rule amendments change criteria for chemicals that may also impact plant health, we find it likely that the amended rule will impact plant health in or near water bodies. Similarly to determining impacts to animal health, it is difficult to determine which or how plants might be impacted. As a result, we discuss this impacted population descriptively as well.

## 6.3 Cancer risk reduction benefits

As discussed in Chapter 5, the amended rule is likely to result in increased efforts to control sources of bis(2-ethylhexyl) phthalate ("phthalates") at 11 publicly owned treatment works and two pump and treat groundwater cleanup sites at pulp and paper mills. This phthalate is regulated as a carcinogen, and is also a recognized developmental and reproductive toxicant.

**It is important to note that the amended rule affects real cancer risk differently for different people, depending on their real fish consumption. Much as the rule amendments do not assume *everyone* consumes 175 g/day of fish and shellfish, and 2.4 L/day of water, the amended rule also does not make everyone's excess cancer risk one in one million.**

For the likely additional activities required under the amended rule, as compared to the baseline, at 13 facilities discharging bis(2-ethylhexyl) phthalate (see Chapter 5), we were unable to quantify benefits related to reduced cancer risk. This is because of uncertainty about the degree to which discharges of phthalates will be successfully identified by additional activities required at the facilities, and the degree to which the concentration of phthalates will be reduced in the environment. Reductions in phthalates in effluent (and therefore the environment) will arise from Source Control Plans. Plans might include improved Best Management Practices and addressing upstream contamination sources. These may have varying degrees of timeliness or effectiveness, and both implementation and benefits arising from them take time as well. This generates additional uncertainty regarding the locations of phthalate reductions, and consequently the relevant benefitting populations. Based on the scope of these behaviors, however, Ecology expects this benefit to be positive but small in terms of total population-wide risk reductions (e.g., in equivalent whole cancer cases).

Reduced risk of cancer in one's lifetime also reduces the risk of mortality. To provide an illustrative value of reductions in mortality risk, Ecology uses an estimate of the Value of Statistical Life (VSL). The VSL is based on estimates of the value of small reductions in future mortality risk, and then is multiplied out to the equivalent of a 100-percent mortality risk reduction. A range of values estimated by Aldy and Viscusi (2003), of $2.1 million to $8.6

million. This is an estimate based on equivalent risk-reductions, and should not be interpreted as the value that Ecology, or other entities, hold for any given person.

There are, of course, benefits of avoiding cancer in addition to simply avoiding the risk of death. These include:

- Pecuniary costs of illness:
  - Medical costs
  - Lost income
  - Interest costs of debt
- Non-pecuniary costs of illness:
  - Physical stress (illness itself)
  - Quality of life losses
  - Impacts to family
  - Lost spouse income
  - Lost children's schooling
  - Psychological impacts to family

By reducing the real risk of cancer for the population, the rule amendments also reduce the risks of incurring these costs. Depending on income, wealth, individual attributes, family attributes, location, type of cancer, treatments, and illness duration, these costs vary considerably. We could not quantify most of these individual costs, as we could not confidently do so for a typical case of cancer, especially in the case of non-pecuniary costs. However, we can provide an illustrative value of some of the direct costs of cancer care.

The initial cost of cancer treatment is, on average across sex and type of cancer, for persons age 65 and older (those likely experiencing long-term exposure to carcinogens), $52 thousand in the initial year, and $6 thousand in subsequent years.

## 6.4 Benefits of reduced non-cancer risks

We could not quantify non-cancer benefits of the rule amendments at this time. This is in part because of how non-cancer toxic chemicals are treated both in the National Toxics Rule (NTR) and in the Surface Water Quality Standards (in terms of exposures that do or do not likely result in non-cancer illness, rather than in degrees of those illnesses), as discussed below. Instead, we discuss here the likely impacts of the rule amendments, qualitatively.

Bis(2-ethylhexyl) phthalate is associated with non-cancer health effects related to endocrine disruption and as a developmental toxicant. Specific endocrine disruption endpoints for general pollutant exposure are difficult to identify and quantify, due to their variety and complexity. Generally, such effects include feminization and reduced reproductive success. Developmental toxicants, in contrast, are often defined in terms of impact to attributes such as IQ, which has a quantifiable impact on lifetime earnings streams (EPA estimates the lost lifetime income of a

decrease of one IQ point as $9,600[14]), but the quantitative relationship between many developmental toxicants and IQ has not been determined. This contributes to Ecology's inability to quantify non-cancer health benefits.

An additional reason Ecology could not quantify non-cancer health benefits is how chemicals causing non-cancer health endpoints are treated in HHC calculations. Carcinogens are regulated for their carcinogenicity, though they also cause non-cancer health endpoints (this is the case for Bis(2-ethylhexyl) phthalate). Moreover, for non-cancer effects, the magnitude of a health effect associated with contaminant exposure is characterized only as being above or below a dose at which there is no appreciable risk of an adverse effect. There is no indication of the probability of exposed individuals contracting such an effect, nor any measure of the severity of the effect – simply a dividing line between having effects and not having any.

For non-carcinogens, the amended rule retains a hazard quotient of one, as in the baseline. Although in many or most cases, we have the values for avoiding a non-cancer health endpoint, or the costs associated with having a non-cancer health effect, it is difficult or impossible to translate chemical exposure to the non-cancer health endpoints themselves.

We can say to some degree, however, that non-cancer health impacts of the rule amendments, are likely similar to its effects on cancer incidence, above, and are positive but small in equivalent whole population-wide incidence of non-cancer health effects.

In broad terms, the baseline is protective of only a small segment of the population, when it comes to non-carcinogens. By making some HHC lower (more protective), the rule amendments expand the breadth of protectiveness afforded by the rule. More people are protected from entering a situation in which their hazard quotient is greater than one (where they will have some positive likelihood of experiencing non-cancer health endpoints). Additionally, people who were protected under the baseline are protected more – kept farther from the levels of exposure that will result in health impacts.

