Appendix J

United States Environmental Protection Agency

Office of Water
EPA 820-R-24-001
April 2024

Technical Support for Adopting and Implementing the EPA's 2016 Selenium Criterion in Water Quality Standards

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While this document cites statutes and regulations that contain requirements applicable to water quality standards, it does not impose legally binding requirements on the EPA, states, authorized Tribes, other regulatory authorities, or the regulated community, and may not apply to a particular situation based upon the circumstances. The EPA, state, Tribal and other decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from those provided in this technical support document as appropriate and consistent with statutory and regulatory requirements. The EPA may update this document as new information becomes available. In addition to this document, the EPA has related documents that provide considerations and recommendations on implementing criteria based on the national Clean Water Act (CWA) section 304(a) recommended selenium criterion for freshwater, which are available at the EPA's selenium website: https://www.epa.gov/wqc/aquatic-life-criterion-selenium.

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List of Acronyms and Abbreviations

BAF	Bioaccumulation factor
CFR	Code of Federal Regulations
CWA	Clean Water Act
FR	Federal Register
GLI	Great Lakes Initiative
HAC	Highest attainable condition
NPDES	National Pollutant Discharge Elimination System
SSD	Species sensitivity distribution
TMDL	Total maximum daily load
UAA	Use attainability analysis
USEPA	U.S. Environmental Protection Agency
WQBELs	Water quality-based effluent limits
WQC	Water quality criteria
WQS	Water quality standards

Definitions[1]

Bioaccumulation
The uptake and retention of a chemical by an aquatic organism from all surrounding media (e.g., water, food, sediment).[2]

Critical species
In the context of the recalculation procedure, a resident species that (a) is commercially or recreationally important at the site, or (b) is listed as threatened or endangered under section 4 of the Endangered Species Act, or (c) is a species for which there is firm evidence that its loss would yield an unacceptable impact on the site's commercially or recreationally important species, endangered species, abundances of a variety of other species, or structure or function.[3]

Dissolved total selenium
All species of selenium that are dissolved into the water column and that would be measured in a water sample after it has been passed through a 0.45 µm membrane filter.[4]

Performance-based approach
A water quality standard that is a transparent process, rather than a specific outcome (such as the concentration portion of a criterion for a pollutant). This process or methodology is sufficiently detailed and has suitable safeguards that ensure predictable, repeatable outcomes. Approval of this process or methodology by the EPA would also serve for CWA purposes as the approval under CWA section 303(c)[5] of each outcome generated from following that process or method.[6]

Site-specific criterion/site-specific criterion element
Water quality criterion/criterion element that is modified to reflect site-specific conditions. For selenium, a criterion/criterion element that is developed to protect aquatic life at a particular

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[1] This glossary is meant to provide plain language definitions for key terms used in this document. Individuals should consult the Clean Water Act and the EPA's implementing regulations to identify whether there are legal definitions of these terms.
[2] USEPA. 2003. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000) Volume 2: Development of National Bioaccumulation Factors.* EPA-882-R-03-030. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://nepis.epa.gov/Exe/ZyPDF.cgi/P1005EZQ.PDF?Dockey=P1005EZQ.PDF.
[3] USEPA. 2013. *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria*. EPA 823-R-13-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC, www.epa.gov/sites/production/files/2015-08/documents/revised_deletion_process_for_the_site-specific_recalculation_procedure_for_aquatic_life_criteria.pdf.
[4] Protho, M.G. USEPA. 1993. Memorandum: Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria. Office of Water, Washington DC. https://www.epa.gov/sites/production/files/2019-03/documents/metals-criteria-interpret-aqlife-memo.pdf.
[5] Approval by the EPA includes federal WQS promulgated by the EPA.
[6] *EPA Review and Approval of State and Tribal Water Quality Standards*, 65 Fed. Reg. 24641 (Apr. 27, 2000).

site, usually by taking into account a site's physical, chemical, and/or biological conditions (i.e., water quality characteristics or species composition).[7]

Steady-state

An organism is in steady-state when the rates of chemical uptake and depuration are equal and tissue concentrations remain constant over time.[8] For the purposes of the national CWA section 304(a) recommended selenium criterion, steady-state refers to conditions where sufficient time has passed after the introduction of a new or increased input of selenium into a waterbody or watershed of a waterbody such that fish tissue selenium concentrations are no longer increasing.

Water quality criterion element

A magnitude, frequency, and duration for a particular media type (e.g., fish tissue, water column), which are individual components of the overall water quality criterion. The water quality criterion elements for selenium are related through a hierarchy, with fish tissue criterion elements having primacy over water column criterion elements, and the egg-ovary fish tissue criterion element having primacy over all other criterion elements.

[7] USEPA. 2017. *Water Quality Standards Handbook. Chapter 3: Water Quality Criteria.* EPA-823-B-17-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/sites/default/files/2014-10/documents/handbook-chapter3.pdf.

[8] USEPA. 2003. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000) Volume 2: Development of National Bioaccumulation Factors.* EPA-882-R-03-030. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://nepis.epa.gov/Exe/ZyPDF.cgi/P1005EZQ.PDF?Dockey=P1005EZQ.PDF.

1.0 Introduction

1.1 The EPA's National CWA Section 304(a) Recommended Chronic Aquatic Life Selenium Criterion in Freshwater

In 2016, the U.S. Environmental Protection Agency updated its national Clean Water Act (CWA) section 304(a) recommended chronic aquatic life criterion for selenium in freshwater systems to reflect the latest scientific information and, in 2021, issued an erratum, *2021 Revision to: Final Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*.[9] The EPA's national CWA section 304(a) recommended selenium criterion still reflects the latest science and the EPA is not aware of any updated scientific information that would change this recommendation. The latest scientific information indicates that selenium toxicity to aquatic life is driven by dietary exposures and that the reproductive life-stages of egg-laying vertebrates are the most sensitive to the toxic effects of selenium. The recommended criterion has four criterion elements: (1) a fish egg-ovary criterion element; (2) a fish whole-body and/or muscle criterion element; (3) a water column criterion element (one value for lentic and one value for lotic aquatic systems); and (4) a water column intermittent criterion element (to account for potential chronic effects from short-term exposures to high concentrations in lentic and lotic aquatic systems) (see Table 1). Under the EPA's 2016 national CWA section 304(a) recommended selenium criterion, the fish tissue criterion elements have primacy over water column elements, except where there are no fish, where fish tissue data are not adequate, or for waterbodies with new or increased discharges where selenium concentrations in fish tissue might not have stabilized and reached steady-state. The EPA also recommends that the egg-ovary tissue criterion element has primacy over whole-body and muscle tissue criterion elements.

Toxicity data indicate that the selenium concentration in fish eggs and ovaries is the most robust and consistent measurement endpoint directly tied to adverse reproductive effects in aquatic organisms. Toxicity to developing embryos and larvae is directly linked to egg selenium concentration.[10] The EPA derived the whole-body, muscle tissue, and water column elements from the egg-ovary element so that states and authorized Tribes could more readily implement their water quality criteria (WQC) based on the EPA's national CWA section 304(a)

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[9] In 2021, the EPA identified that the following text was missing from the second sentence in footnote 4 in the selenium criterion table: "When selenium inputs are increasing" and issued an erratum. The EPA corrected footnote 4 to state: "4. Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. When selenium inputs are increasing, water column values are the applicable criterion element in the absence of steady-state condition fish tissue data." USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[10] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

recommended selenium criterion. The assessment of the available data on chronic selenium exposure for fish, invertebrates, and amphibians indicates that a criterion element derived from fish is expected to be protective of the aquatic community in a waterbody, since other taxa appear to be less sensitive to selenium than fish. The EPA did not develop an acute criterion for selenium when it updated the chronic criterion. Although selenium may cause acute toxicity at high concentrations, the most deleterious effects on aquatic organisms are due to selenium's bioaccumulative properties.

In the case of bioaccumulative compounds like selenium, acute toxicity studies do not address risks that result from chronic exposure to chemicals via the diet (through the food web pathway). Such studies also do not account for the accumulation kinetics of many bioaccumulative compounds, such as selenium, and may underestimate effects from long-term accumulation in some types of aquatic systems. Therefore, since acute studies do not address the primary exposure pathway for organisms to selenium and because chronic toxicity occurs at lower concentrations, an acute criterion was not included in the national CWA section 304(a) recommended selenium criterion. As described in the EPA's *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016* (hereafter referred to as *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*), the EPA also included an intermittent exposure criterion element to provide protection from the most significant chronic effects of selenium toxicity, reproductive toxicity, by protecting against selenium bioaccumulation in the aquatic ecosystem resulting from short-term, high concentration exposure events.[11]

The EPA recommends, as stated in the *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*, that states and authorized Tribes[12] adopt into their water quality standards (WQS) a selenium criterion that includes all four criterion elements.[13] For more information see the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016,* which can be found at https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[11] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[12] Throughout this document and in the CWA, the term "states" means the fifty states, the District of Columbia, the Commonwealth of Puerto Rico, the United States Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. The term "authorized Tribe" means those federally recognized Indian Tribes with authority to administer a CWA WQS program.

