Water Quality Standards Clarification Rulemaking

Technical Support Document

DRAFT DOCUMENT- For deliberative purposes only.

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Executive Summary

The Department of Environmental Conservation (DEC) is proposing amendments 18 AAC 70 to clarify state policies and establish consistency with federal policies pertaining to the federal Clean Water Act (CWA). The proposed amendments target administrative procedures including the interpretation of water quality data, application of federally-approved standard analytical methods for use in the analysis of water quality, and how DEC will make water quality determinations.

What are Alaska's Surface Water Quality Standards?

States adopt water quality standards (WQS) to protect public health or welfare, enhance the quality of state waters, and serve the purposes of the CWA. Alaska's WQS are established in regulations at 18 AAC 70. WQS generally consist of :

- The water quality goals or specific uses (i.e., classes and sub-classes) that will be protected in state waters;
- The criteria, both numeric and narrative, that will be used to determine whether such uses are being attained;
- An antidegradation provision to ensure existing water uses and the level of water quality necessary to protect existing uses are maintained and protected; and
- General provisions that affect implementation of WQS in state water pollution control programs (e.g, mixing zones, water quality standards variances).

Under the CWA, the term *criteria* has two different definitions. Under section 304(a) criteria refers to specific numeric concentrations recommended by U.S. Environmental Protection Agency (EPA) that are considered to be protective of aquatic life and human health. Section 303(c) of the CWA defines criteria as the numeric (or narrative) targets considered to be protective of the water quality goals (i.e. classes and subclasses). In each case, a criterion typically includes three components:

- Magnitude: Numeric or narrative value that represent the maximum allowable amount of a pollutant to be present in a waterbody while still considered to be protective of the associated use of that water.
- Duration: The time period used to calculate exposure (e.g., 1-hour or 96-hour average for toxic pollutants).
- Frequency: The allowable number of exceedances of the magnitude value that may occur within a specific time period. Frequency considers the amount to time required for a use to recover from the stress of exposure to a pollutant (e.g., no more than one exceedance every three years).

How are water quality standards revised?

WQS are revised periodically in accordance with state and federal administrative regulations. Revisions are made to incorporate new science, to meet new state or federal requirements, or to provide additidional clarity to the regulated public. Per section 303(c) of the CWA and federal regulations at 40 CFR 131.21, WQS revisions must be submitted to the EPA for review and

approval prior to use in state water pollution control programs (e.g., APDES permits, waterbody assessments).

States must submit the following documentation to EPA for consideration:

- State-adopted regulatory language;
- Methods used and analysis conducted in support of water quality standards revisions;
- Certification by state legal authority that the water quality standards were adopted pursuant to State law; and
- General information used to determine the adequacy of the scientific basis of the proposed standards and how the standard may be implemented in state water pollution control programs.

Technical Support Document Application

This technical support document (TSD) is intended to describe DEC's technical and legal decision making process and satisfy federal CWA requirements. It does not detail deliberations or specific implementation procedures that will be used by state water pollution control programs.

18 AAC 70.020. Protected Water Classes and Subclasses; Water Quality Criteria; Water Quality Standards Table

18 AAC 70.020(b) describes the specific criteria for each class and sub-class of protected uses of state waters. DEC is proposing to amend two sections of 18 AAC 70.020(b) to clarify DEC policy pertaining to the calculation of water quality criteria.

18 AAC 70.020(b)(5) and (17). Petroleum Hydrocarbons, Oils, and Grease, For Freshwater/Marine Uses

WQS for petroleum hydrocarbons, oils and grease are specified in 18 AAC 70.020(b)(5) for fresh water uses and at 18 AAC 70.020(b)(17) for marine water uses.

DEC is proposing adoption of narrative language for the designated uses of Water Supply (aquaculture) and Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife. The proposed language clarifies that Total aqueous hydrocarbons and Total aromatic hydrocarbon will be assessed as a **four-day (96-hour) average.** Petroleum hydrocarbons consist of multiple toxic pollutants and may be assigned duration values that correspond with state policies pertaining to the assessment toxic pollutants. Per EPA guidance on aquatic life criteria are provided in the 1985 *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*

> "Except possibly where a locally important species is very sensitive, aquatic organisms and their uses should not be affected unacceptably if the **four-day average** concentration does not exceed the **chronic criterion** more than **once every three years** on the average, and if the one-hour average concentration does not exceed the acute criterion more than once every three years on the average" (EPA 1985).