## 6.5 Environmental and non-water-use benefits

Cleaner waters, even if they are in uncertain or limited areas and develop over time, are potentially beneficial to wildlife and plant life. As such (and also accounting for carrying identified low-risk levels of chemicals) they also carry greater value for members of the population that do not directly use them.

Much as small reductions in phthalates resulting from measures taken at facilities identified in Chapter 5 of this analysis are likely to provide small reductions in cancer and non-cancer risk to relevant populations of people, they can also benefit animals and plants. Fish, water and shore birds, mammals and birds drinking water, and aquatic mammals may benefit from reductions in phthalate exposure.

Though likely small, the reduced risks to people and the environment resulting from the rule amendments, may improve the values people hold for the waters surrounding the identified facilities where behaviors may change and reductions may occur. These non-use values are not

[14] https://www.epa.gov/children/childrens-environmental-health-facts

merely conceptual, but are represented in people's increased willingness to pay to purchase or visit property near these waters, as well as maintain improvements to these waters.

## 6.6 Impacts of change in waterbody listing status

The rule amendments are likely to result in a change in the listing status of some waterbodies. Ecology is not changing the policy and methods by which waterbody assessment units are listed as 303(d) (impaired), as part of this rulemaking. Therefore, in this section, we address the issues of:

- Waterbodies likely to change from being unlisted to listed.
- Waterbodies likely to change from being listed to unlisted.
- The number and types of facilities on those waterbodies.
- The likely behaviors and costs resulting from the change in listing status.

Using existing 303(d) listings and policy, the data used to develop those listings, and the changes to criteria resulting from the rule amendments, we determined which waterbody assessment units were likely to change status from being unimpaired to being 303(d) listed. Each 303(d) listing represents an impairment due to a particular chemical for a particular assessment unit of a waterbody. Some waterbody assessment units can have multiple listings for the number of chemicals that do not meet water quality standards.

Our statewide analysis identified:

- 306 listings that are likely to change from unimpaired to impaired due to more stringent and protective criteria.
- 57 listings that are likely to change from impaired to unimpaired due to less stringent and no-less-protective criteria (lower stringency coming from updated science on actual toxicity).

The 57 listings likely to change from impaired to unimpaired are mostly driven by the amended higher (less stringent) HHC for dioxin. The amended dioxin HHC is driven by updated science and is not less protective than the baseline HHC.

Future dischargers on these 57 listing assessment units may incur lower compliance costs to meet the less stringent HHC. Ecology identified existing dischargers on the 57 changing listings, and determined that they do not discharge the relevant chemicals.

## 6.7 Reduced costs of complying with less stringent criteria

Under the amended rule, 23 freshwater and 11 marine HHC are less stringent than under the baseline. These criteria changes are driven by updated scientific information, and while the HHC are higher, they are still protective to the one-in-one-million level of cancer risk. Some facilities, cleanup sites, or in-water construction projects currently affected by these HHC are likely to incur lower compliance costs under the amended rule. The degree to which costs might be reduced depends on facility, site, or project attributes, waterbody attributes, and other elements (e.g., permit status and requirements, cleanup status and other cleanup drivers and remediation methods, and in-water construction project certification requirement drivers). We could not confidently quantify this benefit, and so include it qualitatively.

## 6.8 Potential benefits associated with a hypothetical unrepresented entity

The amended rule includes more stringent HHC for some chemicals that are currently unlikely to be detected in effluent, at cleanup sites, or at in-water construction sites. Should an entity discharging these chemicals exist in the future, the amended HHC could require it to reduce or remediate those chemicals to a greater degree than under the baseline. While this case is hypothetical, we note it as a potential benefit of the amended rule's additional protectiveness against health impacts from chemicals that are not represented in existing data.

## 6.9 Implementation tools

The amended rule includes changes to implementation tools that can be used to comply with the HHC and other water quality standards. We have not included the use of these tools in our cost or benefit assumptions elsewhere in this analysis. That is, the previous analysis of costs and benefits assumes full compliance with the HHC. Here, we discuss the costs and benefits of the implementation tools, with context for how they would affect estimates.

### 6.9.1 Compliance schedules

The amended rule removes the 10-year limit on compliance schedules that exists in the baseline rule. This change was made to comply with the legislature's 2009 directive to Ecology to authorize compliance schedules in excess of ten years under certain circumstances (RCW 90.48.605). The amended rule does, however, limit compliance schedules to the shortest time possible.

When Ecology surveyed compliance schedules in 2014, we found 15 compliance schedules in permits at that time. Based on professional experience, Ecology estimates that at any given time, there are 10-20 compliance schedules. They are often driven by TMDLs, though more recently they are also driven by lower detection limits for some chemical testing.

This change provides a predictable regulatory environment for dischargers and administrators. Instead of repeated new compliance schedules, a single longer compliance schedule allows all entities involved to plan the complete context for compliance in the shortest time possible.

### 6.9.2 Intake credits

The amended rule adds intake credits as a new tool for compliance with water quality standards. Intake credits allow facilities to account for chemicals in their intake when determining the limits and actions required to achieve compliance with the rule. This means intake credits prospectively reduce compliance costs because they allow dischargers to avoid managing chemicals in effluent that were already present in the intake water.

As the degree to which costs might be reduced will vary widely depending on facility attributes, intake attributes, and the amounts and concentrations of chemicals in the water body assessment units involved, we could not quantify this cost-reduction benefit with a high degree of confidence.

### 6.9.3 Variances

The amended rule refines and elaborates on the existing rule provisions authorizing variances in compliance with water quality standards. Ecology has not issued variances in the past, and we consider in this analysis that the issuance of variances will likely remain a rare occurrence. The amended rule, however, better defines the process for variances, making it clearer when a variance will likely be the most appropriate course of action.

