Alkylphenols & Ethoxylates Research Council

Attached are comments of the Alkylphenols & Ethoxylates Research Council regarding the proposed rule for Aquatic Life Toxics Criteria, Chapter 173-201A WAC.

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Comments on Proposed Revisions to
Washington State Aquatic Life Toxics Criteria, Chapter 173-201A WAC
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The Alkylphenols & Ethoxylates Research Council (APERC) appreciates this opportunity to provide comments on the proposed revisions to Chapter 173-201A, Aquatic Life Toxics Criteria (ALTC) for the State of Washington.[1]

APERC is a North American research-based trade association representing manufacturers and processors of alkylphenols, including nonylphenol (NP), and their derivatives. For more than thirty years, APERC and its member companies have been actively engaged in the conduct and review of the toxicity, ecotoxicity, environmental fate, occurrence and risk assessment of NP.[2] As such, APERC has a specific interest the proposed ALTCs for NP.

Ecology provides the background, approach and technical analysis used to develop the proposed ALTCs in this proposed rule in a Technical Support Document.[3] Ecology notes that under the Clean Water Act (CWA) regulations, any revisions to a state's surface Water Quality Standards (WQS) must be approved by EPA and may be subject to review of potential impacts to endangered species under the Endangered Species Act (ESA). Therefore, Ecology's general approach included a review of any EPA recommended Water Quality Criteria (WQC) as well as any consultations under the ESA for the contaminants of interest. If the EPA's recommended WQC for a contaminant were not deemed as "approvable" through previous ESA consultations in Region 10 states, Ecology evaluated "new scientific data, alternative methods to calculate criteria and new modeling tools as remedies to provide full protection to endangered species and their populations."[4]

Ecology is proposing to add ALTCs for NP in this proposed rule by adopting EPA WQC for NP, which were finalized in 2005.[5, 6] In the Technical Support Document, Ecology correctly notes that there are no completed ESA Biological Opinions (BiOps) conducted for NP under the ESA

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[1] Washington State Department of Ecology (Ecology). (02.15.2024). Proposed Rule Making: Amendments to Chapter173-201A, Water Quality Standards for Surface Water. CR-102 (July 2022), (Implements RCW 34.05.320)
[2] Alkylphenols & Ethoxylates Research Council
[3] Washington State Department of Ecology. (2024, February). Technical Support Document: Proposed Updates to Aquatic Life Toxics Criteria, WAC 173-201A-240. Publication 24-10-007
[4] Ecology. (02.15.2024)
[5] WA Ecology. (2024, February)
[6] US Environmental Protection Agency (US EPA). (2005). Aquatic life ambient water quality criteria - nonylphenol. Report 822-R-05-005. US Environmental Protection Agency, Washington, DC, USA.

in other Region 10 states.[7] Ecology's April 4th public hearing slides further note "no known ESA concerns in other PNW states" for NP.[8] However, the Technical Support Document references, but does not rely on, a 2022 EPA Biological Evaluation (BE) of WQS submitted by the Swinomish Tribe, which did include NP.[9] The EPA BE of the Swinomish Tribe WQC has never undergone formal ESA consultation with National Marine Fisheries Service (NMFS) and US Fish and Wildlife (USFW); therefore, Ecology correctly views it as incomplete.[10] In this rulemaking, Ecology is proposing to use new science or increased protection levels relative to EPA WQC only for contaminants that were included in ESA consultations for WQS submitted by Idaho or Oregon.

APERC supports Ecology's decision to not rely on the 2022 EPA BE of the Swinomish WQS for the identification of ESA concerns. This is appropriate as it is a preliminary document that has not undergone full review under the ESA. In addition, as discussed below, APERC has identified issues in the 2022 EPA BE for the Swinomish WQS that raise technical concerns about its endangered species conclusions related to NP. Therefore, it is premature to draw any conclusions regarding potential concerns for NP in endangered species. APERC agrees with Ecology's assessment that there are "no known ESA concerns in other PNW states" for NP.[11]

APERC does not support Ecology's proposal to use updated science or increased protection levels *only* for compounds that have undergone full ESA review and have final BiOPs in Idaho and Oregon. APERC supports the use of the more recent and broader dataset for NP, which was identified and qualified by Ecology to calculate criteria for this substance. While these data are not provided in the Technical Support Document, Ecology acknowledges that they result in the calculation of higher criteria values.[12] Nevertheless, the Technical Support Document proposes to adopt the lower EPA's 2005 WQC recommendations for NP in an effort to be more protective of endangered species.[13]