[13] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

Table 1. Summary of the Recommended Freshwater Selenium Ambient Chronic Water Quality Criterion for Protection of Aquatic Life.

Media Type	Fish Tissue[1]		Water Column[4]	
Criterion Element	**Egg-ovary[2]**	**Fish Whole-body or Muscle[3]**	**Monthly Average Exposure**	**Intermittent Exposure[5]**
Magnitude	15.1 mg/kg dry weight	8.5 mg/kg dry weight whole-body or 11.3 mg/kg dry weight muscle (skinless, boneless fillet)	1.5 µg/L in lentic aquatic systems 3.1 µg/L in lotic aquatic systems	$$WQC_{int} = \frac{WQC_{30-day} - C_{bkgrnd}(1 - f_{in}}{f_{int}}$$
Duration	Instantaneous measurement[6]	Instantaneous measurement[6]	30 days	Number of days/month with an elevated concentration
Frequency	Not to be exceeded	Not to be exceeded	Not more than once in three years on average	Not more than once in three years on average

1. Fish tissue elements are expressed as steady-state.
2. Egg-ovary supersedes any whole-body, muscle, or water column element when fish egg-ovary concentrations are measured, except as noted in footnote 4 below.
3. Fish whole-body or muscle tissue supersedes water column element when both fish tissue and water concentrations are measured, except as noted in footnote 4 below.
4. Water column values are based on dissolved total selenium in water and are derived from fish tissue values via bioaccumulation modeling. When selenium inputs are increasing, water column values are the applicable criterion element in the absence of steady-state condition fish tissue data.
5. Where $WQC_{30\text{-}day}$ is the water column monthly element for either lentic or lotic waters; C_{bkgrnd} is the average background selenium concentration; and f_{int} is the fraction of any 30-day period during which elevated selenium concentrations occur, with f_{int} assigned a value ≥0.033 (corresponding to 1 day).
6. Fish tissue data provide instantaneous point measurements that reflect integrative accumulation of selenium over time and space in fish population(s) at a given site.

1.2 Selenium Technical Support Materials

The EPA has prepared a four-volume set of documents to provide recommendations to states, authorized Tribes, and other agencies for implementing their WQC based on the national CWA section 304(a) recommended selenium criterion for aquatic life.[14] These four documents constitute the Technical Support Materials for the EPA's *Aquatic Life Ambient Water Quality*

[14] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

Criterion for Selenium–Freshwater 2016.[15] Each document of the set focuses on a specific aspect of implementation of WQC based on the national CWA section 304(a) recommended selenium criterion. Together, these four EPA documents provide information to assist states and authorized Tribes with adopting WQC based on the EPA's national CWA section 304(a) recommended selenium criterion and implementing them in various CWA programs.

1) *Technical Support for Adopting and Implementing the EPA's Selenium 2016 Criterion in Water Quality Standards*: Provides recommendations for the adoption and implementation of criteria based on the national CWA section 304(a) recommended selenium criterion, including the various flexibilities available to states and authorized Tribes using WQS tools.
2) *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion*: Provides an overview of how to establish or enhance existing fish tissue monitoring programs to facilitate implementation of fish tissue criterion elements based on the national CWA section 304(a) recommended selenium criterion.
3) *Frequently Asked Questions: Implementing Water Quality Standards Based on the EPA's 2016 Selenium Criterion in Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits*: Provides information to help National Pollutant Discharge Elimination System (NPDES) permit writers understand what permitting guidance (i.e., state or tribal implementation procedures) may be appropriate to implement state and authorized tribal WQS based on the EPA's national CWA section 304(a) recommended selenium criterion. This set of FAQs also provides recommendations on how to establish water quality-based effluent limits (WQBELs) in NPDES permits.
4) *Frequently Asked Questions: Implementing the EPA's 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load Programs*: Provides information on how to complete assessments, list impaired waters, and develop total maximum daily loads (TMDLs) to implement EPA-approved[16] WQS that are based on the EPA's national CWA section 304(a) recommended selenium criterion.

[15] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[16] EPA-approved includes both WQS adopted by states, territories or authorized Tribes and approved by the EPA and WQS promulgated by the EPA.

2.0 Adopting the EPA's National CWA section 304(a) Recommended Selenium Criterion

2.1 The Four-Part Criterion

As described in the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*,[17] the EPA recommends that states and authorized Tribes adopt into their WQS one selenium criterion composed of four criterion elements: two fish tissue criterion elements (i.e., egg-ovary and whole-body and/or muscle tissue) and two water column criterion elements (i.e., 30-day average and intermittent exposure). The EPA recommends that states and authorized Tribes clearly express all four criterion elements as part of a single criterion. Including all four recommended criterion elements of the selenium criterion in state or Tribal WQS ensures protection from excessive selenium when egg-ovary data are unavailable by allowing application of the criterion using other fish tissue or water column data. Along with the four criterion magnitude elements, the EPA also recommends adopting the corresponding durations and frequencies for each of the criterion elements.

States and authorized Tribes should clearly indicate in their WQS that fish tissue criterion elements supersede the water column criterion elements (except when selenium inputs are increasing and steady-state condition fish tissue data are not available), and that the egg-ovary criterion element supersedes all other criterion elements. Under the EPA's national CWA section 304(a) recommended selenium criterion, this hierarchy applies to all CWA implementation activities. The egg-ovary criterion element supersedes all other criterion elements because it was derived directly from toxicity data and served as the basis for deriving all the other criterion elements. This hierarchy should be described in a state or authorized Tribe's WQS, in footnotes accompanying the criterion. The EPA recommends using the footnotes provided with the national CWA section 304(a) recommended selenium criterion (Table 1) to clearly and accurately describe the hierarchical structure.

The fish tissue criterion elements of this criterion are expressed in dry weight concentrations. This is because many of the toxicity values used to derive the criterion were expressed as dry weights. Instructions for converting between dry weight and wet weight concentrations are provided in Appendix C of *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion*.[18]

The two monthly average water column values included in the national CWA section 304(a) recommended selenium criterion were derived for the protection of two different types of

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[17] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*. EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[18] USEPA. 2024. *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion*. EPA-820-R-24-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC.https://www.epa.gov/system/files/documents/2024-03/selenium-fishtissue-tsd.pdf

waterbodies, lentic and lotic waters. Lentic waters are waterbodies that consist of standing water, including waterbody types such as lakes and ponds. Lotic waters are waterbodies that consist of flowing waters, including waterbody types such as rivers and streams. The application of the appropriate water column value is based on best professional judgement of the state or authorized Tribe. Although states and authorized Tribes do not need to classify their waters based on these terms, they may find it useful to consider incorporating these criterion elements into any existing classifications for different types of waterbodies (e.g., lakes). One resource that may be helpful for states and authorized Tribes is a geospatial dataset the United States Geological Survey (USGS) developed on lotic and lentic waters, available at https://www.sciencebase.gov/catalog/item/5d420fbde4b01d82ce8da8e9.

The national CWA section 304(a) recommended selenium criterion is a chronic criterion. The EPA no longer recommends an acute criterion for short-term ambient exposures because aquatic organisms are exposed to selenium primarily through their diet. Since acute studies are conducted as water-only exposures, they do not address this primary exposure pathway for organisms and do not account for the slow accumulation kinetics of selenium. Additionally, chronic toxicity occurs at lower concentrations than acute toxicity, so protection from acute toxicity is provided by the chronic criterion. Given these properties of selenium, an acute criterion was not included in the national CWA section 304(a) recommended selenium criterion.

Selenium has the potential to bioaccumulate in aquatic food webs, where it can continue to pose a risk even after short-term elevations of the selenium concentration in the water column return to ambient levels. Therefore, the EPA's national CWA section 304(a) recommended selenium criterion includes an intermittent exposure water column criterion element to provide protection from long-term chronic effects that may be caused by short-term elevations above ambient background concentrations of selenium water column concentrations in aquatic systems.

If data for a particular criterion element are not available, WQC based on the national CWA section 304(a) recommended selenium criterion should be implemented with one of the other criterion elements, according to the hierarchy of the criterion. For example, if fish tissue data are not available, but water column data are, the criterion should be implemented using the water column criterion element. This situation may occur for fishless waters or when fish tissue data are not available because they were not collected or were not adequate. Fishless waters are defined as waters with insufficient instream habitat and/or flow to support a population of any fish species on a continuing basis, or waters that once supported populations of one or more fish species but no longer support fish (see the executive summary of the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*).[19]

[19] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

As noted in the introduction of this document, the national CWA section 304(a) recommended selenium criterion is designed for the protection of aquatic life. As a result, when the national CWA section 304(a) recommended selenium criterion is adopted into state or Tribal WQS, it should be applied to all waterbodies with an aquatic life designated use and, by extension, all species within those waterbodies that are protected by that use. The assessment of the available data for fish, invertebrates, and amphibians indicates that fish are the most sensitive taxa to the impacts from selenium. As such, the criterion elements were derived from fish toxicity values to be protective of the entire aquatic community, not solely fish species. When all four criterion elements are applied together according to the hierarchy, they protect aquatic life from the chronic effects of exposure to selenium in waters that are both inhabited by fish and not inhabited by fish (i.e., fishless).