DEC interpretes the WQS to be defined as chronic criteria as many of the various chemicals that comprise these compounds are regulated as toxic pollutants per 18 AAC 70.020(b)(11) and the *Alaska Water Quality Criteria Manual for Toxic and Other Deleterious Organic and Inorganic Substances* (2008). DEC considers these amendments to provide adequate protection of the designated use and demonstrates consistency between the 1985 *Guidelines* and applicable studies.

Weber Scannell et al. conducted a literature review in 2005 titled *Acute and Chronic Toxicity of Hydrocarbons in Marine and Fresh Water with an Emphasis on Alaska Species: a Review of the Literature.* The review considered studies developed prior to 1995 and those developed between 1996 and 2003. 96-hour duration periods were used in the majority of both acute and chronic tests. DEC used this information in the development and implementation of the four-day duration period via guidance in the *Listing Methodology for Determining Water Quality Impairments from Petroleum Hydrocarbons, Oils and Grease* (2015) as part of its CWA section 303(d) Integrated Report requirements since its finalization. DEC has not identified any additional research that would modify this interpretation. Adoption of

the duration criteria at 18 AAC 70.020(b) via the proposed rulemaking does not supercede or modify any aspects of the 2015 Listing Methology.

DEC will consider individual as well as multiple samples collected in a four-day period, consistent with EPA *Guidelines for Preparations of Comprehensive State Water Quality Assessments and Electronic Updates* (1997).

> EPA maintains that chronic criteria should be met in a waterbody that fully supports its uses. Few States and Tribes, if any, are obtaining composite data over a 4-day sampling period for comparison to chronic criteria. EPA believes that 4-day composites are not an absolute requirement for evaluating whether chronic criteria are being met. Grab and composite samples (including 1-day composites) can be used in water quality assessments if taken during stable conditions.[1] (Emphasis added) This should give States more flexibility in utilizing chronic criteria for assessments (p. 3-22).

Additional policy guidance is available in the most recent publication of the DEC Consolidated Assessment and Listing Methodology.[2]

18 AAC 70.020(b)(10) Temperature for Freshwater Uses

DEC is proposing to adopt narrative language that clarifies that the duration period used to assess water quality for the designated uses of Water Supply, Water Recreation, and Growth and Propagation of Fish, Shellfish, Other Aquatic Life, and Wildlife will be **determined by the measurement of the 7-Day Average of Daily Maximum (7-DADMax***)* temperatures**.**

The establishment of a formal duration period does not change, modify, or affect the existing biologically-based numeric criteria for the protection of salmonids currently established at 18 AAC 70.020(b)(10).

The amended language will be applied during DEC's water quality assessment process as DEC does not currently have a formal policy dictating the applicable duration value at 18 AAC 70.[3] The proposed duration value is based on recommendations provided in the 2003 *EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards* and technical supporting documents that serve as the scientific basis for the EPA 2003 guidance.[4]

> The recommended metric for all of the following criteria is the maximum 7-day average of the daily maxima (7-DADM). This metric is recommended because it describes the maximum temperatures in a stream, but is not overly influenced by the maximum temperature of a single day. Thus, it reflects an average of maximum temperatures that fish are exposed to over a weeklong period. Since this metric is oriented to daily maximum

[1] EPA does not include a definition for 'stable' in the 1997 document.
[2] See http://dec.alaska.gov/water/water-quality/integrated-report/
[3] Per EPA Water Quality Standards Handbook (2003)[C]riteria indicate a time period over which exposure is to be averaged, as well as an upper limit on the average concentration, thereby limiting the duration of exposure to elevated concentrations (Chapter 3.1.2).
[4] https://www.epa.gov/wa/northwest-water-quality-temperature-guidance-salmon-steelhead-and-bull-trout

temperatures, it can be used to protect against acute effects, such as lethality and migration blockage conditions (EPA 2003. Pg. 19)

Application of a 7-DADMax duration value is considered to be protective of sensitive aquatic life (i.e., salmonids) because it:

- Minimizes potential issues related to lags between stream temperature and air temperatures, reduces the amount of the variability in the data, and works well with stream–air temperature regression (Mayer 2012).
- Demonstrates the period in which the maximum temperatures in a stream are recorded, but is not overly influenced by the maximum temperature of a single day;[5].
- Provides an acceptable level protection from acute exposure as it considers daily maximum values in the calculation process;
- Sublethal chronic biologic reactions are likely to take longer periods of time (i.e., one week) before becoming apparent;
- Provides an acceptable level protection from chronic exposure as 7-DADMax in Pacific Northwest streams were demonstrated to be approximately 3°C than mean values;
    - Mean temperatures were used to calculate the biologically-derived magnitude values (i.e., 13°C, 15°C) consider salmonid growth potential, a sub-lethal effect.