This amended rule provides a predictable regulatory environment for dischargers and administrators. Dischargers would reduce the time and uncertainty incurred by application for repeated variances. Prospectively, this amended rule will also decrease the likelihood of requested use changes for waterbodies.

## 6.10 State self-determination benefits

As discussed in Subsection 2.2.1.2, state law directs surface water quality standards to be determined significantly by the people and administration of Washington State. There is a benefit to not only complying with the law, but with the underlying intent of this law, which includes the self-determination to develop regulation appropriate for the people and businesses of the state. This is a benefit compared to the baseline of retaining existing NTR-based standards, or the possible alternative of federal intervention in updating the HHC for the state.

# Chapter 7: Costs and Benefits under Hypothetical Future Improvements in Sampling and Testing

## 7.1 Introduction

As we have stated, this analysis is based largely on existing effluent and soil or groundwater contaminant data, as well as existing tissue-sample data. This means it may not represent all of the possible types of facilities impacted in the future, or locations that would become 303(d)-listed, and need to develop TMDLs at some point in the future, if approved sampling methods improve. Similarly, it may not represent all of the possible types of cleanup sites impacted in the future. **This is because existing data uses existing sampling methods. Ecology acknowledges the possibility that, in the future, the EPA will approve more sensitive testing methods, and the likelihood of additional sampling in locations that lack sufficient samples.**

This chapter augments the analysis in Chapters 5 and 6 to take into account hypothetical future increases in sampling and possible future improvements in the sensitivity of sample testing. There is too much uncertainty in the locations, facilities, chemicals, concentrations, and timing of impacts associated with future improvements to sampling and testing to assess the impacts of these future actions quantitatively.

While Ecology's economic analyses are typically based on the existing scientific context (e.g., we do not address future technologies or future revelations in health sciences), we include this qualitative analysis as contemplated by the Administrative Procedure Act (APA, RCW 34.05.328).

Like the NTR, the amended HHC set water quality standards for some chemicals at levels below the level at which these chemicals can be detected in water using approved EPA test methods. For these chemicals, non-detection in effluent samples is deemed to be compliance with the standard. Similarly, where the HHC are used as Applicable or Relevant and Appropriate Requirements (ARARs) in cleanup at soil and groundwater sites, non-detection is also deemed to be compliance with the standard in such cases.

As test methods improve, however, some of these chemicals will become detectable at lower concentrations. In addition, not all water bodies or effluent has been tested for all of the chemicals in the amended rule. For these reasons, future sampling of effluent or water bodies, and future testing using improved detection methods may detect chemicals of concern in places where they have not yet been detected. If these chemicals are present at levels that exceed the amended HHC, dischargers will incur costs to decrease the amount of these chemicals in their effluent, and the public will receive benefits from decreased exposure to these chemicals. It is important to note, however, that some of the chemicals that might be found in water bodies or effluent that has not been tested for them, may exceed baseline criteria as well, and the costs of treatment or remediation of these chemicals will not be a result of the rule amendments.

# 7.2 Likely costs of the rule amendments under future improvements in sampling and testing

This section examines compliance costs in the general case of new or improved sampling, associated with control technology and possible 303(d) listings in addition to those addressed in Chapter 5, in cases that would not have occurred under the baseline.

## 7.2.1 Context for size and scope of costs due to future improvements in sampling and testing

For context (from Chapter 5), given existing sample and effluent information, we determined that 13 facilities are likely to incur total quantifiable costs of nearly $11 thousand under the amended rule, and two additional facilities will possibly incur costs.

We also determined that in groundwater, soils, and sediments:

- Cleanup sites are not likely to be impacted by the amended rule.
- The majority of in-water construction projects are not likely to incur costs as a result of the amended rule.
- Some in-water construction projects may incur additional investigation and more stringent requirements and BMPs to receive Section 401 certification.

We also determined that in waterbody listings for impairment:

- 306 listings will be likely to change from unimpaired to impaired.
- 57 listings will be likely to change from impaired to unimpaired.

This is a subset of a universe of:

- 543 existing 303(d) listings, and
- 157 current and in-progress TMDL projects (covering 1445 listings, of which approximately 70 are for a chemicals toxic to human health).

These listing changes do not impact existing dischargers because no dischargers discharge the chemicals that triggered the additional 303(d) listings.

Forecasting future TMDLs is difficult to do with a high degree of confidence, as the locations of the TMDLs and the chemicals involved depend on the number and location of future 303(d) listings. The table below summarizes Ecology's planned approach to ongoing TMDL implementation and the new HHC.

Table 5: Approach to ongoing TMDL work taking into account amended human health criteria (HHC).

| TMDL Status | Transition Solution |
|---|---|
| 1. TMDL formally approved. | • Keep TMDL in place, even if criteria in the new rule are different<br>• Continue implementation measures<br>• Monitor compliance with TMDL allocations<br>• Compare TMDL targets to new criteria, but not required to change targets<br>• Water body will be placed in category 4a: Has a TMDL - in accordance with the 303(d) listing policy.<br>• As effectiveness monitoring is done on the TMDL it will include analysis of the new criteria. |
| 2. TMDL not yet approved, but field work completed and report may or may not be completed | • Report will have to be updated to include analysis of the new criteria<br>• Proceed with submittal of TMDL if the analysis shows that new criteria will be met.<br>• If new criteria will not be met then the TMDL will need to be amended to address new criteria. |
| 3. TMDL study in progress and field work begun but not completed | • Continue study and include new criteria<br>• Analysis should be based on new criteria<br>• Develop monitoring plan that incorporates new criteria |
| 4. TMDL study planned and no field work yet begun | • Include new criteria in study design and sampling and drop old criteria |
| 5. 303(d) listed but no priority set for doing study | • Retain on 303(d) list<br>• Continue to scope and schedule projects. When projects are selected for work, the project will be treated the same as in (4) above |

The trajectory of future TMDLs also depends on whether and when large projects will be undertaken. For example, the Yakima River technical work is already done, but a formal TMDL and Load Allocation must still be developed.