As discussed below, APERC supports the adoption of the NP ALTCs listed in Table 1 below. These criteria were calculated based on an updated and broader data set, including data available from the 2005 EPA WQC as well as more recent studies identified by Ecology as meeting data quality standards in accordance with EPA guidance. In addition, there is no basis to assume that criteria calculated for NP using an updated dataset, which includes a greater number of genera and species, are less protective than EPA's WQC to endangered species in Washington State.[14]

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[7] WA Ecology. (2024, February).
[8] Washington Department of Ecology (WA Ecology). (2024, April 4). Aquatic Life Toxics Criteria Public Workshop and Hearing Presentation
[9] US Environmental Protection Agency (US EPA). (2022, June 22). Biological Evaluation of EPA's Proposed Approval Action on the Swinomish Tribe's Water Quality Standard.
[10] Finch, B. (04.10.2024). WA Ecology Correspondence with Alkylphenols & Ethoxylates Research Council.
[11] Washington Department of Ecology (WA Ecology). (2024, April 4). Aquatic Life Toxics Criteria Public Workshop and Hearing Presentation
[12] WA Ecology. (2024, February).
[13] WA Ecology. (2024, February)
[14] WA Ecology. (2024, February).

1.0 APERC supports adoption of NP ALTCs based on the broad data set available from the 2005 EPA WQC and including additional data available since 2005, which have been identified and evaluated for data quality by the Department of Ecology.

Ecology reports that it examined new science available for NP since EPA finalized the NP WQC in 2005 and that these new data resulted in a higher ALTC values; however, these updated calculations and values are not provided in the Technical Support Document.

Ecology provided APERC with its updated dataset for NP allowing calculation of updated criteria as described in Attachment I to these comments.[15] The updated criteria are compared to EPA's 2005 WQC for NP in Attachment I, Table A3 as well as below in Table 1.

Table 1: Surface Water Criteria for NP based on USEPA (2005) dataset and Updated dataset (2024) [a, b]

	Freshwater		Marine	
Criteria	US EPA (2005)	Updated (2024)	US EPA (2005)	Updated (2024)
FAV	56	65	14	17
CMC	28	32	7.0	8.6
CCC	6.6	8.3	1.7	2.2

[a.] All concentrations are in µg/L.
[b.] All calculations are in accordance with EPA Guidance for Deriving National WQC (1985)[16]
FAV is Final Acute Value
CMC is Criterion Maximum Concentration (FAV divided by 2)
CCC is Criterion Continuous Concentration

The additional studies and species provided in the updated dataset allow a more comprehensive view of the range of species sensitivities and as such, provide more confidence in the calculated values, both in terms of their accuracy and protectiveness. The impact of NP on endangered species has not been reliably assessed, and development of aquatic criteria that are based on an updated, high quality data set representing a broader range of species and genera is scientifically justified.

2.0 US EPA's 2022 Biological Evaluation (BE) of the Swinomish Tribe's WQS is pending review under the ESA and its assessment of NP raises some issues and technical concerns about its endangered species conclusions related to NP.

[15] Finch, Bryson. (10.19.2023). WA Ecology correspondence with Alkylphenols & Ethoxylates Research Council regarding Proposed Aquatic Life Toxicity Criteria for Nonylphenol
[16] Stephen,C.E. et al., (1985). US EPA Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. PB85-227049

The purpose of the Endangered Species Act (ESA) is to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide a program for the conservation of such species. The ESA directs all federal agencies to participate in conserving these species. Specifically, section 7(a)(1) of the ESA charges federal agencies to aid in the conservation of listed species, and section 7(a)(2) requires the agencies to ensure their activities are not likely to jeopardize the continued existence of federally listed species or destroy or adversely modify designated critical habitat.

Pursuant to section 7 of the ESA, EPA submitted a BE of the Swinomish Tribe WQS to the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) on June 23, 2022.[17] Recent correspondence from the US Fish and Wildlife Service to US EPA (February 22,2024) confirms receipt of the request for an ESA consultation; however, it also notes that USFWS staffing constraints and competing workload priorities restrict the Service's ability to complete the consultation in a timely manner.[18] To APERC's knowledge NMFS has not yet responded to the request for consultation. Therefore, EPA 2022 BE of the Swinomish Tribe WQS cannot be considered as complete under the ESA.