DEC will calculate the 7-DADMax using a lagged seven-day average, which is calculable each day beyond day six of the applicable assessment period.

In addition to the evidence provided above, DEC finds that the proposed action can be reasonably implemented in water quality assessment processes and is consistent with regional water quality policy as evidenced by other Northwest states (i.e., Idaho, Oregon, Washington) and British Columbia.

While stream temperature is a critical factor in determining productivity, its role is complicated as salmonids are thermoconformers who live in a dynamic environment. Sullivan (2000) considered the complex relationship between salmonids and temperature and notes multiple metabolic responses such as an inherit tolerance to temperatures below 27°C for limited periods of time (i.e., 'resistance time') and ability to adapt to large fluxuations in temperature (i.e., 13.5°C) without deleterious effects to growth or mortality. Sullivan also notes the multitude of other factors that are less understood such as disease resistance, toxicity resistance, and ecological factors (e.g., predator-prey relationship) that is affected by temperature variability.

More recent studies (Armstrong et al. 2013, Brewitt 2017, Luisardi 2019) have demonstrated that salmonids of varying age and size tend to disperse from cooler to warmer habitats to take advantage of optimal foraging, digestion, and absorbtion conditions. It also has identified the importance of temperature refugia, habitat diversity, and food web dynamics to sustaining salmonid populations. Such work demonstates the importance of robust data collection methods when conducting

[5] In addition, please reference EPA (2003) and Support Document for EPA'a Action Reviewing Nor or Revised Water Quality Standards for the State of Oregon (2004). ;

temperature assessments. This information is not intended to minimize the importance of adhering to the biologicly-derived temperature criteria. Rather, it is intended to emphasize the fact that salmonid populations inheritantly demonstrate behavorial thermoregulation as a growth and survival mechanism and that use of a 7DADMax is a more accurate means of assessing temperature variability and the potential for thermal stress to occur.

Notes applicable to 18 AAC 70.020(b)(10)

DEC is also proposing to adopt three categorical exclusions from the proposed freshwater temperature criteria at 18 AAC 70.020(b)(10).

1. A de minimis value of 0.3°C in cases where anthropogenic activity is considered.

DEC is proposing to adopt a de minimus value of 0.3°C above the biologically-driven numeric criteria or adopted site-specific criteria that would be applicable to the state water quality assessments process. This proposed amendment is consistent with the EPA 2003 recommendations and approved by EPA for use in Oregon (EPA 2004) and Washington (EPA 2008) state water quality standards.

> The data and information currently available to EPA appear to indicate that an increase on the order of 0.25°C for all sources cumulatively (at the point of maximum impact) above fully protective numeric criteria or natural background temperatures would not impair the designated uses, and therefore might be regarded as de minimis (EPA 2003. p.21)

DEC finds the proposed de mimimis allowance provides a margin for point and nonpoint sources that may be biologically insignificant or difficult to quantify. Adoption a de minimus value also provides for a certain degree of uncertainty that may occur during the assessment process and potential natural variations in temperature not previously captured in water quality assessments. Application of a de minimus value is also important in the context of waters naturally warmer than the biologic criteria as they provide for assimilative capacity where one would not normally be allowed.

2. Low flow exclusion.

DEC is proposing a low flow exclusion from the applicable criteria during those periods when stream flow is below the calculated 7Q10[6] low flow condition. This provision is intended to address unusual climatic episodes. DEC will implement the low flow exclusion through the 303(d) assessment process and APDES Compliance program.

Multiple states (e.g., South Carolina, Oregon) have previously adopted exclusionary language pertaining to 7Q10 flows as these values are used to calculate permit effluent calculations or wasteload or load allocations in Total Maximum Daily Loads.

The 7Q10 low flow is calculated by determining the lowest seven-day streamflow period during the year for each year, and determining the 10-year reoccurrence interval, which is the 10th percentile of the distribution over a long term record. The 7Q10 low flow can also be calculated for particular

[6] The 7Q10 represents the lowest seven-day average flow that occurs (on average) once every 10 years.

months or seasons. EPA's *Technical Support Document for Water Quality Based Toxics Control* (1991) recognizes and discusses the 7Q10 low flow as an appropriate design flow for developing both permit limits and wasteload allocations.

DEC will implement the low flow exclusion through the 303(d) assessment process and APDES Compliance program. To implement the proposed allowance, DEC may use modeling tools to quantify the allowable heat budget during the water quality assessment process. Heat source information may include point and nonpoint pollutant sources, watershed geomorphic properties, habitat characteristics, and similar forms of information.