Table 1, reproduced from the USEPA 2021, provides an example of how the four-part criterion could be adopted into a state or authorized Tribe's WQS. The EPA recommends adopting this table, including the frequency and duration components, with all accompanying footnotes.

Footnote 1 in Table 1 indicates that the fish tissue concentrations of the criterion are expressed as steady-state. An organism is in steady-state when the rates of chemical uptake and depuration are equal and tissue concentrations remain generally constant over time.[20]

Footnotes 2 and 3 in Table 1 describe the structure of the criterion. They explain the primacy of the whole-body and/or muscle tissue criterion element over the water column criterion elements, and the egg-ovary criterion element over any other criterion element. This means when assessing a waterbody in steady-state conditions against WQC based on the national CWA section 304(a) recommended selenium criterion, egg-ovary data take precedence for assessment decisions followed by whole-body and/or muscle tissue data, and lastly by water column data (see *Frequently Asked Questions: Implementing the EPA's 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load Programs*).[21]

Footnote 4 in Table 1 states that the water column criterion elements of the national CWA section 304(a) recommended selenium criterion were derived from the egg-ovary criterion element via mechanistic bioaccumulation modeling.[22]

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[20] USEPA. 2003. *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000) Volume 2: Development of National Bioaccumulation Factors.* EPA-882-R-03-030. U.S. Environmental Protection Agency, Office of Water, Washington, DC. pp. 1-4. https://nepis.epa.gov/Exe/ZyPDF.cgi/P1005EZQ.PDF?Dockey=P1005EZQ.PDF.

[21] USEPA. 2024. *Frequently Asked Questions: Implementing the EPA's 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load Programs*. EPA-820-R-24-004. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2024-03/selenium-faq-cwa303.pdf

[22] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

Footnote 4 also indicates that when both steady-state fish tissue data are absent and selenium inputs to the waterbody (e.g., receiving stream) are increasing, the water column criterion element is the applicable criterion element. For the purposes of the EPA's national CWA section 304(a) recommended selenium criterion, steady-state refers to conditions where sufficient time has passed after the introduction of a new or increased input of selenium into a waterbody or watershed of a waterbody such that fish tissue selenium concentrations are no longer increasing.[23] New or increased inputs of selenium will likely result in higher selenium concentrations in the water column and food web; however, the increase in selenium concentrations in fish tissue is likely to occur at a slower rate than in the water column. When fish tissue data are not in steady-state and do not represent the total potential bioaccumulative effects of selenium in the aquatic ecosystem, the water column criterion element is more appropriate to protect the entire aquatic ecosystem. Fish tissue data should not be considered for CWA implementation of the criterion (e.g., NPDES permits program or CWA section 303(d) listing of impaired waters) until after selenium concentrations in fish tissue have stopped increasing due to new or increased selenium inputs to a waterbody or watershed of a waterbody. However, any fish tissue data, whether steady-state or not, that are higher than the fish tissue criterion elements indicate a potential impact on the aquatic community. Therefore, in the situation where the water column criterion element is met, but the fish tissue criterion element is exceeded, the EPA recommends developing a site-specific water column criterion element that more appropriately reflects a protective water column concentration for that site (see section 2.2 for more information on the development of site-specific water column criterion elements).

In the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*, "new inputs" are defined as new activities resulting in the release of selenium into a lentic or lotic aquatic system. These "new inputs" are both new and increased inputs of selenium and are referring to the release of a substantial amount of additional selenium from either anthropogenic point or nonpoint sources into a waterbody or watershed. New or increased selenium inputs do not refer to seasonal variability of selenium that occurs naturally within a system (e.g., spring run-off events or precipitation-driven pulses) or *de minimis* discharges. Examples of new or increased inputs include releases of additional selenium into the waterbody or watershed from the opening or expansion of petroleum refining facilities, the opening or expansion of mining operations where increased selenium is likely to be discharged, or other anthropogenic activities (such as irrigation of selenium-rich soils) that would substantially increase selenium loadings to a waterbody or watershed of a waterbody over time. Any available appropriate data, including data collected by the state or authorized Tribe, by permittees, and by other entities may be evaluated to determine if there are new or increasing selenium inputs.

[23] This definition of steady-state applies to the national CWA section 304(a) recommended selenium criterion. It does not apply to the discussion of steady-state modeling or conditions in the "Technical Support Document for Water Quality-based Toxics Control" (EPA/505/2-90-001, March 1991).

A watershed is defined as "an area of land that drains water, sediment, and dissolved materials to a common receiving body or outlet" (i.e., waterbody).[24] For large waterbodies, a state or authorized Tribe may want to evaluate new or increased inputs of selenium within a portion of the watershed that is at or up to a hydrologic unit code level of eight digits in size or consider whether a different watershed size is warranted.

For implementation purposes, states and authorized Tribes may assume that the selenium concentration in fish tissue is in steady-state unless a substantial new or increased input of selenium has recently occurred in the waterbody's watershed. In general, the EPA estimates that once a new or increased input of selenium commences the concentration of selenium in fish tissue will reach steady-state after several months in lotic systems and longer time periods (e.g., two to three years) in lentic systems.[25] These time frames can be used as a general estimate of what is considered a recent input of selenium into a watershed. However, these values are general estimates and the time needed for fish tissue to achieve steady-state after a new or increased input of selenium to a waterbody has occurred is site-specific. Potential factors affecting steady-state conditions in an aquatic system can include: (1) the hydrodynamics of the aquatic system (e.g., particularly reservoirs with multiple riverine inputs and controlled releases of water into downstream waterbodies); (2) the location of the selenium input; and (3) the site-specific food web. Therefore, if states and authorized Tribes make the assumption that fish tissue is in steady-state, the EPA recommends documenting the rationale behind those assumptions to demonstrate that any resulting CWA decisions are protective and have a sound scientific rationale.

Alternatively, fish tissue data can be used to evaluate whether fish tissue concentrations are in steady-state. The EPA recommends monitoring fish tissue in the affected waterbody, starting when new or increased inputs of selenium begin (or before if possible) and continuing until fish tissue data demonstrate that selenium concentrations in fish tissue are no longer increasing. With sufficient and appropriate monitoring data, collected over several sequential sampling periods, the state or authorized Tribe can use appropriate statistical methods (one example is the Mann-Kendall statistical approach, but other statistical approaches may be used) to determine when the fish tissue concentrations are no longer increasing.[26]

When implementing state and Tribal criteria based on the national CWA section 304(a) recommended selenium criterion, if selenium inputs are decreasing in a waterbody, the

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[24] USEPA. *Watershed Academy website*, *Introduction to Watershed Ecology*. https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=518

[25] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[26] The following documents may be referenced for guidance on statistical analyses: *Statistical Methods in Water Resources* (https://pubs.usgs.gov/tm/04/a03/tm4a3.pdf); *Guidance for Assessing Chemical Contaminant Data for Use in Fish Advisories: Volume 1, Fish Sampling and Analysis, Third Edition* (https://www.epa.gov/sites/default/files/2015-06/documents/volume1.pdf); *Statistical Analysis for Monotonic Trends* (https://www.epa.gov/sites/default/files/2016-05/documents/tech_notes_6_dec2013_trend.pdf); *Statistical Methods for Environmental Pollution Monitoring* (https://www.osti.gov/servlets/purl/7037501).

hierarchy of the criterion should apply, and fish tissue criterion elements should take precedence for CWA implementation. Just as the concentration of selenium increases in fish tissue at a slower rate than it does in the water column, selenium concentration also decreases at a slower rate in fish tissue compared to the selenium concentration in the water column. Similarly, selenium can persist in an aquatic ecosystem, and it will take more time to decrease in sediment and biota than in the water column. When water column concentrations of selenium are decreasing, those concentrations may meet the water column criterion element before the fish tissue concentrations meet the fish tissue criterion elements. That is, there is a lag between decreasing water column concentrations of selenium and decreasing selenium concentrations in fish tissue. While the fish tissue selenium concentrations are elevated, effects on aquatic life are still possible. Therefore, the EPA recommends using the fish tissue criterion elements for the CWA implementation of WQC based on the national CWA section 304(a) recommended criterion when selenium inputs to a waterbody or the watershed of a waterbody are decreasing.

In footnote 4, the EPA intends for "dissolved total selenium," to have a defined meaning. Within that term, "total selenium" refers to the combination of all species of selenium that are dissolved into the water column and does not refer to the total recoverable form of selenium. Dissolved total selenium is the selenium that would be measured in a water sample after it has been passed through a 0.45 µm membrane filter.[27] In other words, the criterion is for dissolved selenium in total, not the individual species of selenium (e.g., selenite or selenate, individually).