In addition, based on APERC's review, the 2022 EPA BE includes errors and raises technical concerns about its endangered species conclusions related to NP. As discussed in more detail below, the most important problems with the EPA BE report related to NP relate to concerns about the approach to systematic review and study review. Of note is the fact that some of the data used in this assessment cannot be tracked back or does not agree with the cited source report, leading to incorrect conclusions regarding the protectiveness of the US EPA 2005 criteria for NP for endangered species.

> 2.1 The acute Prey Category Lowest Toxicity Value (PCTLV) and Prey Category Mean Acute Value (PCMAV) for NP indirect (prey) effects for salmonids in the EPA 2022 BE for the Swinomish Tribe WQS appear to be based on an erroneous LC50, which is not consistent with data in the cited source study; the correct data would result in a "no impact likely" to endangered species conclusion.

For indirect acute effects, toxicity data related to the prey species for salmonids is considered in the BE, since fish constitute a major portion of the endangered species' diet. The only NP acute toxicity study that was used in the EPA 2022 BE for the evaluation on prey was for bluegill (*Lepomis macrochirus)* from a study by Brooke, 1993.[19] Table 2 lists the PCMAV, PCTLV and range for acute values for the Brooke, 1993 study, as reported in the 2022 EPA BE document along with APERC's calculated values based on the reported acute LC50 value for this species in Brook, 1993.

[17] US EPA Region 10. (2022, June 22). Biological Evaluation of EPA's Proposed Approval Action on the Swinomish Tribe's Water Quality Standards.
[18] US Fish and Wildlife Service (USFWS). (2024, February 22). Response to US EPA Request for Consultation of Swinomish Tribe's Water Quality Standards Aquatic Life Criteria under the Endangered Species Act
[19]Brooke, L. (1993). Accumulation and lethality for two freshwater fishes (fathead minnow and bluegill) to nonylphenol. Report to the US EPA for Work Assignment No. 1-12 of Contract No. 68-C1-0034

Table 2: Acute Indirect (Prey) Values for NP							
	Cited Source	Species	Lowest LC50	PCMAV	Range	PCLTV	Conclusion
EPA, 2022	Brooke, 1993	Bluegill *(Lepomis macrochirus)*	31 Not located in source study	13.7	13.5-13.8	13.5	Impact Likely
APERC, 2024	Brooke, 1993	Bluegill *(Lepomis macrochirus*	135	-	-	59	Impact Not Likely
Concentrations are in ug/L PCMAV Prey Category Mean Acute Values PCLTV Prey Category Lowest Toxicity Value = LC50/2.27							

Based on the understanding that PCLTV is calculated by dividing the lowest LC50 by 2.27, it would appear that the PCLTV listed for bluegill in the 2022 EPA BE document (13.5 µg/L) is based on an LC50 of approximately 31 µg/L. APERC could not locate an LC50 (~ 31µg/L) in the source study report by Brooke,1993.[20] The actual lowest acute value from this study for NP in bluegill was a 96-h LC50, which was reported as **135 ug/L.** If a PCLTV for this study is calculated based on this value, the result is 135 / 2.27 = **59 ug/L.** Since there was only one LC50 reported for bluegill in Brooke, 1993 there is no reportable range and no PCMAV available for this species from this study.[21] As such, the 2022 EPA BE document reports PCMAV and PCLTV values that appear to be based on an erroneous LC50 value that was not reported in the source study. This is a significant error because it drives a “likely impact” conclusion for prey species relative to the proposed Swinomish acute freshwater criterion for NP (28 µg/L). Use of the correct data in Brooke, 1993 would result in a PCLTV of 59 µg/L, which is greater than the proposed acute freshwater criteria of 28 µg/L and would indicate a “no impact likely” conclusion for acute indirect effects of NP on prey.

> 2.2 The 2022 EPA BE evaluation of chronic indirect (prey) effects for NP in *Gammarus fossarum* is based on a study by Geffard, 2010, which has a questionable dose response and is based on an endpoint that was reported as *not* having effects; this raises questions about the systematic review process and quality checks employed in the BE, as well as its conclusions regarding likely impacts to endangered species.

In the 2022 EPA BE assessment of the proposed Swinomish Tribe WQS for chronic effects of NP, fish, insects, and crustaceans were considered as prey categories. The PCMAV and PCLTV values for these categories as listed in the 2022 EPA BE document are provided in Table 3.

