Mukilteo Water and Wastewater District

Comment letter attached.

Mukilteo Water and Wastewater District
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March 8, 2021

Department of Ecology
Attention: Eleanor Ott, PSNGP Permit Writer
Water Quality Program
PO Box 47600
Olympia, WA 98504-7600

Re: Preliminary Draft Puget Sound Nutrient General Permit Comments

Dear Ms. Ott:

As General Manager for the Mukilteo Water and Wastewater District, following are comments on the Preliminary Draft Puget Sound Nutrient General Permit (PSNGP). Our district owns and operates the 2.6 million gallons per day (MGD) Big Gulch wastewater plant which currently discharges effluent with a Total Inorganic Nitrogen (TIN) concentration of around 3 mg/l.

Regulations of this significance need to be based on accurate data and modeling:

Ecology staff has refused to address substantial concerns with the science and modeling associated with the Salish Sea Model and continues to overstate the contribution of wastewater plants to nutrient loading in the Sound. Prior to and throughout the Advisory Committee process, numerous questions and inaccuracies were raised relating to the assumptions, boundary conditions and conclusions of the Salish Sea Model. Rather than address these concerns, Ecology Staff indicated they would be basing their nutrient permit on the Model's conclusions.

The PSNGP process of utilizing knowingly inaccurate data and modeling is not an isolated case and its rush to regulate nutrients is no different than their recent mislabeling segments of the Columbia River as not meeting dissolved oxygen standards. This inaccurate listing was based on data provided to Ecology by a volunteer monitoring program that took measurements only in shallow areas along the Columbia River shoreline nearly a decade ago. The volunteer monitoring program was not designed to evaluate the river as a whole and did not include the large expanse of deeper, more free-flowing zones. Little other data was available at the time which resulted in this limited, nearshore data being incorporated into the evaluation. Ultimately it created an inaccurate picture of water quality of the river. Although aware of the limitations, Ecology proceeded with listing segments of the Columbia River as not meeting water quality standards. Only after two years of scientifically-defensible data collected and funded by the Discovery Clean Water Alliance did the updated information conclusively establish that the Columbia River complies with Ecology's water quality standards. As appropriately noted by the Discovery Clean Water Alliance, "Relevant, accurate, and up-to-date water quality information is essential to making sound policy decisions and setting appropriate environmental standards".

Specific to Ecology's rush to regulate nutrients, included as Attachment A is an article written by Lincoln Loehr who accurately outlines the lack of science utilized with listing impaired waters and implementing a nutrient reduction program. As Mr. Loehr concludes,

> *"Because dissolved oxygen water quality criteria are important drivers for both listing impaired waters and determining the amount of nutrient reduction needed, such criteria must be based on a sound scientific rationale that leverages scientifically defensible methods.*
>
> *Washington's marine DO water quality criteria, adopted in 1967, have no scientific basis. While the state can identify waters as not meeting these criteria, that determination does not demonstrate that the waters are impaired, as the comparison is made with baseless criteria. Similarly, computer modeling to compare to a 0.2 mg/L decrease in DO from human causes (part of the state's criteria) is not a basis for demonstrating impairment as it has no biological basis".*

Given a pattern of utilizing inaccurate science and data to establish regulations, one questions the legality of Ecology's proposed Nutrient General Permit in its current form. To maximize our chances for cost-effective programs that actually address and resolve marine water quality issues, the expectations and standards for Puget Sound modeling should begin with accurate science and data.

Insignificant impact by smaller Publicly Owned Treatment Works (POTWs):

According to the Preliminary Draft, Ecology intends to treat the smallest POTWs much the same as the largest. This is unlikely to produce cost-effective results, as significant and expensive upgrades to facilities with very small flows will not have a noticeable benefit to Puget Sound. Of the 58 plants proposed to be covered by the General Permit, the 41 smallest plants (in terms of current flows) contribute a total of 5% of the total nutrients coming from the 58 facilities. The 33 smallest plants together contribute less than 1%. Throughout the Nutrient Advisory Committee meetings, recognition (even by the Environmental Caucus) of the insignificant impact small plants have on nutrient loading and a consensus of reducing nutrient related requirements was voiced. However, other than monitoring frequency, the smallest and largest plants are treated essentially the same, with identical optimization and Tier requirements.