### 7.2.2 Context for types of costs incurred under future improvements in sampling and testing

New or improved information arising from newly approved testing methods could result in lower enforceable permit limits for dischargers. Additionally, better or broader coverage of sampling could discover contamination information that will result in additional 303(d) listings, more stringent cleanup levels, or more stringent Section 401 certification costs, in addition to those discussed in Chapters 5 and 6 of this document. Some of this newly discovered contamination information could also exceed baseline criteria, the impacts of which are not a result of the rule amendments.

If an existing facility, or a new/expanded future facility, finds itself on a future 303(d)-listed waterbody assessment unit that will not have been listed under the baseline, it will likely face more-stringent permit limits if it discharges the chemical for which the waterbody assessment unit becomes listed. Depending on the relevant concentrations of chemicals, facility attributes, and economic viability of additional controls, the facility might:

- Incur additional compliance costs for testing, monitoring, changes in practice, or possible control technologies.
- Have a compliance schedule in its permit, facilitating long-run compliance.[15]
- Need to comply with a facility-specific load allocation, or other limits due to non-TMDL water-quality improvement projects.
- Need to comply with a load allocation resulting from a TMDL if it discharges a chemical to a waterbody that is the chemical that triggers the impairment listing. Such a facility might need to address its location and discharge as part of its business decisions, when determining where to locate.

Overall, costs might include:

- Additional testing or monitoring periods.
- Development and implementation of source control plans.
- Capital costs of new or additional control technologies.
- Operating and maintenance costs of new or additional control technologies.
- Monitoring costs.
- Costs of interim limitations on chemicals discharged, as necessary studies are completed to support a final load-allocation.

Cleanup proponents or owners of in-water construction projects might incur similar costs if new or improved information from improved sampling and testing methods identifies contamination that was not previously confidently quantified or detectable.

Ecology is not likely to incur additional costs under the amended rule, even in the context of improved sampling or detection, as this work is likely to become part of existing and ongoing workload. Development and enforcement of permit limits is part of the baseline, as is listing of impaired waterbodies and management of TMDLs using the existing process (see Table 5, above). Prospective increased use of implementation tools is likely to be absorbed as part of ongoing permit management, rule work and TMDL work.

[15] A new facility would not be allowed to have a compliance schedule; it would need to meet limits based on the new human health criteria at startup.

### 7.2.3 Context of possible costs incurred under future improvements in sampling and testing

Future improvements in sampling and testing may result in increased costs of compliance for affected dischargers and cleanup proponents, as discussed above. However, uncertainty about the number of affected sites and facilities, chemicals, concentrations, locations, and timing, makes it impossible to quantify these costs. Moreover, in the context of technological and methodological improvements, it is unclear what price trajectories will be prompted by technological improvements.

**Marine Waters**
It is important to note that 27 of the marine water HHC are already below quantitation limits (QL; below which Ecology will not be able to confidently regulate) under the baseline. Under the amended rule, a total of 45 HHC are below their QL, of which 3 are chemicals without a HHC under the baseline. This means 15 of the amended HHC fall below the QL, while they were above it under the baseline. Improvements in sampling and testing will result in increased costs to dischargers to comply with the baseline standards as well.

For the 27 marine water HHC that are below QL under the baseline , increased costs of meeting the baseline HHC under a hypothetical better-testing scenario (where the QL is less than HHC) are part of the baseline, and are not a consequence of the changes in HHC.

**Fresh Waters**
It is important to note that 42 of the freshwater HHC are already below quantitation limits (QL; below which Ecology will not be able to confidently regulate) under the baseline. Under the amended rule, a total of 51 HHC are below their QL, of which 4 are chemicals without a HHC under the baseline. This means 5 of the amended HHC fall below the QL, while they were above it under the baseline. Improvements in sampling and testing will result in increased costs to dischargers to comply with the baseline standards as well.

For the 42 freshwater HHC that are below QL under the baseline , increased costs of meeting the baseline HHC under a hypothetical better-testing scenario (where the QL is less than HHC) are part of the baseline, and are not a consequence of the changes in HHC.

## 7.3 Likely benefits of the rule amendments under future improvements in sampling and testing: reduced cancer

For the same reasons we could not confidently quantify costs in previous sections (lack of data that does not yet exist), we could not confidently quantify the benefits of the rule amendments under a possible future scenario of increased and more-sensitive sampling. We therefore did not estimate the possible avoided cancer mortality for this section. Instead, we discuss this benefit qualitatively with some illustrative unit values.

To estimate the value of equivalent reductions in mortality risk, Ecology uses an estimate of the Value of Statistical Life (VSL). The VSL is based on estimates of the value of small reductions in future mortality risk, and then is multiplied out to the equivalent of a 100-percent mortality

risk reduction. We use a range of values estimated by Aldy and Viscusi (2003), of $2.1 million to $8.6 million (2015$). This is an estimate extrapolated from percentage risk reductions, extended to 100-percent risk reductions, and should not be interpreted as the value that Ecology, or other entities, hold for any given person.

### 7.3.1 Non-mortality benefits of avoided cancer risk under future improvements in sampling and testing

There are, of course, benefits of avoiding cancer in addition to simply avoiding the risk of death. These include:

- Pecuniary costs of illness:
  - Medical costs
  - Lost income
  - Interest costs of debt
- Non-pecuniary costs of illness:
  - Physical stress (illness itself)
  - Quality of life losses
  - Impacts to family
  - Lost spouse income
  - Lost children's schooling
  - Psychological impacts to family

By reducing the real risk of cancer for the population, the rule amendments also reduce the risks of incurring these costs. Depending on income, wealth, individual attributes, family attributes, location, type of cancer, treatments, and illness duration, these costs vary considerably.