[20] Brooke, L. (1993)
[21] Brooke, L. (1993)

Table 3: Chronic Indirect Values for NP (EPA, 2022 BE of Swinomish Tribe Proposed WQS)

Species	Reference	PCMAV	Range	PCLTV	Conclusion
Chironomus tentans	England and Bussard, 1993[22]	21	21	21	No likely Impact
Pimephales promelas	Ward and Boeri, 1991b[23]	37.2	7.40-77.5	7.40	No likely Impact
Gammarus fossarum	Geffard et al, 2010[24]	3.0	5.0	5.0	Likely Impact
All concentrations in units of ug/L.					

Since the PCLTVs for chironomids (*Chironomus tentans*) and fathead minnows (*Pimephales promelas*) were greater than the proposed Swinomish criterion, which adopted the 2005 EPA chronic freshwater WQC for NP (6.6 µg/L), the 2022 EPA BE concluded the WQC would be protective of these prey species.

The only chronic study identified in the 2022 EPA BE document with a PCLTV for NP that was less than the EPA chronic freshwater WQC was by Geffard et al, 2010 for the species *Gammarus fossarum*. The BE document lists a PCLTV of 5.0 µg/L, based on reduced gamete production; however, review of Geffard, 2010 finds that gamete production was not affected by NP. The only endpoint that was adversely affected by NP in this study was an increase in abnormalities in the C2 molt stage. In this study *only* two exposure levels were included (0.05 µg/L and 5.0 µg/L). Also, effects on this endpoint at other molting stages were not mentioned and differences between solvent and clean controls were not provided.

One of the stated goals of this study was to establish testing protocols for a reproduction test with *G. fossarum* rather than to determine effect levels for WQS purposes. The dosing metric of a 100 (0.05 µg/L and 5.0 µg/L) in this study does not follow OECD/USEPA recommendations for other tests with similar species where differences between doses should be less than 5-fold. Therefore, it is difficult to use these data as no real dose response curve was noted due to the 100-fold dosing difference between the two treatment levels. It is not known if the observed effect occurred at other stages of molting. It is possible that this was a transitory effect and it is reasonable to assume that the effect was not observed at other stages or it would have been mentioned. This study could be classified as a method development study as the authors were working out the methodology; therefore, reliance on this study for PCMAV or PCLTV for the assessment endangered species is not advised.

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[22] England, D and Bussard, J. (1993). Toxicity of nonylphenol to the midge *Chironomus tentans*. Analytical Bio-Chemistry Laboratories, Inc. Report(40597).
[23] Ward,T. and Boeri,R. (1991b) Early life stage toxicity of nonylphenol to the fathead minnow (*Pimephales promelas*). Report prepared for Chemical Manufacturers Association by Resource Analysts
[24] Geffard, O., *et al.* (2010). Ovarian cycle and embryonic development in *Gammarus fossarum*: application for reproductive toxicity assessment. Environmental Toxicology and Chemistry, 29(10), 2249-2259

Overall, these issues with systemic review, errors with endpoint identification and reliance on erroneous LC50 values that cannot be traced to source studies raise questions about the reliability of the conclusions of EPA 2022 BE regarding NP. Therefore, as discussed in section 1.0 and Appendix I of these comments, APERC supports adoption of NP ALTCs based on the broader data set which has been identified and evaluated for data quality by the Department of Ecology.

Attachment I
Calculation of Updated Aquatic Life Toxics Criteria for Nonylphenol

The procedures and methods used by the State of Washington (WA) Department of Ecology to derive Aquatic Life Toxics criteria (ALTCs) for nonylphenol are consistent with guidance followed by the USEPA to establish Tier I ambient surface water quality criteria to protect aquatic organisms.[25, 26] In both approaches, the information used to establish these criteria is based on aquatic toxicity data taken from acute and chronic studies. Both approaches use apical toxicological endpoints that are related to ecologically relevant metrics including survival, growth, reproduction, and development that can be linked to adverse impacts to aquatic populations. Ecology provided the results of their literature search to identify new studies available since the EPA WQC for NP were finalized in 2005. Ecology identified 10 additional acute toxicity studies that included 26 species. When the new toxicity data from the WA search is combined with the data used to derive the USEPA 2005 criteria Genus Mean Acute Values (GMVAs) can be calculated for each freshwater (Table 1) and marine (Table 2) species.
Based on the data provided in Tables 1 and 2, and using WA guidance, freshwater and marine ALTCs were calculated for nonylphenol. While the freshwater and marine Final Acute Values (FAVs) are representative of the updated acute toxicity data, the acute to chronic ratio was taken from the 2005 USEPA criterion documentation (ACR= 8.4123) no additional chronic studies were added by the updated WA toxicity dataset. Criterion maximum concentration (CMC) and Criterion continuous concentration (CCC) were calculated and are presented in Table 3. The new ATLCs for nonylphenol incorporate toxicity data from a greater number of species than that used in the 2005 USEPA criteria providing additional information on the overall sensitivity of aquatic organisms to nonylphenol. As such, the State of Washington should update the nonylphenol criteria to values are more reflective of our current knowledge of this chemical.