An argument has been made that small plants can have a noticeable impact in certain embayments due to local conditions. However, throughout this process Ecology has generally ignored locational issues, arguing that all plants regardless of size or site meet the new standards. We believe that in this case "one rule fits all" is inappropriate, and that restrictions on small POTWs should only be imposed when warranted by local conditions.

Ecology also noted in the Preliminary Draft that water-quality based effluent limits (WQBELs) will be released during the initial general permit term, and that the WQBELs are likely to affect how facilities are regulated and to what standards they will be held. Given this time line and the minimal impact smaller plants contribute to the total nutrient loading, it makes more sense to only require Tier 1 optimization efforts and delay more extensive improvements until WQBEL's area established.

Ecology further states: "...nutrient loads cannot continue to increase in an uncontrolled manner while facilities work toward eventual reduction." Given that population growth at these smaller plants is

typically minor, that nutrient concentration levels are characteristically stable, and the insignificant percent of current nutrient loading, it is a gross overstatement to classify these plants as contributing to an increase in nutrient loading "in an uncontrolled manner." As previously mentioned, it makes more sense to require Tier 1 optimization efforts and delay more extensive Tier 2 and Tier 3 requirements until WQBELs are established – if then.

Why regulate POTWs that are currently achieving nutrient discharge concentrations of less than 10 mg/l:

Ecology has identified 14 POTWs that are currently achieving nutrient discharge of less than 10 mg/l. Most of these plants are achieving a discharge concentration level of less than 6 mg/l. Ecology's Preliminary Draft Report states, "...facilities currently discharging 10 mg/l or less do not need to complete actions beyond monitoring and annual optimization reporting during this permit cycle". Other than not being required to perform planning requirements described in Section VI of the Preliminary Draft Permit, there appears little benefit to these well-run, low nutrient discharging plants. With WQBELs scheduled to be established within the first permit cycle, it is difficult to understand or justify why these plants need to be regulated under the General Permit. Monitoring protocols for "compliant" plants should be based on the specific goals, and a requirement to spend time and resources evaluating optimization opportunities is wasteful.

Specific to Mukilteo Water and Wastewater's Big Gulch Wastewater Treatment Facility, we are currently discharging around 3 mg/l of TIN. There is no logical explanation as to why we need the frequency of monitoring or to spend the time and resources considering optimization options, or for our Ecology Permit Manager to review and approve this report. This is a waste of time and resources for both the District and Ecology, just as it is for the other 13 plants that are also discharging low concentration levels of nutrients (less than 10 mg/l of TIN). For these plants, overall regulations and requirements should await issuance of the WQBELs.

Sincerely,

Jim Voetberg, General Manager
Mukilteo Water and Wastewater District

Washington state's marine dissolved oxygen water quality criteria lack a sound scientific rationale and need to be updated

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Abstract

The process in the state of Washington for listing impaired waters and implementing its nutrient reduction program affects municipal treatment plants that discharge to marine waters. Permit requirements for nutrient reductions are driven by the state's marine dissolved oxygen (DO) water quality criteria. These criteria are greater than 50 years old, lack a sound scientific rationale and are not scientifically defensible. This article reviews the history of the state's DO criteria and the questionable scientific basis underpinning the criteria. After resisting petitions in 1998 and again in 2017 to revise its criteria, Washington's Department of Ecology (DOE) created a false history for marine DO criteria to assert a scientific basis. These actions indicate DOE is incapable of conducting a systematic review to develop scientifically sound marine DO criteria. EPA should step in and develop recommended marine DO criteria like they did for Chesapeake Bay and the Atlantic Coast.

Keywords: Criteria; Dissolved Oxygen; Nutrients; Washington

Washington's marine dissolved oxygen criteria

In the late 1990s, Washington State's Department of Ecology (DOE) was engaged in a process required by Section 303(d) of the Clean Water Act to identify water bodies that were considered impaired for not meeting the state's water quality criteria. The state was proposing to list a number of marine water bodies as impaired for failing to meet the current marine dissolved oxygen (DO) criteria. At that time, the state classified marine waters in one of four classifications:

Class AA. Extraordinary quality.

> Water quality of this class shall markedly and uniformly exceed the requirement for all uses including, but not limited to, salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

Class A. Excellent quality.

> Water quality of this class shall meet or exceed the requirements for all uses including, but not limited to, salmonid and other fish migration, rearing, and spawning; clam, oyster,

and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

Class B. Good quality.