We chose not to quantify these individual costs, as we could not confidently do so for a typical case of cancer, especially in the case of non-pecuniary costs. However, we did quantify the typical cost of cancer care. The initial cost of cancer treatment is, on average across sex and type of cancer, for persons age 65 and older (those likely experiencing long-term exposure to carcinogens), $52 thousand in the initial year, and $6 thousand in subsequent years.[16]

[16] Mariotto, AB, KR Yabroff, Y Shao, EJ Feuer, and ML Brown (2011). Projections of the Cost of Cancer Care in the U.S.: 2010-2020. *J Natl Cancer Inst*. 2011 Jan. Supporting analysis for National Cancer Institute, National Institutes of Health, US Department of Health and Human Services (2011). "Annualized Mean Net Costs of Care".

# 7.4 Future Protectiveness Benefit under Improved Sampling and Testing: Non-Cancer

We could not quantify non-cancer benefits of the rule amendments at this time. This is because of how non-cancer toxic chemicals are treated both in the National Toxics Rule and in the Surface Water Quality Standards. Instead, we qualitatively discuss here the likely impacts of the rule amendments.

For non-cancer effects, the magnitude of a health effect associated with contaminant exposure is characterized only as being above or below a dose at which there is no appreciable risk of an adverse effect. There is no indication of the probability of exposed individuals contracting such an effect, nor any measure of the severity of the effect – simply a dividing line between having effects versus not having any effects.

For non-carcinogens, the amended rule retains a hazard quotient of one, as in the baseline. Although in many or most cases, we have the values for avoiding a non-cancer health endpoint, or the costs associated with having a non-cancer health effect, it is difficult or impossible to translate chemical exposure to the non-cancer health endpoints themselves.

The Environmental Protection Agency states:

> In order to monetize the benefits associated with avoiding a non-cancer health effect, an analyst must first develop a full characterization of the effect itself. This includes a clear definition of the nature of the effect and a method for quantifying the likelihood of its occurrence within an exposed population. For non-cancer effects, the magnitude of a health effect associated with contaminant exposure is characterized only as being above or below a dose at which there is no appreciable risk of the adverse effect. There is no indication of the probability of exposed individuals contracting such an effect nor any measure of the severity of the effect.
>
> While standard cancer risk assessment methods can be used to quantify the magnitude of risk, analogous methods are not available for quantifying non-cancer risks. Specifically, cancer risk assessment methods can produce estimates of the probability associated with contracting cancer as a result of exposure to a contaminant. In contrast, available non-cancer risk assessment methods do not provide quantitative estimates of the probability of experiencing non-cancer effects from contaminant exposures. Non-cancer risk assessments are typically based on the use of the hazard quotient, a ratio of the estimated dose of a contaminant to the dose level below which there will not be any appreciable risk (the Reference Dose or RfD). Such an approach can only be used to determine how a contaminant dose compares to the RfD for that contaminant. If the dose for an exposed population is equal to or greater than the RfD, then the population is at risk of contracting the adverse effect associated with the contaminant.
>
> There are significant constraints in our ability to characterize and quantify non-cancer health effects in ways that can be monetized. These include difficulties in defining the nature of the effect itself and in quantifying the probability that a given exposure level will result in an individual contracting the effect. (EPA, 2000)

We can say to some degree, however, that non-cancer health impacts of the rule amendments, are likely similar to its effects on cancer incidence and mortality risk, above. In broad terms, the baseline is protective of only a small assessment unit of the population, when it comes to non-carcinogens. By making some HHC lower, the rule amendments expand the breadth of protectiveness afforded by the rule. More people are protected from entering a situation in which their hazard quotient is greater than one (where they will have some positive likelihood of experiencing non-cancer health endpoints). Additionally, people who were protected under the baseline are protected more – kept farther from the levels of exposure that will result in health impacts.

# 7.5 Non-use benefits under future improvements in sampling and testing

A value also held for both health and environmental goods and services, is the non-use value. One can think of it as the value held for something one may never encounter or use. This set of values includes:

- Empathetic values (values we have for others' ability to use something),
- Historic value,
- Cultural value,
- Bequeathment value to children or future generations, and
- Value of something simply existing.

We discuss these values qualitatively in this section.

We assume that non-use benefits for water quality in the state are likely only in the case of broad future protectiveness, and have therefore not included them in the benefits based on current data in Chapter 6.

## 7.5.1 General population values

Illustratively, there are various values in the literature for "water quality". In general, criteria levels decreasing would affect these values by improving perceived water quality. Such values are often difficult to quantify, particularly because they rarely rely on a quantitative measure of water quality. Instead, they rely on perceptions of water being "boatable", or "fishable", or "swimmable". The way many of these values are defined – on a qualitative or perception basis – may indicate that regardless of the underlying factors causing changes to criteria, the perception may, in fact, be that lower (more protective) criteria mean better "water quality".

### 7.5.2 Tribes' values

Tribes in the state hold long-standing cultural values for the quality of the environment, and as part of that, for safe consumption of fish. In communication with Ecology, representatives stated the following, to support Ecology's ability to better describe this set of values for tribal health, lifeways, communities, and economy:

> Tribes maintain treaty-reserved rights to the harvest of fisheries resources that the state of Washington is required to acknowledge and implement. The health, culture and lifeways of tribal communities and individuals are inextricably connected to water quality and the consumption of fisheries resources. These intangible and priceless benefits derived from clean water have been impaired by existing toxic contamination. A amended rule that will reduce the concentration of toxic contamination, or eliminate the input of additional toxic contamination, serves to prevent additional harm and helps protect the priceless and intangible rights of tribes to treaty reserved resources and cultural lifeways for generations in the future.
>
> …
>
> Subsistence fishers harvest fish for cultural, spiritual, and economic reasons. Fishing closures and advisories deny these individuals the nutritional benefit, economic savings, and cultural satisfaction of the opportunity to harvest their own food.
>
> …
>
> Recent economic analyses have emphasized the value of "natural capital" and its role in sustaining human communities. Clean and healthy ecosystems produce food and other material provisions, regulate the quality of air and water, and support cultural values and activities.
>
> …
>
> Tribal fish consumers are, and will be, impacted by the state's water quality rules, and must be differentiated from the general population. Tribal leaders are resolute in their perspective that there is no appropriate price for a human life and human health, including the health of a tribal member or the loss of the tribal way of life in connection with natural resources. Leaders have also noted that the existing inadequate standards perpetuate the status quo, incurring continuing costs to fish consumers—particularly to tribal citizens in the form of diminished health and welfare, and the loss of access to treaty-reserved resources. Tribes are facing a future without fish, either due to the loss of "First Foods" resulting from reductions in the quantity of fish available for consumption, or the exposure to toxic chemicals which may render the fish inedible.