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[25] Washington State Department of Ecology. (2024, February). Technical Support Document: Proposed Updates to Aquatic Life Toxics Criteria, WAC 173-201A-240. Publication 24-10-007
[26] Stephen. et al., (1985). US EPA Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses. PB85-227049

Table A1: Freshwater acute toxicity data for aquatic organisms (LC50 ug/L)

Organism	**Genus**	**GMAV**	**Rank**	**P**
Mollusca	Ligumia	1040	31	0.9688
Mollusca	Physella	774	30	0.9375
Mollusca	Utterbackia	770	29	0.9063
Mollusca	Lampsilis	764	28	0.8750
Chordata	Rhinella	100	27	0.8438
Arthropoda	Ophiogomphus	596	26	0.8125
Mollusca	Leptodea	570	25	0.7813
Mollusca	Megalonaias	560	24	0.7500
Rotifera	Plationus	500	23	0.7188
Annelida	Lumbriculus	342	22	0.6875
Chordata	Lithobates	332	21	0.6563
Chordata	Gila	289	20	0.6250
Chordata	Notropis	215	19	0.5938
Chordata	Ptychocheilus	255	18	0.5625
Rotifera	Brachionus	250	17	0.5313
Chordata	Poeciliopsis	230	16	0.5000
Chordata	Pimephales	226	15	0.4688
Chordata	Lepomis	209	14	0.4375
Chordata	Oncorhynchus	178	13	0.4063
Chordata	Xyrauchen	174	12	0.3750
Euathropoda	Chironomus	160	11	0.3438
Chordata	Etheostoma	145	10	0.3125
Arthropoda	Daphnia	137	9	0.2813
Chordata	Bufo	120	8	0.2500
Mollusca	Physa	120	7	0.2188
Arthropoda	Moina	104	6	0.1875
Chordata	Cyprinella	98	5	0.1563
Cnidaria	Hydra	98	4	0.1250
Chordata	Acipenser	81	3	0.0938
Arthropoda	Ceriodaphnia	71.3	2	0.0625
Arthropoda	Hyalella	56	1	0.0313

Rank is the numerical value of a GMAV based on sorting the data from greatest to least GMAV
P is the cumulative probability of the GMAV based on it rank.

Table A2. Marine acute toxicity data for aquatic organisms (LC50 µg/L)

Phylum	Genus	GMAV	Rank	P
Chordata	Cyprinodon	209.8	11	0.9167
Arthropoda	Dyspanopeus	195	10	0.8333
Arthropoda	Acartia	190	9	0.7500
Amphipod	Eohaustorius	138	8	0.6667
Euathropoda	Homarus	71	7	0.5833
Chordata	Menidia	70	6	0.5000
Arthropoda	Leptocheirus	61.6	5	0.4167
Arthropoda	Paleomonetes	59.4	4	0.3333
Arthropoda	Americamysis	51.1	3	0.2500
Mollusca	Mulinia	37.9	2	0.1667
Chordata	Pleuronectes	17	1	0.0833

Rank is the numerical value of a GMAV based on sorting the data from greatest to least GMAV
P is the cumulative probability of the GMAV based on it rank.

Table A3. Ambient surface water quality criteria for nonylphenol (µg/L)

	Calculated with Data from USEPA (2005) and Updated WA Ecology Data 2024		Calculated by USEPA 2005	
	Freshwater	Marine	Freshwater	Marine
FAV	65	17	56	13.9
CMC	32	8.6	28	7.0
CCC	8.3	2.2	6.6	1.7

FAV is Final acute value,
CMC is Criterion maximum concentration (FAV divided by 2)
CCC is Criterion continuous concentration