Water quality of this use class shall meet or exceed the requirements for most uses including, but not limited to, salmonid migration and rearing; other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning.

Class B. Fair quality.

Water quality of this class shall meet or exceed the requirements for selected and essential uses including, but not limited to, salmonid and other fish migration.

There were specific temperature, dissolved oxygen, turbidity and pH criteria for each of the classes. The DO criteria for the classes included numeric values, as well as an allowance for a 0.2 mg/L decrease from human causes when the natural conditions were below the criteria. There was no description as to how the criteria were to be applied, no averaging or duration component, no seasonal criteria, no understanding as to how dissolved oxygen may vary over the water column. In essence, the criteria applied anywhere in the water column, but allowed that natural conditions could be lower. The numeric dissolved oxygen criteria were:

Class AA. Extraordinary quality. 7 mg/L
Class A. Excellent quality. 6 mg/L
Class B. Good quality. 5 mg/L
Class C. Fair quality. 4 mg/L

Note that the criteria asserted they were protective of a broad list of species, and the lists were identical for Classes AA, A, and B with one small exception. Classes AA and A asserted they were also protective of salmonid spawning, whereas Class B did not include salmonid spawning. Since salmonids do not spawn in marine water, the list of species protected is essentially the same for all three classes. Note that in 2019, DOE made a minor change to the rule, deleting salmonid spawning from the Extraordinary and Excellent quality classes.

Most of Washington's marine waters are assigned to Class AA - extraordinary quality but the assignments were not based on the waters actually meeting the associated DO criteria. (S*ee slide 7 in*

https://www.ezview.wa.gov/Portals/_1962/Documents/PSNSRP/BrysonFinch_Marine%20DO%20Criteria%20Presentation%202018.pdf)

In the early 2000s, DOE made a few changes.

- They clarified that DO concentrations are measured as a 1-day minimum in milligrams per liter.

- They stopped using the class-based system and instead implemented a use-based system. This was essentially a non-change for marine waters, since the uses were the same extraordinary, excellent, good and fair quality uses described above.
- They added a frequency provision, "Concentrations of D.O. are not to fall below the criteria in the table at a probability frequency of more than once every ten years on average."
- They added that "D.O. measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge."

The standards today are found in WAC 173-201A-210(1)(a) and (d).

Basis behind Washington's DO criteria.

On June 12, 1998, I wrote a brief letter to the state's water quality standards coordinator, asking DOE to define the basis of the DO standards both in marine and fresh water. I also asked when they were adopted. I noted that they do not coincide with historical or recent EPA criteria documents for DO. (In 1998, EPA did have national recommended DO criteria for fresh water, but not for marine water.) I also asked if there was anything in the history of the DO criteria that supported the need to apply them as instantaneous minima.

I received a response dated July 8, 1998 noting that DOE does not have supporting information on the technical basis for our existing criteria. The water quality standards coordinator noted that he personally went through all the files stored at Ecology and also in the state central archives with the intent to document the basis for our various water criteria. All he found in relation to dissolved oxygen was a comment letter sent by a pulp mill stating the need to allow some human degradation beyond natural levels in marine waters during periods of upwelling. He noted that the DO criteria go back to at least 1967 (which was before there was a Department of Ecology) and have never been expressed other than as an absolute threshold value, even though many other criteria have been and continue to include averaging periods.

Petition to develop new DO criteria.

Later in 1998, I petitioned DOE to implement rulemaking to update the DO criteria to be scientifically relevant. I noted that EPA had developed freshwater DO criteria recommendations in 1986 that were well described and were less stringent than those of the state. I also noted that EPA did not have any recommended criteria yet for marine water.

DOE denied the petition.

EPA developments in marine DO recommended criteria.

In 2000, EPA published national recommended criteria for marine DO for the Atlantic Coast from Cape Cod to Cape Hatteras. In this time frame, the states around Chesapeake Bay were

working to understand what was needed to reduce nutrient-induced eutrophication in the Bay. The states had DO standards of 5 mg/L as an average and 4 mg/L as a minimum.

The states realized that their DO standards would be unattainable. Because several different states shared these waters, EPA stepped in and developed DO criteria recommendations for Chesapeake Bay, and the states subsequently adopted the recommendations into their water quality standards.