Footnote 5 of Table 1 describes the equation and input parameters for the intermittent criterion element. The intermittent criterion element is a rearrangement of the 30-day average water column criterion element and was designed to help with permitting where discharges into waterbodies occur only intermittently, rather than continuously. CWA section 303(d) assessments of waterbodies should still be made using the 30-day average water column criterion element, but for waterbodies that have intermittent discharges, this criterion element can be used to determine proper limits for permits. For more information, see section 3.3 of the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*,[28] questions 11 and 15 of *Frequently Asked Questions: Implementing the EPA's 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load Programs,*[29] and questions 2-2, 3-1, and 3-4 of *Frequently Asked*

[27] Protho, M.G. USEPA. 1993. Memorandum: Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria. Office of Water, Washington, DC. https://www.epa.gov/sites/production/files/2019-03/documents/metals-criteria-interpret-aqlife-memo.pdf.
[28] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.
[29] USEPA. 2024. *Frequently Asked Questions: Implementing the EPA's 2016 Selenium Criterion in Clean Water Act Sections 303(d) and 305(b) Assessment, Listing, and Total Maximum Daily Load Programs*. EPA-820-R-24-004. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/wqc/aquatic-life-criterion-selenium.

Questions: Implementing Water Quality Standards Based on the EPA's 2016 Selenium Criterion in Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits.[30]

Footnote 6 of Table 1 explains the duration component of the fish tissue criterion elements. These criterion elements were developed to protect aquatic populations from negative impacts caused by selenium. Fish tissue data provide instantaneous point measurements that reflect integrative accumulation of selenium over time and space in the fish at a given site.[31] Thus, the recommended duration for the selenium criterion is an instantaneous measurement. States and authorized Tribes have flexibility in how they interpret a discrete fish sample to represent a given species' population at a site at a given time. Generally, fish tissue samples collected to calculate the central tendency of tissue concentrations for a species at a site are collected either in one sampling event, as a composite, or over a short time interval (less than a week) due to the logistical constraints and costs for obtaining samples. The EPA recommends defining a single sampling event as a week or less and does not recommend averaging fish concentrations across sampling events, but instead evaluating each sampling event separately for implementation purposes. The *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion* contains additional information on sampling fish populations.[32]

The frequency component of the fish tissue criterion elements of the national CWA section 304(a) recommended selenium criterion differs from the "once-in-three years on average" frequency of most other national CWA section 304(a) recommended aquatic life water column criteria. Selenium is a bioaccumulative pollutant; therefore, elevated levels of selenium in various ecological compartments (e.g., biota, surficial sediments) require a long period of time to decrease. As a result, the associated aquatic community requires a long time to recover following the reduction or removal of an elevated selenium exposure to a given system. The time frame to recover is variable and will depend on the biogeochemical processes of the system, including residence time and food web dynamics. Thus, the "once-in-three years on average" frequency component is not appropriate for selenium in fish tissue, as this could lead to sustained ecological impacts. Therefore, the recommended frequency for the fish tissue criterion elements of the national CWA section 304(a) recommended selenium criterion is "not

[30] USEPA. 2024. *Frequently Asked Questions: Implementing Water Quality Standards Based on the EPA's 2016 Selenium Criterion in Clean Water Act Section 402 National Pollutant Discharge Elimination Systems Permits.* EPA-820-R-24-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/wqc/aquatic-life-criterion-selenium.

[31] See the *Technical Support for Fish Tissue Monitoring for Implementing the EPA's 2016 Selenium Criterion* for information on selection of sampling location and target species to assure appropriate representation of the waterbody. Mobility and home range of a species should be considered when selecting a target species to assure fish tissue is representative of selenium exposure at the sampling location.

[32] USEPA. 2024. *Technical Support for Fish Tissue Monitoring for Implementing EPA's 2016 Selenium Criterion*. EPA-820-R-24-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2024-03/selenium-fishtissue-tsd.pdf.

to be exceeded." For additional information regarding duration and frequency, see sections 2.7.6 and 2.7.7 of *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*.[33]

In addition to the four-part criterion, states and authorized Tribes have the option of adopting a method to derive site-specific water column criterion elements, referred to by the EPA as a "performance-based approach." The EPA discusses a performance-based approach for a WQS in the preamble of the rule *EPA Review and Approval of State and Tribal Water Quality Standards*.[34] Here the EPA considers a performance-based approach to be a WQS that is a transparent process rather than a specific outcome. [35] The state or authorized Tribe can adopt a process, such as a criterion derivation methodology, rather than a specific outcome, such as a concentration of a pollutant. If a state or authorized Tribe adopts a process or methodology that is sufficiently detailed and has suitable safeguards that ensure predictable, repeatable outcomes, the EPA can approve that process as a WQS. Approval of this process or methodology would also serve for CWA purposes as the approval of each outcome generated from following that process or method. More information about this approach and what information should be included in the method can be found in section 2.2.1 of this document.

The EPA recommends the adoption of the entire national CWA section 304(a) recommended selenium criterion, including all of the criterion elements, footnotes, frequency, and duration. In addition, states and authorized Tribes have the option to develop, adopt, and submit for the EPA approval, site-specific criteria or criterion elements for individual sites (see sections 2.2 and 3.1 for information on options for developing and adopting site-specific criteria). While the EPA presents some methods for developing site-specific criteria in this document and in the national CWA section 304(a) recommended selenium criterion document, any method that is scientifically defensible and protective of the designated uses may be used to develop site-specific criteria. States and authorized Tribes also have the option of developing a methodology for deriving site-specific water column criterion elements for individual sites, which can be adopted as part of a WQS in addition to the four-part criterion and submitted to the EPA for review. If approved by the EPA, this process can be used to develop site-specific water column criterion elements for state and Tribal waters (see section 2.2.1 of this document).

2.2 Options for Site-specific Water Column Criterion Elements

The EPA recommends that when states and authorized Tribes adopt the national CWA section 304(a) recommended selenium criterion, they adopt all four criterion elements, including the 30-day average water column criterion element. States and authorized Tribes also have the

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[33] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[34] *EPA Review and Approval of State and Tribal Water Quality Standards.* 65 Fed. Reg. 24641 (Apr. 27, 2000). A performance-based approach can be included in state or tribal WQS or as a part of a federal WQS promulgated by the EPA in accordance with the CWA section 303(c) and the EPA's implementing regulations.

[35] *EPA Review and Approval of State and Tribal Water Quality Standards* 65 Fed. Reg. 24641 (Apr. 27, 2000).

additional option of adopting site-specific water column criterion elements, if desired (either through individual adoption or a performance-based approach). The relationship between the concentration of selenium in the tissues of fish and the concentration of selenium in the water column can differ substantially between different aquatic systems. The chemical form of selenium, species of fish, the species and proportion of prey, and a variety of site-specific biogeochemical factors affect selenium bioaccumulation and thus determine the allowable concentration of selenium in ambient water that is protective of aquatic life. Because of the site-specific nature of this relationship, the EPA provides two methodologies for deriving site-specific water column criterion elements:

1) The mechanistic modeling approach; and
2) The empirical bioaccumulation factor (BAF) approach.

The mechanistic modeling approach uses scientific knowledge of the physical and chemical processes underlying bioaccumulation to specifically model bioaccumulation and trophic transfer through the food web to establish a relationship between the concentrations of selenium in the water column and the concentration of selenium in the tissue of aquatic organisms. The EPA used this approach to derive the default water column criterion elements.[36] This approach generally requires the collection of particulate material and water samples and knowledge of the site's food web. The empirical bioaccumulation factor approach, on the other hand, establishes a site-specific relationship between water column selenium concentrations and fish tissue selenium concentrations by measuring both matrices directly and using the ratio between them to determine a site-specific water column criterion element. Both approaches are described in detail in Appendix K of *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*.[37] Both methodologies provide acceptable approaches for translating the recommended fish tissue criterion elements into site-specific water column criterion elements. States and authorized Tribes may use either approach to develop a site-specific water column criterion element. The decision of which approach to use will likely be driven by which data is easiest to collect for a particular site.

In addition, a state or authorized Tribe can develop site-specific criteria using other methodologies if the methodologies are scientifically defensible and the criteria are based on a sound scientific rationale and protective of the applicable designated uses, pursuant to the CWA section 303(c) and the EPA's implementing regulations, including 40 Code of Federal Regulations (CFR) section 131.11. Where a state or authorized Tribe adopts the 304(a) recommended fish tissue criterion elements and the hierarchy of the criterion, and then adopts a site-specific water column criterion element, the hierarchy of the criterion still applies; fish tissue criterion elements take precedence over the site-specific water column criterion

[36] Presser, T.S. and S.N. Luoma. 2010. A methodology for ecosystem-scale modeling of selenium. *Integrated Environmental Assessment and Management* 6:685-710; Presser, T.S. and S.N. Luoma. 2010. *Ecosystem-Scale Selenium Modeling in Support of Fish and Wildlife Criteria Development for the San Francisco Bay-Delta Estuary, California*. U.S. Geological Survey, Reston, Virginia.
[37] Ibid.

elements in the implementation of the criterion, unless selenium inputs are increasing in a waterbody.