3. Air temperature exclusion.

DEC is proposing to include an air temperature exclusion to address those periods in which a waterbody may be experiencing exceedances of the 7-DADMax due to daily maximum air temperatures that exceed the 90th percentile value of annual maximum seven-day average maximum air temperatures. Air temperature exclusions must be calculated using at least 10 years of air temperature data. In cases where air temperature data is not readily available from a monitoring station adjacent to a waterbody, such data may be acquired from the nearest recording station(s) within a reasonable distance from the waterbody provided such data is still considered to be representative of air conditions in the respective watershed. The exemption only applies for the days in which the 90^{th} percentile values of air temperature were exceeded.

DEC will implement the air temperature exclusion through the 303(d) assessment process and APDES Compliance program. Implementation language was referenced by EPA in the 2003 R10 Temperature Recommendations as *unsusally warm conditions* (pg 20).

> In order to have criteria that protect designated uses under the CWA, EPA expects that the criteria would need to apply nearly all the time. However, EPA believes it is reasonable for a State or Tribe to decide not to apply the numeric temperature criteria during unusually warm conditions for purposes of determining if a waterbody is attaining criteria (EPA pg 20).

18 AAC 70.020(c) Analysis of Water Quality

18 AAC 70.020(c) references the various analytical processes explicitly authorized in regulation or adopted by reference.

18 AAC 70.020(c)(1)

DEC is proposing to amend the regulation to reference the 2012 and 2017 editions of the Standard Methods for the Examination of Water and Waste Water. Under the CWA section 304(h), DEC water pollution control programs are required to use EPA-approved analytical methods listed in 40 CFR 136 and adopted in state regulations in 18 AAC 70.020(c). This action is consistent with previous amendments to (c)(1) and ensures consistency in the analytical methods used by CWA-approved water pollution control programs.

18 AAC 70.020(c)(3)

Section 304(h) of the CWA requires the Administrator of EPA to "…promulgate guidelines establishing test procedures for the analysis of pollutants that shall include the factors which must be

provided in any certification pursuant to [section 401 of the CWA] or permit application pursuant to [section 402 of the CWA]." Section 501(a) of the CWA authorizes the Administrator to "… prescribe such regulations as are necessary to carry out this function under [the CWA]." EPA generally has codified its test procedure regulations (including analysis and sampling requirements) for CWA programs at 40 CFR part 136 (EPA 2021).

DEC is proposing to amend 18 AAC 70.020(c)(3) to adopt by reference the most recent federal register publication date pertaining to *Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act*; Analysis and Sampling Procedures.

The final EPA rule[7] approves CWA methods published by (1) EPA, (2) voluntary consensus organizations (e.g., ASTM International and the Standard Methods Committee) and (3) certain commercial entities. The new rule provides additional guidance on quality assurance/quality control requirements and changes to sample collection, preservation, and holding times.

This action is consistent with previous amendments to (c)(3) and ensures consistency in the analytical methods used by CWA-approved water pollution control programs

18 AAC 70.040. Procedures for applying water quality criteria.

DEC is proposing to amend language at paragraph (3) and (3)(B), adopting two new paragraphs at 18 AAC 70.040(4) and 18 AAC 70.040(6) and relocating material previously located at paragraph [4] to (5).

18 AAC.040(3)

The purpose of adding amended language at (3) to remove "within the same use class" and adding the following language is to clarify that salinity will be used as the basis for determining whether fresh or marine water classes and their respective criteria will be applied:

> "For waters in which the salinity varies between greater than two and less than ten parts per thousand, the applicable criteria are the more stringent of the fresh water or marine water criteria."

This language is designed to complement the proposed definitions of "fresh water" and "marine water" at 18 AAC 70.990(80) and 18 AAC 70.990(81) Additional documentation is located at 18 AAC 70.990 (Fresh and Marine Water definition) of this document.

The purpose of amending the existing language at (3)(B) ensures consistency with the proposed amendments at 18 AAC 70.040(4) and 18 AAC 70.990(81).

18 AAC 70.040(4)

The purpose of the repealed and readopted language at 18 AAC 70.040(4) is to clarify DEC's preferences for collecting salinity data for the determiniation of application of fresh or marine water criteria. This language is designed to complement the new definitions of freshwater and marine water located at 18 AAC 70.900 and clarify interpretation of salinity stratification of the water

[7] EPA promulgated *Clean Water Act Methods Update Rule for the Analysis of Effluent* on May 3, 2021.

column. DEC requires measurement of salinity during mean higher high water periods to ensure that the maximum extent of daily or monthly values for salinity are considered.