(Memo from Northwest Indian Fisheries Commission staff, received 5/12/14)

## 7.6 Co-benefits to nutrition and the environment under future improvements in sampling and testing

We note in this analysis, that fish consumption is also a means of getting nutrition that is either not available, or available at higher cost from other sources. The rule amendments may offer an increased degree of protectiveness that allows fish-consumers to eat fish more safely, thereby reducing their costs of either acquiring nutrients, or the pass-through costs of a lack of nutrients (illness).

Where the benefits of reducing toxic chemicals in the water exist, as a likely result of the rule amendments, there are also likely benefits to animals and plants. While there are varying impacts, and different degrees of impact, of different chemicals across species, we expect the amended rule to have ancillary benefits to animals in water, as well as those that drink water directly. We expect that the bioaccumulative species, including fish, through which toxic chemicals eventually impact human health, to be among those benefitting. Where species – especially those with threatened populations – will experience reduced toxic exposure, we expect there will be a benefit to the environment in terms of both quality of the environment and quality of populations.

# Chapter 8: Cost-Benefit Summary

## 8.1 Cost and benefit summary

We estimated the following ranges of costs and benefits of the rule amendments, as well as the following qualitative impacts.

### 8.1.1 Changes to Human Health Criteria (HHC) using existing data and sampling techniques

**Likely costs:**

- Two industrial facilities may incur additional unquantifiable costs:
  - Costs of compliance actions if action required to comply with Hazardous Waste regulations was insufficient to also meet the amended HHC.
  - Costs of compliance actions if a facility chooses to continue operations rather than curtailing them.
- Quantifiable capital cost to facilities to comply with amended standards for phthalates: $10.6 thousand
- Unquantifiable costs of Cleanup Action Plan implementation, and compliance schedule or variance acquisition costs if the amended HHC cannot be met using the Cleanup Action Plan.
- Possible unquantifiable sampling and testing costs, as well as costs of more stringent requirements and BMPs at some in-water construction sites seeking Section 401 Certification, if Ecology determines turbidity is not a sufficient proxy for the likelihood of contaminating the water column.
- Possible incremental cleanup costs to some sediment cleanup sites, determined on a site-specific basis.
- Potential compliance costs to a hypothetical unrepresented discharger, cleanup site, or in-water construction project, to control chemicals not currently observed in samples.

**Likely benefits:**

- Unquantifiable positive but likely small reduced cancer risk associated with bis(2-ethylhexyl) phthalate, resulting in reduced:
  - Mortality
  - Treatment costs
  - Income loss
- Other financial and non-money costs relating to quality of life
- Unquantifiable positive but likely small reduced non-cancer illness risk.

- Potential reduced compliance costs to existing and future dischargers discharging to 57 waterbody assessment units changing from impaired to unimpaired.
- Potential future reduced costs of complying with less stringent HHC for:
  - 23 chemicals in freshwater
  - 11 chemicals in marine waters
- Increased protectiveness against hypothetical future discharges of chemicals not represented in current sampling.
- Retention of the state's ability to develop regulation appropriate for the people and businesses of the state.

### 8.1.2 Changes to implementation tools

Benefits likely include:

- A predictable regulatory environment.
- Reduced likelihood of multiple compliance schedules or variance applications.

### 8.1.3 Changes to HHC under hypothetical future improved sampling

Ecology was unable to quantify these hypothetical costs and benefits because data under this scenario does not currently exist.

Costs likely include:

- Equipment capital costs
- Operation and maintenance costs
- Monitoring costs
- Timing costs of interim limitations on chemicals discharged
- Remediation costs

Benefits likely include:

- Avoided property value impacts.
- Cancer risk reductions resulting in reduced mortality.
- Avoided cancer treatment costs.
- Reduced exposure to non-carcinogenic toxic chemicals, reducing risk of experiencing health impacts associated with endocrine disruptors and developmental toxicants.
- Reduced losses to income, debt, and non-pecuniary quality of life measures.
- Preservation of tribal values for cultural, treaty, and maintenance or improvement of tribal lifeways.

- Preservation of general non-use values.
- Reduced animal and plant health impacts from chemicals in the water.
- Prospective co-benefits to nutrition.

# Chapter 9: Least-Burdensome Alternative Analysis

## 9.1 Introduction

Chapter 34.05.328(1)(e) 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 proposed 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 proposing the rule.

(c) Provide notification in the notice of amended rule making 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 proposed under RCW 34.05.360.

In other words, Ecology is required to determine that the contents of the rule are the least burdensome set of requirements that still achieve the goals and objectives of the authorizing statute(s).

Ecology assessed alternatives to elements of the amended rule, and determined whether they met the goals and objectives of the authorizing statues. Of those that will meet these goals and objectives, Ecology determined whether those chosen for the amended rule were the least burdensome.

## 9.2 Goals and objectives of authorizing statutes

The authorizing statutes for the Water Quality Standards for Surface Waters of the State of Washington involve both federal and state regulations. We describe these regulations below, then discuss their goals and objectives.

## 9.2.1 Federal requirement

Clean Water Act 303(c)(2)(A) states:

…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 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.

## 9.2.2 State requirements

In addition to the federal requirements the Department of Ecology is required under State Statute to “retain and secure high quality waters”.