One instance where a state or authorized Tribe may want to develop a site-specific water column criterion element for selenium is for fishless waters. Fishless waters are defined as waters with insufficient instream habitat and/or flow to support a population of any fish species on a continuing basis, or waters that once supported populations of one or more fish species but no longer support fish (see the executive summary of the EPA's *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016*).[38] Even though the national CWA section 304(a) recommended selenium criterion tissue elements are for fish tissue, the criterion is intended to protect an aquatic life designated use that would include other aquatic life, including invertebrates. In this instance, a site-specific water column criterion element for a fishless waterbody would need to be protective of the entire aquatic community present in that water and potentially downstream waters (40 CFR 131.10(b)). When deriving a site-specific water column criterion element for fishless waters, it may be appropriate to use the mechanistic model[39] to translate from either a fish tissue criterion element or an invertebrate toxicity threshold. Fish tissue criterion elements should be used to protect the whole aquatic community if fish populations were once supported in that waterbody or for protection of fish downstream, depending on the type of waterbody downstream and the fish present in that downstream waterbody. Invertebrate toxicity thresholds may be appropriate if fish currently and historically have not used the waterbody. Currently (April 2024), the EPA is not aware of sufficient toxicity data on invertebrates for an invertebrate toxicity threshold for selenium. However, as new toxicity data become available, this may be an appropriate taxa to use for deriving site-specific water column criterion elements for fishless waters. The appropriateness of that toxicity data will be evaluated on a case-by-case basis but should generally account for dietary exposure and evaluate survival, growth, and potentially reproductive effects. Potential downstream impacts should also be accounted for by evaluating trophic transfer factors and evaluating what impacts the selenium concentrations of the invertebrates may have on downstream fish species.

There is also one instance where the EPA specifically recommends developing a site-specific water column criterion element. This is when the ambient water column selenium concentrations in a waterbody/waterbody segment are meeting the national CWA section 304(a) recommended water column criterion elements, but the fish tissue concentrations are greater than the national recommended fish tissue criterion elements. In this situation, the elevated fish tissue concentrations may indicate an impact on the aquatic system and indicate

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[38] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

[39] See Appendix K of USEPA 2021 for a description of the mechanistic model. USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

that a water column criterion element lower than the national CWA section 304(a) recommended water column criterion element is needed to protect aquatic life.

There are two approaches to adopting and submitting site-specific selenium water column criterion elements to the EPA for review under section 303(c) of the CWA: 1) states and authorized Tribes may adopt and submit individual water column criterion elements each time they are derived; or 2) they may adopt and submit a performance-based approach for deriving site-specific water column criterion elements (see section 2.2.1). States and authorized Tribes should carefully consider the relative tradeoffs of each approach. The adoption and the EPA approval of individual site-specific water column criterion elements could potentially be simpler to apply in assessment, CWA section 303(d) listing and TMDL development, as well as in NPDES permit development since the implementation can immediately proceed with the established criterion element value rather than having the additional step of calculating the criterion element value using the criterion derivation methodology. On the other hand, the performance-based approach could provide states and authorized Tribes the flexibility to adaptively derive site-specific water column criterion elements to account for the most up-to-date data and information for the site without making it necessary for them to submit the site-specific water column criterion element to the EPA for review each time those criterion elements are derived. Under the performance-based approach, stakeholders would have the opportunity to provide comments on the derivation process (e.g., translation mechanisms and associated sampling plans, input parameters, and data analysis methods) during the WQS adoption process under CWA section 303(c) and the EPA's implementing regulations at 40 CFR Part 131. However, comments on the resulting site-specific water column criterion elements derived through the performance-based approach would be submitted as part of individual actions through each of the implementing programs, such as during a public notice for an NPDES permit. The performance-based approach could involve more coordination among the implementation programs to ensure that they are aiming to achieve the same desired condition in the waterbody. For more information on the performance-based approach, see *EPA Review and Approval of State and Tribal Water Quality Standards*.[40]

When developing site-specific water column criterion elements either through the adoption of individual site-specific water column criterion elements or a performance-based approach, states and authorized Tribes must ensure that the site-specific water column criterion elements are protective of the designated use and based on a sound scientific rationale (40 CFR 131.11(a)) and developed using scientifically defensible methods (40 CFR 131.11(b)(1)(iii)). To help ensure that the designated uses are protected, states and authorized Tribes may want to engage with local community stakeholders to evaluate how the waterbody is used and what species are present in the waterbody. If threatened or endangered fish species are present, states and authorized Tribes may need to derive alternative water column elements with a refined protection goal that account for site-specific bioaccumulation characteristics (both when individually adopting a site-specific water column criterion element or using a performance-based approach). The EPA recommends consulting with its regional offices early

[40] *EPA Review and Approval of State and Tribal Water Quality Standards*. 65 Fed. Reg. 24641 (Apr. 27, 2000).

and often during the process. The EPA also recommends states and authorized Tribes periodically review the adopted criterion elements, including during the triennial WQS review process (33 USC 1313(c)(1); 40 CFR 131.20), to ensure that those water column criterion elements continue to protect the designated use over time.

2.2.1 Adoption of Site-specific Water Column Criterion Elements through a Performance-Based Approach

As previously mentioned, states and authorized Tribes can choose to adopt into their WQS and submit to the EPA a set of procedures to translate the fish tissue criterion elements into site-specific water column criterion elements. The EPA considers this a performance-based approach to developing site-specific water column criterion elements. Any translation procedure should be transparent, sufficiently detailed, and include suitable safeguards to ensure repeatable, predictable outcomes. In addition, the resulting water column criterion elements must protect the applicable designated use (including federally listed species, if present). If the EPA approves the procedures of the performance-based approach consistent with CWA section 303(c) and the EPA's implementing regulations at 40 CFR Part 131, each resulting site-specific water column criterion element generated consistent with that approach does not need to be individually adopted into the state or authorized Tribe's WQS or individually approved by the EPA under CWA section 303(c).

Importantly, for public transparency, the EPA strongly recommends states and authorized Tribes maintain a list of the resulting site-specific water column criterion elements and underlying data used for their respective derivations on their publicly accessible website. The EPA also strongly encourages states and authorized Tribes to coordinate closely with the EPA when developing a performance-based approach and when conducting the first few studies to develop site-specific water column criterion elements.

In *Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016,* the EPA provides recommendations for site-specific water column translation procedures in Appendix K.[41] States and authorized Tribes may consider the procedures described in this appendix as a starting point for developing a performance-based approach to derive site-specific water column criterion elements. Appendix K presents the general methods for conducting a site-specific water column translation by either the mechanistic model approach or the BAF approach. In addition, it presents a number of options for determining the values to use as input parameters in both of these methods. Interested states or authorized Tribes should decide which of those options they will use for their performance-based approach or describe in their WQS under which circumstances each option will be used.

[41] USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf.

In addition to the general methods provided in Appendix K, states and authorized Tribes should include additional methods in a performance-based approach that can help to make the procedure more transparent and repeatable. These could include methods for: 1) selecting sites and sampling locations within a site; 2) determining what aquatic species (including threatened and endangered species) are present at the site; 3) selecting target species; 4) selecting tissue type for sampling; 5) sampling plans, including spatial and temporal considerations at a site, whether individual or composite samples will be collected, the total number of samples that will be collected per replicate, and the number of replicates that will be collected; 6) extrapolating trophic transfer factors or conversion factors from existing data; and 7) specifying how data will be processed and analyzed. States and authorized Tribes should consider what level of protection will appropriately protect the designated aquatic life use of the waterbody, which will influence what percentile of the resulting data set should be used for the final criterion value. States and authorized Tribes should also account for spatial and temporal variability and assure that the resulting criterion element is protective of the entire site.

States and authorized Tribes' methods for their performance-based approaches should be clear and definitively state which methods will be followed in particular situations. For example, a state or authorized Tribe's performance-based approach should specifically address fishless waters by either including a method specifically designed to derive a site-specific water column criterion element for a fishless water (potentially translating from an invertebrate threshold when data for that are available) or specifying that the performance-based approach cannot be used to derive a site-specific water column criterion element for a fishless water. An example of a detailed performance-based approach is the *Draft Translation of Selenium Tissue Criterion Elements to Site-specific Water Column Criterion Elements for California Version 1, August 8, 2018*.[42]

If a state or authorized Tribe chooses to adopt a performance-based approach as part of a WQS, one method for incorporating the performance-based approach could be to adopt the national CWA section 304(a) recommended selenium criterion table (Table 1) into its WQS with the addition of a footnote that references the document that describes the state or authorized Tribe's translation methodology, sampling plans, and data analysis. By adopting such a footnote into the WQS, the state or authorized Tribe will have incorporated by reference their translation procedure that is scientifically defensible, produces repeatable, predictable outcomes and results in criterion elements that protect the applicable designated use. Any revisions to this document that has been incorporated by reference would be a revision to a WQS that would be subject to the EPA review under CWA section 303(c) and the EPA's implementing regulations at 40 CFR Part 131.

[42] USEPA. 2018. *Draft Translation of Selenium Tissue Criterion Elements to Site-specific Water Column Criterion Elements for California Version 1, August 8, 2018.* U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/sites/production/files/2018-12/documents/california_selenium_2040-af79_pba_20181121_508c_.pdf.