The Chesapeake Bay criteria applied to five different types of water and uses.

- Migratory fish spawning and nursery use (generally in tidal inlets that were mostly freshwater
- Shallow-water bay grass use
- Open-water fish and shellfish use
- Deep-water seasonal fish and shellfish use, and
- Deep-channel seasonal refuge use

DO criteria in these waters varied with depth and varied with season. They also included 30-day mean values, 7-day mean values, and instantaneous minimum values. Deeper waters had lower criterion values than shallower waters.

EPA noted that their recommended criteria for Chesapeake Bay met the requirements of 40 CFR 131.11 and had also gone through Endangered Species Act Consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Agency. 40 CFR 131.11 requires that states must adopt criteria that are "based on sound scientific rationale", and that can be accomplished by adopting criteria based on federal established guidance, or modified from federal guidance to reflect site-specific conditions, "or other scientifically defensible methods."

Washington Department of Ecology's nutrient reduction program.

Beginning around 2010, DOE started to develop modeling capabilities to evaluate how human nutrient inputs might be impacting state inland marine waters, primarily using the Salish Sea Model (SSM) developed by the Pacific Northwest National Laboratory. These modeling efforts encompassed inland waters including Puget Sound (with numerous distinct basins and inlets), the Strait of Juan de Fuca, and parts of the Strait of Georgia (which is mostly in British Columbia), which are collectively known as the Salish Sea.

Modeling efforts have been focused on the 0.2 mg/L allowable difference from human causes, and DOE has concluded that nutrient inputs from all sources (e.g., upland nonpoint, riverine and point sources including municipal treatment plants) contribute to a reasonable potential to violate the state's criteria, thereby necessitating a reduction of permitted nutrient discharges. Modeling results also show that in some sensitive areas (generally ones with limited circulation), the nutrients contribute to decreases in DO greater than allowed by the water quality criteria.

DOE has formed several advisory committees with different, but inter-related functions:

- The Nutrient Forum. This was formed in 2017 as a large public advisory group for the project to discuss, learn, and provide input on how to reduce human sources of nutrients entering Puget Sound. This forum is open to all interested parties.
- The Marine Water Quality Implementation Strategy Interdisciplinary Team.
- The Nutrient General Permit Advisory Committee.

Second petition to Department of Ecology to revise the state's DO criteria.

I again petitioned DOE in 2017 to implement rulemaking to update their marine DO criteria and provide a sound scientific basis for their development. I noted how there was now EPA guidance that could provide an approach to follow. I included information about the criteria recommendations from EPA for the Atlantic coast and for Chesapeake Bay.

The petition was denied in 2018.

Department of Ecology's misrepresentation of past marine DO criteria
At the May 30, 2018 meeting of DOE's Nutrient Forum, DOE made a presentation about the state marine DO criteria. Two weeks before the meeting, DOE provided attendees with a report regarding the DO criteria (DOE May 2018. Washington State's Marine Dissolved Oxygen Criteria: Application to Nutrients. An Overview of the Purpose and Application of the Criteria in the Surface Water Quality Standards). This first Marine DO report included a section titled, "History and Rationale of Marine DO Numeric Criteria" which made the following claim.

> The DO marine water quality standards for Washington are based upon the 1968 "Water Quality Criteria Report of the National Technical Advisory Committee to the Secretary of the Interior."

There is nothing ambiguous about this statement. There is a brief explanation of how the 1968 Department of the Interior (DOI) recommendations supported the DO criteria which were adopted by the predecessor agency to the DOE (the Pollution Control Commission) in 1967. There is also a review of a 2008 article by Vaquer-Sunyer and Duarte titled "Thresholds of hypoxia for marine biodiversity" (in PNAS, October 7, 2008, Vol. 105, no. 40, 15452-15457) and a claim that the article supported Washngton's DO criteria.

At the May 30, 2018 meeting of the Nutrient Forum, DOE gave a presentation concerning the marine DO criteria and made the same assertions. At that meeting, I questioned the presenter as to whether he had actually found anything in writing in the state archives that stated our DO criteria were based on the DOI recommendations or if he just inferred it because they were close together in time. He answered that he inferred it.