### 9.2.2.1 Water Pollution Control Act:

**90.48.010 Policy enunciated**

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.

**90.48.035 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.

**90.48.260 Federal Clean Water Act – Department designated as state agency, authority – Powers, duties and functions**

The Department of Ecology is hereby designated as the State Water Pollution Control Agency for all purposes of the federal clean water act as it exists on February 4, 1987, and is hereby authorized to participate fully in the programs of the act.

**90.48.605 Amending state water quality standards – Compliance schedules in excess of ten years authorized**

The department shall amend the state water quality standards to authorize compliance schedules in excess of ten years for discharge permits issued under this Chapter that implement allocations contained in a total maximum daily load under certain circumstances. Any such amendment must be submitted to the United States environmental protection agency under the clean water act. Compliance schedules for the permits may exceed ten years if the department determines that:

(1) The permittee is meeting its requirements under the total maximum daily load as soon as possible;

(2) The actions proposed in the compliance schedule are sufficient to achieve water quality standards as soon as possible;

(3) A compliance schedule is appropriate; and

(4) The permittee is not able to meet its waste load allocation solely by controlling and treating its own effluent.

**9.2.2.2 Water Resources Act of 1971**

**RCW 90.54.020 General declaration of fundamentals for utilization and management of waters of the state.**

(b) Waters of the state shall be of high quality. Regardless of the quality of the waters of the state, all wastes and other materials and substances proposed for entry into said waters shall be provided with all known, available, and reasonable methods of treatment prior to entry. Notwithstanding that standards of quality established for the waters of the state would not be violated, wastes and other materials and substances shall not be allowed to enter such waters which will reduce the existing quality thereof, except in those situations where it is clear that overriding considerations of the public interest will be served.

## 9.2.3 Goals and objectives summary

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

- To retain and secure high quality for all waters of the state.
- Insure the purity of all waters of the state consistent with:
  - Public health and public enjoyment thereof.
  - Propagation and protection of wild life, birds, game, fish and other aquatic life.
  - Industrial development of the state.

- Require the use of all known available and reasonable methods (AKART) by industries and others to prevent and control the pollution of the waters of the state of Washington.
- To protect the public health or welfare, enhance the quality of the water, taking into consideration their use and value for public water supplies, propagation of fish and wildlife, recreational purposes, and agricultural, industrial and other purposes.
- To authorize compliance schedules lasting longer than ten years under certain circumstances.

# 9.3 Alternatives considered and why they were not included

In this subsection we discuss alternatives that were considered, but were not included in the rule amendments. We identify, for each alternative, why it was not included.[17]

## 9.3.1 Higher fish consumption rate

A higher fish consumption rate would, were it the only element of the rule amendments to change, result in lower criteria values for discharged chemicals that are hazardous to human health. This would inherently be more burdensome, depending on the degree to which the rate was higher. Mathematically, any rate higher than the 175 g/day in the rule amendments would lower criteria values and be more burdensome than the contents of the rule amendments.

## 9.3.2 Lower fish consumption rate

Ecology believes that a lower fish consumption rate, were it the only element of the rule amendments to change, would not be sufficiently protective of human health, as it would allow for higher concentrations, in effluent, of chemicals toxic to human health – both carcinogens and non-carcinogens.

As part of the overall package, combining the most-appropriate set of inputs to the EPA HHC equations, Ecology determined a fish consumption rate of 175 g/day was sufficiently protective (in light of other inputs such as cancer risk and toxicity and exposure attributes of various chemicals) as part of their risk-management decision, without being excessively burdensome. The risk-management decision included elements of both protectiveness and burden.

[17] This discussion addresses higher and lower HHC concentrations. For discussion of higher and lower concentrations in the nuanced context of protectiveness, see for example Section 7.4 of this document.

### 9.3.3 National Toxic Rule (NTR) Criteria (no change from the baseline)

Keeping the existing NTR chemical criteria for protection of human health would not be sufficiently protective of populations in Washington State. As is discussed in Section 1.3 of this document, the baseline standards do not reflect current science on protection from toxic chemicals. As such, the existing NTR criteria would not meet the goals and objectives of the authorizing statutes, particularly those relating to protecting the public health and welfare, as well as public enjoyment, as related to water use. Additionally, they do not reflect high fish-consuming populations in Washington.

### 9.3.4 Probabilistic risk assessment approach

A probabilistic risk assessment approach would not necessarily be more or less burdensome than the amended rule. While such an approach would solve for risk using distributions for specific inputs, it would still require choices to be made regarding the degree of protectiveness provided for certain populations (especially those consuming high levels of fish), as well as choices of what distributions are used in the assessment. Ecology acknowledges that the true risk to any particular individual or population is not accurately represented by the inputs to the criteria equations (there are inherent population distributions to body weight, fish consumption rate, drinking water intake, etc.). Also, additional assumptions would be necessary about what "protection of the designated use" means. As opposed to making probabilistic determinations regarding the population-wide risk, Ecology believes the amended rule comprehensively protects high-consuming populations to a greater degree than a probabilistic risk assessment approach, in line with the protectiveness goals of the authorizing statutes.

### 9.3.5 EPA proposed Human Health Criteria (HHC)

The economic analysis done by EPA for their proposed HHC for Washington state[18] provides cost estimates for compliance with arsenic and mercury that are substantially higher than for the Ecology amended rule. This is because the proposed EPA HHC would be more burdensomely stringent than the Ecology amended rule. Additionally, while EPA estimates no additional costs for compliance with the other 97 chemicals in its draft regulation, the EPA analysis underestimates some costs, and may underestimate others, in a number of ways that are reflected in higher cost estimates (for non-arsenic and non-mercury) in our analysis. It does not include cleanup costs under the Model Toxics Control Act, which is sometimes driven by the HHC. It does not estimate costs for minor facilities.