The purpose of the new language at 18 AAC 70.040(4)(A) is to specify the preferred hydrologic conditions (i.e., instream flow conditions and mean higher high water (MHHW)) for conducting salinity measurements for the purpose of quantifying salinity values.

The purpose of the new language at 18 AAC 70.040(4)(B) is to specify the preferred tidal conditions for conducting salinity measurements for the purpose of quantifying salinity values.

18 AAC 70.040(5)

The proposed language was previously located at 18 AAC 70.040(4). No modifications to the existing regulatory language is proposed.

18 AAC 70.900

DEC is adopting four new definitions to ensure consistency and clarity in the application of state WQS.

(79) "7-DADMax or 7-day average of the daily maximum temperatures" means the arithmetic average of seven consecutive measurements of daily maximum temperatures. The 7-DADM for any individual day is calculated using a lagged seven-day average, which is calculable each day beyond day six of the applicable assessment period.

(80) fresh waters" means waters in which salinity is less than two parts per thousand based on the 95th percentile of the data set of salinity values; the applicable criteria are the fresh water criteria in 18 AAC 70.020(b)(1-12) except as noted at 18 AAC 70.040;

(81) "marine waters" means the salinity is equal to or greater than 10 parts per thousand based on the 95th percentile of the dataset of salinity values; the applicable criteria are the marine criteria in 18 AAC 70.020(b)(13-24).

(82) "mean higher high water" means the tidal datum plane of the average of the higher of the two high waters of each day, as would be established by the National Geodetic Survey, at any place subject to tidal influence.

7-DADMax definition

DEC is proposing adoption of "7-DADMax" or "7-day average of the daily maximum to support consistent application of the proposed language at 18 AAC 70.020(b)(10).

Fresh and Marine Waters definitions

DEC is proposing definitions for fresh water and marine water to provide clear numeric thresholds for determining which water quality criteria are applicable in water pollution control programs. DEC considered the following fresh and marine water definitions:

U.S. Geologic Survey Water Basics Glossary of Hydrologic Terms[8]
Fresh water - Less than 1,000 parts[9] per million (ppm)
Slightly saline water - From 1,000 ppm to 3,000 ppm
Moderately saline water - From 3,000 ppm to 10,000 ppm
Highly saline water - From 10,000 ppm to 35,000 ppm

EPA (2002) National Recommended Water Quality Criteria national guidance on the applicability of Freshwater and Saltwater criteria:

> EPA recommends that the aquatic life criteria in this compilation apply as follows:
> (1) For water in which the salinity is equal to or less than 1 part per thousand 95% or more of the time, the applicable criteria are the freshwater criteria.
>
> (2) For water in which the salinity is equal to or greater than 10 parts per thousand 95% or more of the time, the applicable criteria are the saltwater criteria in Column C; and
>
> (3) For water in which the salinity is between 1 and 10 parts per thousand the applicable criteria are the more stringent of the freshwater or saltwater criteria, as described in items (1) and (2) of this section. However, an alternative freshwater or saltwater criteria may be used if scientifically defensible information and data demonstrate that on a site-specific basis the biology of the water body is dominated by freshwater aquatic life and that freshwater criteria are more appropriate; or conversely, the biology of the water body is dominated by saltwater aquatic life and that saltwater criteria are more appropriate. (pg. 9)

DEC has determined inclusion of language pertaining to application of the 95th percentile of the dataset of salinity values provides adequate statistical confidence when making a salinity determination for regulatory purposes.

Mean Higher High Water definition

DEC is proposing to use the mean higher high water period for salinity measurement to ensure sampling for the purpose of developing a salinity data set occurs during the period of time salinity concentrations in state waters may be highest due to the influence of tidal conditions.

18 AAC 83.010(f)

DEC is amending 18 AAC 83.010(f) for consistency with 18 AAC 70.020(c)(1) and regulations specific to 18 AAC 83 as both reference federal regulations at 40 C.F.R. Part 136.

(f) The provisions of 40 C.F.R. Part 136 (Guidelines Establishing Test Procedures for the Analysis of Pollutants), **revised as of September 18, 2014**, are adopted by reference.

[8] Retrieved at https://water.usgs.gov/edu/dictionary.html on May 16, 2018
[9] USGS is referring to parts of dissolved salts, the most common being sodium chloride (NaCl). Retrieved at https://www.usgs.gov/special-topic/water-science-school/science/saline-water-and-salinity?qt-science_center_objects=0#qt-science_center_objects on August 11, 2021.

The existing language at (f) will be replaced with **July 1, 2021.**

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