Following the May 30, 2018 meeting I talked with DOE personnel and said they needed to correct their report, because it was dishonest to claim the state's DO criteria were based on the DOI 1968 report. DOE did revise the report (DOE August 2018. Washington State's Marine Dissolved Oxygen Criteria: Application to Nutrients. An Overview of the Purpose and Application of the Criteria in the Surface Water Quality Standards). This second Marine DO

report is available on Ecology's web site, but the first report is not. In this second Marine DO report, the claim shifted to the following.

> Washington State first adopted marine DO numeric criteria into rule in 1967 and they continue to be the applicable water quality standards. In order to provide background information on the development of the marine DO standards, Ecology staff searched through historical archival records in an attempt to find the origin of the current marine DO numeric criteria. Unfortunately, no definitive records were found that confirmed the origin of Washington's 1967 water quality standards for marine DO criteria.
>
> In the absence of a definitive historic record, Ecology staff searched for studies and reports available during that timeframe and found relevant information in a Department of Interior (DOE) 1968 "Water Quality Criteria Report of the National Technical Advisory Committee to the Secretary of the Interior." Based on the similarities in the report to the marine DO criteria adopted by Washington, Ecology believes that the marine DO water quality standards for Washington State are most likely based upon this federal report.

The DOI 1968 report has only a half-page discussion of marine DO. It has two criteria recommendations and a cautionary note.

- Surface dissolved oxygen concentrations in coastal waters shall not be less than 5.0 mg/l, except when natural phenomena cause this value to be depressed.
- Dissolved oxygen concentrations in estuaries and tidal tributaries shall not be less than 4.0 mg/l at any time or place except in dystrophic waters or where natural conditions cause this value to be depressed.
- The committee would like to stress the fact that, due to a lack of fundamental information on the DO requirements of marine and estuarine organisms, these requirements are tentative and should be changed when additional data indicate that they are inadequate.

The DOI 1968 report's recommendations of 5 and 4 mg/l do not resemble the marine DO criteria of 7, 6, 5 and 4 mg/l adopted by Washington in 1967. Note also that the DOI 1968 report had freshwater DO criteria recommendations of 7 mg/l for cold water fish spawning, 6 mg/l for cold water fish, and 5 mg/l for warm water fish, while the freshwater criteria adopted by Washington in 1967 were 9.5 mg/l for Class AA Extraordinary, 8.0 mg/l for Class A Excellent, and 6.5 mg/l for Class B Good. Again, no resemblance.

Washington's marine criteria claim they are protective of salmonid and other fish migration, rearing, and spawning; clam, oyster, and mussel rearing and spawning; crustaceans and other shellfish (crabs, shrimp, crayfish, scallops, etc.) rearing and spawning. Conversely, the DOI 1968 report's DO criteria are very clear that they lack fundamental information on the DO requirements of marine and estuarine organisms. The DOI 1968 report's DO criteria do not provide DOE with a basis for claiming the protections described in the water quality standards for extraordinary, excellent and good marine waters. The 1968 DOI report's DO criteria also encourage updating them. The authors of the 1968 DOI report's DO criteria would probably be dumbfounded that by 2020, a state had not revised their standards to reflect more current studies.

At the May 30, 2018 Nutrient Forum meeting DOE noted that the 0.2 mg/L decrease allowance from human causes is not biologically based. While DOE asserts that this amount was based on the minimum difference that could be measured, there is nothing in the archive records that supports that. The archives showed that a pulp and paper mill requested that there be some allowance for human caused decreases, and indeed, the agency responded with such an allowance. Ultimately, the entire nutrient reduction project, with its modeling and various public participation activities, is all driven by the 0.2 mg/L assessment, which has no biological basis.

DOE's presentation slides presented to the May 30, 2018 Nutrient Forum are available at https://www.ezview.wa.gov/Portals/_1962/Documents/PSNSRP/BrysonFinch_Marine%20DO%20Criteria%20Presentation%202018.pdf. The twelfth slide in that presentation described the Vaquer-Sunyer and Duarte (2008) paper as supporting Washington's criteria. It included a graph that appeared to show effects for different species at different concentrations, and in the context of the slide and presentation the viewers would assume it was related to DO and the Vaquer-Sunyer and Duarte data. However, the fine details in the slide could not be examined by the audience during the presentation, and the slide was not in the first (or second) Marine DO report. The power point presentation is available from the web.