The proportionately representative sample of major facilities on which EPA's costs are based may not reflect costs to individual non-typical facilities as accurately as this document's comprehensive analysis. In particular, where the amended Ecology HHC are more stringent than EPA and create costs, EPA's zero-cost estimates may be underestimated, though not necessarily as high as Ecology's estimates.

[18] US Environmental Protection Agency, 2015. Economic Analysis for the Revision of Certain Federal Water Quality Criteria Applicable to Washington. Contract # EP-C-13-03.

### 9.3.6 One-in-one-hundred-thousand excess cancer risk level

The legislature directed Ecology to maintain the highest possible standards to insure the purity of waters of the State (RCW 90.48.010). Ecology has historically implemented this legislative directive by requiring that risk-based criteria for carcinogenic substances have an excess cancer risk less than or equal to one in one million ($10^{-6}$). WAC 13-201A-240(6). In 2014, Governor Inslee announced an innovative approach to regulating carcinogenic toxics that would have increased the cancer risk rate to $10^{-5}$, coupled with a toxic reduction strategy that would have allowed the State to require the removal of toxic chemicals from consumer products that result in water pollution. The Governor believed this innovative approach would result in broader and more effective removal of both cancer and non-cancer causing chemicals from discharges than the traditional approach. Unfortunately, the legislature did not pass the legislation necessary to implement the Governor's innovative approach, thus Ecology will retain the $10^{-6}$ cancer risk rate that has historically been part of Washington's water quality standards. **See the Final Overview of key decisions in rule amendment document for more detail.**

## 9.4 Conclusion

After considering alternatives to the amended rule, as well as the goals and objectives of the authorizing statutes, Ecology determined that the amended rule represents the least burdensome alternative possible to meet the goals and objectives of the rule.

# WORKS CITED

RCW 34.05.272 directs agencies taking significant actions in the Water Quality Program to categorize citations as follows in bold headings, with citations for this analysis categorized into each section.

(i) Independent peer review: Review is overseen by an independent third party;

Aldy, JE & Viscusi, WK (2003). Age variations in workers' value of statistical life. Cambridge, MA: National Bureau of Economic Research, NBER Working Paper 10199.

Federal Remediation Technologies Roundtable (FRTR; 2006).Remediation Technologies Screening Matrix and Reference Guide. 4.45 Air Stripping. (Ex Situ GW Remediation Technology).

Mariotto, AB, KR Yabroff, Y Shao, EJ Feuer, and ML Brown (2011). Projections of the Cost of Cancer Care in the U.S.: 2010-2020. *J Natl Cancer Inst*. 2011 Jan. Supporting analysis for National Cancer Institute, National Institutes of Health, US Department of Health and Human Services (2011). "Annualized Mean Net Costs of Care".

(ii) Internal peer review: Review by staff internal to the department of ecology;

(n/a)

(iii) External peer review: Review by persons that are external to and selected by the department of ecology;

(n/a)

(iv) Open review: Documented open public review process that is not limited to invited organizations or individuals;

WA Department of Ecology (2003). Washington State Mercury Chemical Action Plan. Ecology publication no. 03-03-001.

WA Department of Ecology (2012). Water Quality Program Policy 1-11. http://www.ecy.wa.gov/programs/wq/303d/WQpolicy1-11ch1.pdf

WA Department of Ecology (2013). Fish Consumption Rates Technical Support Document. Ecology publication no. 12-09-058.

WA Department of Ecology (2015). Water quality program permit Writer's Manual. Publication no. 92-109. https://fortress.wa.gov/ecy/publications/summarypages/92109.html

Ecology (2016). Washington State Water Quality Standards: Human health criteria and implementation tools. Overview of key decisions in rule amendment. Ecology publication no. 16-10-006.

(v) Legal and policy document: Documents related to the legal framework for the significant agency action including but not limited to:

(A) Federal and state statutes;

(n/a)

(B) Court and hearings board decisions;

(n/a)

(C) Federal and state administrative rules and regulations;

US Environmental Protection Agency, EPA (1992). *Federal Register*, Volume: 57, Issue: 246, Page: 60848 (57 FR 60848), Tuesday, December 22, 1992. Unofficial copy: http://water.epa.gov/lawsregs/rulesregs/ntr/.

US Environmental Protection Agency (2000). Handbook for Non-Cancer Health Effects Valuation. Non-Cancer Health Effects Valuation Subcommittee of the EPA Social Science Discussion Group.

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(D) Policy and regulatory documents proposed by local governments;
(n/a)

(vi) Data from primary research, monitoring activities, or other sources, but that has not been incorporated as part of documents reviewed under the processes described in (c)(i), (ii), (iii), and (iv) of this subsection;

Integrated Risk Information System (IRIS) http://www.epa.gov/IRIS/

PARIS, Permit and Reporting Information System (2014). Summary: http://www.ecy.wa.gov/programs/wq/permits/paris/paris.html. Database: https://fortress.wa.gov/ecy/wqreports/public/f?p=110:300:986469352264310.

US Bureau of Labor Statistics (2016). "Occupational Outlook Handbook, 2016 – 2017, Environmental Engineering Technicians." Bureau of Labor Statistics, U.S. Department of Labor. Accessed January 15, 2016 from: http://www.bls.gov/ooh/architecture-and-engineering/environmental-engineering-technicians.htm

US Environmental Protection Agency (2016). Children's Environmental Health Facts. https://www.epa.gov/children/childrens-environmental-health-facts

US Census Bureau (2010). "2010 Census Interactive Population Search." Accessed January 19, 2016 from: http://www.census.gov/2010census/popmap/

US Census Bureau (2013). State & County QuickFacts for Washington State. Sub-source: Population Estimates Program (PEP).

US Census Bureau (2014). North American Industry Classification System. http://www.census.gov/eos/www/naics/

(vii) Records of the best professional judgment of department of ecology employees or other individuals; or
(n/a)

(viii) Other: Sources of information that do not fit into one of the categories identified in this subsection (1)(c).
(n/a)