2.2.2 Adoption of Site-specific Water Column Criterion Elements Individually

States and authorized Tribes can choose to adopt and submit to the EPA for review site-specific water column criterion elements each time they are derived and adopted. These site-specific water column criterion elements can be derived using one of the methodologies described in Appendix K or another scientifically defensible approach. These site-specific water column criterion elements must protect the designated use and must be reviewed and approved by the EPA under CWA section 303(c) and the EPA's implementing regulations at 40 CFR Part 131 before they are applicable for CWA purposes, such as NPDES permitting, waterbody assessment and listing, and TMDL development.

2.3 Relationship of the EPA's National CWA section 304(a) Recommended Selenium Criterion to the Great Lakes Initiative

The EPA's national CWA section 304(a) recommended selenium criterion does not supersede the requirements applicable to the Great Lakes at 40 CFR Part 132. Those requirements, known as the *Great Lakes Water Quality Guidance* (also known as the *Great Lakes Initiative* or *GLI*), apply to all streams, rivers, lakes, and other bodies of water within the U.S. portion of the Great Lakes drainage basin. For those waters, states and authorized Tribes must adopt WQS, including criteria, that are *consistent with (as protective as)* the WQS regulations the EPA promulgated on March 23, 1995 (see 60 FR 15366, March 23, 1995, and 40 CFR 132.1(b) and 132.4).

Under the Great Lakes system-specific regulations, if a state or authorized Tribe adopts a revised criterion for selenium, the EPA in its review must determine if the new criterion is as protective as the selenium chronic criterion (5 µg/L) promulgated in 40 CFR 132.6, Table 2, and whether all binding implementation procedures are as protective as the GLI procedures (see 40 CFR 132.5(g)). The EPA makes its approval/disapproval decisions about new and revised WQS on a case-by-case basis depending upon the supporting information. For waters within the Great Lakes Basin, states and authorized Tribes should evaluate whether the national CWA section 304(a) recommended selenium criterion meets the requirements at 40 CFR Part 132. The EPA would evaluate any proposed revised selenium criterion submitted as part of a state or authorized Tribe's new or revised WQS on a case-by-case basis, in accordance with the CWA and the EPA's implementing regulations at 40 CFR Parts 131 and 132.

3.0 Options for Implementing the EPA's Selenium Criterion

States and authorized Tribes have some flexibility when adopting the national CWA section 304(a) recommended selenium criterion. Options include, but are not limited to, deriving site-specific fish tissue criterion elements, deriving site-specific water column criterion elements (see section 2.2 of this document), adopting WQS variances, revising designated uses, and using

compliance schedules. This section describes how each option could fit within a state or authorized Tribe's WQS adoption and implementation processes.

3.1 Site-specific Fish Tissue Criterion Elements

3.1.1 Site-specific Fish Tissue Criterion Elements Using the Species Recalculation Procedure[43]

The EPA's WQS regulation at 40 CFR 131.11(b)(1)(ii) provides states and authorized Tribes with the opportunity to adopt criteria that are "…modified to reflect site-specific conditions." As with any criterion, a site-specific criterion must protect the designated use, must be based on a sound scientific rationale, and is subject to the EPA review and approval or disapproval (40 CFR 131.11(a)).

One process that can be used to modify a criterion to reflect site-specific conditions is the recalculation procedure. The recalculation procedure is a process used to modify the taxonomic composition of the toxicity data set used for the species sensitivity distribution (SSD)[44] upon which a site-specific criterion is based, in order to better match the species assemblage that is expected to occur at the site. The recalculation procedure creates a site-specific toxicity data set (and corresponding SSD) that is appropriate for deriving a site-specific aquatic life criterion by correcting, adding, and/or deleting test results from the national toxicity data set for the pollutant of concern based on the resident species of the site. For site-specific recalculations at sites with limited diversity, "the underlying concept of having tests for a diversity of species is more fundamental than having tests for particular taxonomic groups that may be irrelevant to the site."[45] Therefore, recalculations can be performed, even if all of the minimum data requirements are not met. This procedure is intended to provide flexibility to states and authorized Tribes to derive site-specific criteria that best reflect the expected resident species at a site. The species recalculation procedure may result in site-specific criteria that differ from national CWA section 304(a) criteria recommendations (i.e., concentrations that are higher or lower than national recommendations) when there are demonstrated differences in sensitivity

[43] USEPA. 2013. *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria*. EPA 823-R-13-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. www.epa.gov/sites/production/files/2015-08/documents/revised_deletion_process_for_the_site-specific_recalculation_procedure_for_aquatic_life_criteria.pdf.

[44] For additional description of the derivation of the fish tissue criterion elements and the distribution of species sensitivities, see section 3.1.3 of USEPA 2021. USEPA. 2021. *2021 Revision to: Aquatic Life Ambient Water Quality Criterion for Selenium–Freshwater 2016.* EPA 822-R-21-006. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2021-08/selenium-freshwater2016-2021-revision.pdf

[45] USEPA. 2013. *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria*. EPA 823-R-13-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. www.epa.gov/sites/production/files/2015-08/documents/revised_deletion_process_for_the_site-specific_recalculation_procedure_for_aquatic_life_criteria.pdf.

between the expected resident aquatic species and those that were used to derive the national criteria recommendations.

Critical species should also be taken into consideration when using the recalculation procedure. A critical species is a resident species that (a) is commercially or recreationally important at the site; or (b) is listed as threatened or endangered under section 4 of the Endangered Species Act (states and authorized Tribes may also want to consider species that are candidates for protection under the Endangered Species Act as critical species); or (c) is a species for which there is firm evidence that its loss would yield an unacceptable impact on the site's commercially or recreationally important species, endangered species, abundances of a variety of other species, or structure or function.[46] The deletion process of the recalculation procedure should not be undertaken unless toxicity data are available for at least one species in each *class* of aquatic plants or animals that contains a *critical species*. For example, if the site has a salmonid that fits the designation of a critical species, the deletion process should not be undertaken unless toxicity data for a species in class teleostei[47] are available (possibly via new testing). It is important to note that species not present at the site, but included in the national criterion database, may be surrogates for other species that are present at the site, but not included in the national criterion database.

The EPA developed the national CWA section 304(a) recommended selenium criterion by first deriving an egg-ovary criterion element from egg-ovary toxicity data then deriving all other criterion elements from that egg-ovary criterion element. A state or authorized Tribe developing site-specific fish tissue criterion elements using the recalculation procedure could similarly start with deriving the egg-ovary criterion element and then deriving other fish-tissue criterion elements. States and authorized Tribes should also consider corresponding changes to the applicable water column criterion elements. See section 2.2 of this document for more information. Note that a state or authorized Tribe that is considering adopting the EPA's national CWA section 304(a) selenium criterion recommendations for the fish tissue criterion elements as recommended but is interested in developing site-specific water column values can proceed as described in section 2.2 of this document.

As with any criteria, states and authorized Tribes using the recalculation procedure should ensure that their site-specific criteria "…provide for the attainment and maintenance of the water quality standards of downstream waters" (40 CFR 131.10(b)). This requirement can be met in a number of ways, including using a combination of water quality standards, such as criteria (numeric criteria and/or narrative criteria) and general policies. Additional information

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[46] USEPA. 2013. *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria*. EPA 823-R-13-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC, www.epa.gov/sites/production/files/2015-08/documents/revised_deletion_process_for_the_site-specific_recalculation_procedure_for_aquatic_life_criteria.pdf.

[47] Teleostei is currently listed as a class by the Integrated Taxonomic Information System (itis.gov). Osteichthyes was previously classified as a superclass that contained the classes Sarcopterygii and Actinopterygii, but those two taxa have now been elevated to superclasses and Teleostei has been elevated to class (https://www.itis.gov/servlet/SingleRpt/SingleRpt).

about this requirement can be found in *Protection of Downstream Waters in Water Quality Standards: Frequently Asked Questions*.[48] In addition, states and authorized Tribes should consider how they will demonstrate that a species that is contained in the national data set but is being removed from that data set in order to derive the new site-specific criterion is not present at the site (or a surrogate for another species present at the site) before using the recalculation approach. For additional information on the procedure, see the EPA's *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria*.[49] States and authorized Tribes interested in developing site-specific fish tissue criterion elements based on the revised deletion process should engage their EPA Regional office early in the process to ensure the development of sound scientific analyses. The EPA cautions that the deletion process for site-specific criterion development is not appropriate for a performance-based approach because different survey techniques are needed at different sites to determine which species are present.