A closer investigation of this slide shows that it presents data for 10 different species (an east coast clam, a New Zealand mussel, a Taiwanese abalone, several Asian shrimp, rotifers and brine shrimp). The Y-axis is the percent of species and the X-axis is the concentration. The X-axis is presented on a log scale and in units of micrograms/L, whereas DO data are more commonly presented in milligrams/L. The figure does not identify what the data represented. The data for most individual species spanned two orders of magnitude. Boxes at either end of the graph identified "most sensitive species" and "least sensitive species." The locations of these boxes made sense if the data were dealing with toxic substances, where the most sensitive would be impacted at the lowest concentrations, but for DO the labels would need to be reversed.

The figure is troubling as none of the information on it made sense for DO. One member of the Marine Water Quality Implementation Strategy Interdisciplinary Team, in an effort to understand what the data were supposed to be, went through the Vaquer-Sunyer and Duarte report, and could not find any information reported in it for the 10 species shown. He was able to open the graph as imported into the original slide. The graph was for ammonia toxicity and presented LC50s. DOE had imported the figure to the slide deck and then deleted the ammonia LC50 label.

The second Marine DO report discusses federal Clean Water Act requirements for water quality standards. It specifically mentions 40 CFR 131.11 (which calls for there being a scientifically defensible basis for criteria). It says that the marine water quality standards were developed under this federal regulatory framework. It is an odd claim. The marine DO criteria were adopted in 1967 before there was a Clean Water Act, before there was an EPA, and before the 40 CFR 131 regulations were promulgated. The marine DO criteria were not and could not have been developed under a regulatory framework that did not exist at the time.

The second Marine DO report discusses aquatic life designated uses, and asserts that

> To determine DO limits for designated uses, Ecology used scientific literature to set limits that provide protection for salmonid and other fish migration, rearing, and spawning as well as rearing and spawning for clams, oysters, and mussels, crustaceans, and other shellfish (crabs, shrimp, crayfish, scallops, etc.). Where appropriate, Ecology used minimum DO requirements of individual life stages of aquatic species to create synthesis recommendations that protects all life stages including the most sensitive species (e.g. salmonids, clam, oyster, mussel, crustaceans, crabs, shrimp, crayfish, scallops, etc.).

The above statement is false. The marine DO discussion in the DOI 1968 report shows that there was no such scientific literature available in 1967 when the criteria were adopted.

On numerous occasions I have pushed DOE to defend their marine DO criteria to any of the committees they have set up. Rather than addressing my concerns, they simply refer to the web site for the second Marine DO report. Challenged on the marine DO criteria, DOE has resorted to a world of alternative facts.

Conclusion

Because dissolved oxygen water quality criteria are important drivers for both listing impaired waters and determining the amount of nutrient reduction needed, such criteria must be based on a sound scientific rationale that leverages scientifically defensible methods.
Washington's marine DO water quality criteria, adopted in 1967, have no scientific basis. While the state can identify waters as not meeting these criteria, that determination does not demonstrate that the waters are impaired, as the comparison is made with baseless criteria. Similarly, computer modeling to compare to a 0.2 mg/L decrease in DO from human causes (part of the state's criteria) is not a basis for demonstrating impairment as it has no biological basis. Neil deGrasse Tyson describes the scientific method as follows.

> *"Do whatever it takes not to fool yourself into thinking that something is true that is not, or that something is not true that is."*

That is pretty good advice.

Washington should not misrepresent history to support or defend its criteria. This is not a substitute for a legitimate peer-reviewed rulemaking process to develop timely and scientifically sound criteria.

Based on the actions of the state agency described here, I believe the Washington Department of Ecology is incapable of the type of review, studies and analyses needed to develop scientifically sound marine DO criteria. Therefore, EPA should step in and develop recommended marine DO criteria much as they did with Chesapeake Bay and the Atlantic Coast. Such criteria for Washington should be developed in accordance with 40 CFR 131.11 and must also satisfy Endangered Species Act consultations.

About the Author

Lincoln Loehr is an oceanographer with research experience in the 1970s and 80s concerning the physical and chemical properties in Puget Sound. Beginning in 1987 he shifted to working with industries and municipalities on issues pertaining to water quality standards, mixing zones, impaired waters determinations, and wastewater discharge permitting in Washington, Alaska and with the cruise ship industry. He is mostly retired now, but still provides consulting assistance to the City of Everett, Washington, as he has for more than 30 years now.