When developing site-specific criterion elements, consideration should be given to what area is defined as the site. In the general context of site-specific criteria, a "site" may be a state, region, watershed, waterbody, or segment of a waterbody. The site-specific criterion must provide adequate protection for the entire site, however the site is defined. For the recalculation procedure, all species that occur at the site need to be considered when deciding what species, if any, are to be deleted (or added) from (to) the data set. Unique populations or less sensitive uses within sites may justify a designation as a distinct site. If the site contains endangered or threatened species and/or their critical habitat, and the EPA's approval of the state or authorized Tribe's proposed site-specific criterion may affect these species or habitat, the EPA must engage in interagency consultation under the Endangered Species Act section 7(a)(2) with either or both the United States Fish and Wildlife Service and National Marine Fisheries Service, depending on the species, to ensure that the EPA's approval is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of critical habitat. During consultation, the EPA would consider the potential effect of its approval on the species and on the physical and biological features of the critical habitat as well as how the EPA's approval of the site-specific criterion may affect water quality required for the species within the critical habitat.

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[48] USEPA. 2014. *Protection of Downstream Waters in Water Quality Standards: Frequently Asked Questions*. EPA 820-F-14-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. www.epa.gov/sites/production/files/2018-10/documents/protection-downstream-wqs-faqs.pdf.

[49] USEPA. 2013. *Revised Deletion Process for the Site-Specific Recalculation Procedure for Aquatic Life Criteria*. EPA 823-R-13-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. www.epa.gov/sites/production/files/2015-08/documents/revised_deletion_process_for_the_site-specific_recalculation_procedure_for_aquatic_life_criteria.pdf.

For additional information on site-specific WQC, see chapter 3 of the EPA's *Water Quality Standards Handbook*.[50]

3.1.2 Site-specific Criteria for Sites with Naturally Elevated Selenium Levels

Natural conditions are generally associated with the condition of ecological integrity, defined as the structure, composition, function, or diversity of a habitat in the absence of human disturbance or alteration.[51] For some areas in the U.S., selenium may be elevated in soils and waterbodies under natural conditions. States and authorized Tribes have two options when addressing areas that have naturally elevated selenium concentrations: (1) they may develop site-specific criteria for waterbodies in these locations (e.g., where the current aquatic life designated use is appropriate); or (2) they may refine or subcategorize the aquatic life designated use for waterbodies in these areas and set new criteria to be protective of the modified use (See section 3.3 of this document for more information on revising designated uses). These are two separate pathways for accomplishing the goal of setting appropriate criteria for these waterbodies.

To set a site-specific criterion using a natural conditions justification, states and authorized Tribes should demonstrate that the elevated levels of selenium are due to natural conditions and that no anthropogenic activities (e.g., agriculture, mining, irrigation, coal, or oil combustion) are responsible for elevating selenium concentrations in the waterbody. In many areas where soils are elevated in selenium, anthropogenic activities either release selenium or expose soils or rock to weathering, which results in the release of additional selenium into the water column. When an anthropogenic activity leads to a greater release of selenium than natural weathering, the state or authorized Tribe should not develop a site-specific criterion using the natural conditions justification. However, if the anthropogenic impacts can be separated from the natural impacts in these situations where both occur, then the state or authorized Tribe could develop a site-specific criterion for the portion of the elevated selenium that is due solely to those natural causes.

When developing a site-specific criterion, the state or authorized Tribe should identify the site boundaries and temporal dynamics to which a natural background (concentration of a parameter due only to non-anthropogenic sources) criterion applies (i.e., it is important that such criteria are developed to maintain and protect the spatial and temporal variation in

[50] USEPA. 2017. Chapter 3: Water Quality Criteria in *Water Quality Standards Handbook*. EPA 823-B-17-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/sites/production/files/2014-10/documents/handbook-chapter3.pdf.

[51] Landres, P.B., P. Morgan, and F.J. Swanson. 1999. Overview of the use of natural variability concepts in managing ecological systems. *Ecological Applications* 9(4): pp. 1179–1188; Davies, S.P. and S.K. Jackson. 2006. The biological condition gradient: A descriptive model for interpreting change in aquatic ecosystems. *Ecological Applications* 16(4): pp. 1251–1266.

selenium concentrations under natural conditions[52]). If concentrations vary seasonally, adoption of seasonal criteria may be appropriate. Where concentrations vary spatially, additional waterbody segmentation may be appropriate. In cases where selenium is elevated due to both natural conditions and anthropogenic activities, methods such as modeling (e.g., historical or hydrologic modeling), an examination of past paleolimnological studies, comparison to reference sites with no anthropogenic impacts, or other scientifically defensible techniques may be considered as an option for defining natural conditions.[53] Using these or other tools, a state or authorized Tribe may be able to define what proportion of elevated selenium is due to natural versus anthropogenic impacts. A site-specific criterion could then be derived for the portion of the concentration that is elevated due to natural conditions.

When deriving site-specific fish tissue criterion elements, states and authorized Tribes should consider corresponding changes to the applicable water column criterion elements. If selenium at the site is entirely from natural sources, then the water column criterion element could be set at ambient water column concentrations. However, if some of the selenium is from anthropogenic sources, then the water column concentration should be derived using modeling methods. See section 2.2 for more information on options for adopting site-specific water column criterion elements.

As articulated in the 1997 memorandum *Establishing Site-Specific Aquatic Life Criteria Equal to Natural Background,*[54] the EPA recommends that interested states and authorized Tribes establish site-specific numeric aquatic life criteria by setting the criteria values equal to natural background, where natural background is defined as due *only* to non-anthropogenic sources (i.e., non-human-induced sources). The EPA cautions against using the terminology "ambient" interchangeably with "natural." Ambient conditions refer to current conditions at a site and can include both impacts from anthropogenic and natural sources.

3.2 Water Quality Standards Variances

A state or authorized Tribe could consider a WQS variance if it determines that it is not feasible at present to attain a designated use and an associated criterion, such as a newly adopted

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[52]See the *Technical Support for Fish Tissue Monitoring for Implementing of the EPA's 2016 Selenium Criterion* for information on sampling fish and spatial and temporal variability. https://www.epa.gov/system/files/documents/2024-03/selenium-fishtissue-tsd.pdf.

[53] Swetnam, T.W., C.D. Allen, and J.L. Betancourt. 1999. Applied historical ecology: Using the past to manage for the future. *Ecological Applications* 9(4): pp. 1189–1206; Hughes, R.M., S.G. Paulsen, and J.L. Stoddard. 2000. EMAP-Surface waters: A multiassemblage, probability survey of ecological integrity in the U.S.A. *Hydrobiologia* 422/423: pp. 429–443; Kilgour, B.W., and L.W. Stanfield. 2006. Hindcasting reference conditions in streams. *American Fisheries Society Symposium* 48: pp. 623–639; Herlihy, A.T., S.G. Paulsen, J. Van Sickle, J.L. Stoddard, C.P. Hawkins, and L.L. Yuan. 2008. Striving for consistency in a national assessment: The challenges of applying a reference-condition approach at a continental scale. *Journal of the North American Benthological Society* 27(4): pp. 860–877.

[54] Davies, T. USEPA. 1997. Memorandum: Establishing Site Specific Aquatic Life Criteria Equal to Natural Background. Office of Water, Washington DC. https://www.epa.gov/sites/production/files/2014-08/documents/naturalbackground-memo.pdf.

selenium criterion, but it may be attainable in the future. A WQS variance may also be considered if there is uncertainty about the feasibility of meeting the designated use and criterion, but progress can be made by implementing known controls and tracking environmental improvements. The WQS regulations at 40 CFR 131.3(o) define a *WQS variance* as "a time-limited designated use and criterion for a specific pollutant(s) or water quality parameter(s) that reflect the highest attainable condition (HAC) during the term of the WQS variance." The WQS variance regulation at 40 CFR 131.14 ensures that incremental progress is made toward attainment of the applicable designated use and associated criterion, while not allowing any lowering of the currently attained ambient water quality. This is accomplished by establishing an HAC, which serves as the basis for deriving less-stringent NPDES permit limits and requirements throughout the term of the WQS variance.[55] Although less stringent than the adopted criterion, the HAC still provides a target for incrementally improving water quality until the applicable designated use and associated criterion become attainable. It is important to note that these permit limits and requirements are applicable only to the discharger(s), pollutant(s)/parameter(s), and waterbody or waterbody segment(s) identified in the WQS variance. All other applicable standards not specifically addressed by the EPA-approved WQS variance would continue to apply for CWA purposes.

A state or authorized Tribe can choose to adopt a WQS variance that is applicable to a single discharger, multiple dischargers, or an entire waterbody/waterbody segment. Because the national CWA section 304(a) recommended selenium criterion is intended to protect aquatic life (CWA section 101(a)(2)), in its WQS variance submission the state or authorized Tribe must provide supporting documentation demonstrating that attaining the designated use and criterion is not feasible throughout the term of the WQS variance due to one of the factors listed at 40 CFR 131.14(b)(2)(i)(A). Such a demonstration, when combined with the other regulatory requirements of 40 CFR 131.14, provides the framework for WQS variances as a water quality improvement tool. The regulations at 40 CFR Part 132 apply to states and authorized Tribes that regulate waters in or contributing to waters of the Great Lakes System. If 40 CFR 131.14 and 40 CFR Part 132 overlap, the more stringent regulation applies. WQS variances are considered new or revised WQS and, therefore, must be reviewed and approved by the EPA in order to be in effect for CWA purposes.

To help states and authorized Tribes in the process of adopting WQS variances, the EPA has developed various resources, including a WQS variances website,[56] the *WQS Variance Building Tool*,[57] *Checklist for Evaluating State Submission of Discharger-Specific Water Quality Standards*

[55] WQS variances with a term greater than five years must be reevaluated at least every five years to determine whether the HAC is more stringent than originally adopted. See 40 CFR 131.14 (b)(1)(v).
[56] USEPA. *Water Quality Standards Variance website.* https://www.epa.gov/wqs-tech/water-quality-standards-variances.
[57] USEPA. *Water Quality Standards Variance Building Tool*. https://www.epa.gov/wqs-tech/water-quality-standards-variance-building-tool.

Variances,[58] and several other resources available on the "Resources" tab of the *WQS Variance Building Tool*. States and authorized Tribes are encouraged to coordinate with the EPA throughout the WQS variance adoption process to develop their WQS variance submissions.

3.3 Revision to Designated Uses

Prior to adopting a revised selenium criterion, a state or authorized Tribe may want to evaluate potential revisions to the relevant designated uses for certain waterbodies as discussed below. The WQS regulation at 40 CFR 131.10(g) provides that states or authorized Tribes may remove a CWA section 101(a)(2) designated use that is *not* an existing use, as defined in 40 CFR 131.3(e), or establish subcategories of such a use that requires less stringent criteria if the state or authorized Tribe can demonstrate that attaining the designated use is not feasible because of one or more of the six factors listed in 40 CFR 131.10(g). Those factors are:

1) Naturally occurring pollutant concentrations prevent the attainment of the use; or

2) Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating state water conservation requirements to enable uses to be met; or

3) Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place; or

4) Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the waterbody to its original condition or to operate such modification in a way that would result in the attainment of the use; or

5) Physical conditions related to the natural features of the waterbody, such as the lack of a proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or

6) Controls more stringent than those required by sections 301(b) and 306 of the Act would result in substantial and widespread economic and social impact.

Where required under the EPA's WQS regulations, the state or authorized Tribe must make such a demonstration through a *use attainability analysis* (UAA), which is defined under 40 CFR 131.3(g) as "…a structured scientific assessment of the factors affecting the attainment of the use which may include physical, chemical, biological, and economic factors as described in 40 CFR 131.10(g)." A state or authorized Tribe must conduct a UAA whenever (1) the state or

[58] USEPA. 2016. *Checklist for Evaluating State Submission of Discharger-Specific Water Quality Standards Variances*. U.S. Environmental Protection Agency, Office of Water. Washington, DC. https://www.epa.gov/sites/production/files/2016-03/documents/checklist-evaluating-discharger-specific.pdf.

authorized Tribe designates for the first time, or has previously designated for a waterbody, uses that do not include the uses specified in section 101(a)(2) of the CWA; or (2) the state or authorized Tribe wishes to remove a designated use that is specified in section 101(a)(2) of the Act, to remove a subcategory of such a use, or to designate a subcategory of such a use that requires a criterion less stringent than previously applicable (40 CFR 131.10(j)). If a state or authorized Tribe adopts a new or revised WQS based on a required use attainability analysis, the state or authorized Tribe shall also adopt the highest attainable use, as defined in 40 CFR 131.3(m).[59] The WQS regulations also do not allow states and authorized Tribes to remove any uses that are existing uses. In addition, uses cannot be removed if they can be attained by implementing effluent limits required under sections 301(b) and 306 of the Act and by implementing cost-effective and reasonable best management practices for nonpoint source control (40 CFR 131.10(h)).

For selenium, there are at least two potential circumstances where a use change may be appropriate for a waterbody. The first is fishless waters. States or authorized Tribes may want to recognize the difference in aquatic communities in these waters by creating a subcategory of the aquatic life designated use. When doing so, the state or authorized Tribe should be sure that protections for other forms of aquatic life, such as macroinvertebrates, are protected by the revised designated use and associated criterion. If aquatic-dependent wildlife use the waterbody, then the state or authorized Tribe may also want to set a selenium criterion for the protection of these species as well. The second is waterbodies located in areas where the selenium is naturally elevated in the underlying geology and, as a result, are particularly vulnerable to elevated selenium concentrations in the water. Ambient selenium concentrations in these waterbodies can be exacerbated by anthropogenic activities. If the conditions in this circumstance are precluding attainment of the designated use and cannot be remedied, a limited or modified aquatic life use may be more appropriate for these waterbodies. The EPA's regulations at 40 CFR 131.10(g) provide factors related to natural and anthropogenic conditions for states and authorized Tribes to employ in a UAA to justify revising the aquatic life use (see 40 CFR 131.10(j) for when a UAA is required). If the state or authorized Tribe can demonstrate the full aquatic life use is not feasible for a waterbody using at least one of the factors at 40 CFR 131.10(g), then the designated use the state or authorized Tribe must adopt in place of the full aquatic life use must be the highest attainable use for the waterbody, as required by 40 CFR 131.10(g).

[59] 40 CFR 131.3(m) defines "highest attainable use" as the "…modified aquatic life, wildlife, or recreation use that is both closest to the uses specified in section 101(a)(2) of the Act and attainable, based on the evaluation of the factor(s) in §131.10(g) that preclude(s) attainment of the use and any other information or analyses that were used to evaluate attainability."

For additional information on use changes and UAAs, see the EPA's *Water Quality Standards Handbook.*[60] Additional information also is available at http://water.epa.gov/scitech/swguidance/standards/uses/uaa/.

3.4 Compliance Schedules

If a state or authorized Tribe's applicable WQS[61] or implementing regulations include a provision authorizing the use of permit compliance schedules, a compliance schedule that is consistent with 40 CFR 122.47 can be included in an NPDES permit with WQBELs for selenium. The NPDES permit regulations at 40 CFR 122.47 allow compliance schedules if (1) the discharger cannot immediately meet the new WQBEL, and requires time to install treatment technology or implement other controls necessary to come into compliance with a new WQBEL; (2) the permitting authority (the state or the EPA) determines that a compliance schedule is *appropriate* in light of all the circumstances; and (3) the discharger can meet its final WQBEL at a date determined to be as-*soon-as-possible*. See section 502(17) of the CWA for a definition of *schedules of compliance* and 40 CFR 122.47 for more information about the schedules. For additional information on compliance schedules, see section 5 in *Frequently Asked Questions: Implementing Water Quality Standards Based on the EPA's 2016 Selenium Criterion in Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits*.[62]

Compliance schedules in NPDES permits can allow additional time to achieve compliance with WQBELs based on WQS adopted after July 1, 1977, if the state or authorized Tribe (i.e., a Tribe with TAS for WQS) has indicated clearly in its WQS or implementing regulations that it intends to allow the use of permit compliance schedules. As defined in the NPDES regulations, "a schedule of compliance" is "a schedule of remedial measures included in a 'permit', including an enforceable sequence of interim requirements (for example, actions, operations, or milestone events) leading to compliance with the CWA and regulations" (40 CFR 122.2). If the schedule is longer than one year, it must include annual interim requirements and dates for their achievement (40 CFR 122.47(a)(3)). Additionally, the permit must include a final WQBEL and a date for its achievement. The decision to include a compliance schedule as well as the dates and interim requirements must be supported by the administrative record. The permit fact sheet should include a justification for the compliance schedule being determined to be *appropriate* and why the chosen time frame was deemed to be *as soon as possible*. For

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[60] USEPA. 2012. Chapter 2: Designation of Uses in *Water Quality Standards Handbook*. EPA 823-B-12-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/sites/production/files/2014-10/documents/handbook-chapter2.pdf.

[61] 40 CFR 131.15 states that: "If a State intends to authorize the use of schedules of compliance for water quality-based effluent limits in NPDES permits, the State must adopt a permit compliance schedule authorizing provision. Such authorizing provision is a water quality standard subject to EPA review and approval under section 303 of the Act and must be consistent with sections 502(17) and 301(b)(1)(C) of the Act."

[62] USEPA. 2024. *Frequently Asked Questions: Implementing Water Quality Standards Based on the EPA's 2016 Selenium Criterion in Clean Water Act Section 402 National Pollutant Discharge Elimination System Permits.* EPA-820-R-24-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/system/files/documents/2024-03/selenium-faq-cwa402.pdf.

additional information on compliance schedules, see section 9.1.3 of the EPA's *NPDES Permit Writers' Manual*[63] and the May 10, 2007, memorandum from the EPA's Office of Wastewater Management on compliance schedules for water quality-based effluent limitations in NPDES permits.[64]

[63] USEPA. 2010. *NPDES Permit Writers' Manual*. EPA 833-K-10-001. U.S. Environmental Protection Agency, Office of Water, Washington, DC. https://www.epa.gov/sites/production/files/2015-09/documents/pwm_2010.pdf.

[64] Hanlon, J.A. USEPA. 2007. Memorandum: Compliance Schedules for Water Quality-Based Effluent Limitations in NPDES Permits. Office of Water, Washington DC. https://www3.epa.gov/npdes/pubs/memo_complianceschedules_may07.pdf.