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# PERMANENT ADMINISTRATIVE ORDER

**FILED**
10/03/2024 10:25 AM
ARCHIVES DIVISION
SECRETARY OF STATE
& LEGISLATIVE COUNSEL

## DEQ 16-2024
CHAPTER 340
DEPARTMENT OF ENVIRONMENTAL QUALITY

FILING CAPTION: Aquatic Life Toxics Criteria Rulemaking 2024

EFFECTIVE DATE: 10/03/2024

AGENCY APPROVED DATE: 09/27/2024

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RULES:
340-041-0033, 340-041-8033

AMEND: 340-041-0033

RULE TITLE: Toxic Substances

NOTICE FILED DATE: 03/14/2024

RULE SUMMARY: Amending language and references to reflect changes to the tables in 340-041-8033.

RULE TEXT:
(1) Toxic Substances Narrative. Toxic substances may not be introduced above natural background levels in waters of the state in amounts, concentrations, or combinations that may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bioaccumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare or aquatic life, wildlife or other designated beneficial uses.
(2) Aquatic Life Numeric Criteria. Levels of toxic substances in waters of the state may not exceed the applicable aquatic life criteria as defined in Table 30 under OAR 340-041-8033.
(3) Human Health Numeric Criteria. The criteria for waters of the state listed in Table 40 under OAR 340-041-8033 are established to protect Oregonians from potential adverse health effects associated with long-term exposure to toxic substances associated with consumption of fish, shellfish and water.
(4) To establish permit or other regulatory limits for toxic substances without criteria in Table 30 under OAR 340-041-8033 or Table 40 under 340-041-8033, DEQ may use public health advisories and published scientific literature. DEQ may also require or conduct bio-assessment studies to monitor the toxicity to aquatic life of complex effluents, other suspected discharges or chemical substances without numeric criteria.
(5) Establishing Site-Specific Background Pollutant Criteria: This provision is a performance- based water quality standard that results in site-specific human health water quality criteria under the conditions and procedures specified in this rule section. It addresses existing permitted discharges of a pollutant removed from the same body of water. For waterbodies where a discharge does not increase the pollutant's mass and does not increase the pollutant concentration by more than 3 percent, and where the water body meets a pollutant concentration associated with a risk level of 1 x 10-4, DEQ concludes that the pollutant concentration continues to protect human health.

(a) Definitions: As used in this section:
(A) “Background pollutant concentration” means the ambient water body concentration immediately upstream of the discharge, regardless of whether those pollutants are natural or result from upstream human activity.
(B) An “intake pollutant” is the amount of a pollutant present in waters of the state (including groundwater) as provided in subsection (C), below, at the time it is withdrawn from such waters by the discharger or other facility supplying the discharger with intake water.
(C) “Same body of water”: An intake pollutant is considered to be from the “same body of water” as the discharge if DEQ finds that the intake pollutant would have reached the vicinity of the outfall point in the receiving water within a reasonable period had the permittee not removed it. To make this finding, DEQ requires information showing that:
(i) The background concentration of the pollutant in the receiving water (excluding any amount of the pollutant in the facility's discharge) is similar to that in the intake water; and,
(ii) There is a direct hydrological connection between the intake and discharge points.
(I) DEQ may also consider other site-specific factors relevant to the transport and fate of the pollutant to make the finding in a particular case that a pollutant would or would not have reached the vicinity of the outfall point in the receiving water within a reasonable period had the permittee not removed it.
(II) An intake pollutant from groundwater may be considered to be from the “same body of water” if DEQ determines that the pollutant would have reached the vicinity of the outfall point in the receiving water within a reasonable period had the permittee not removed it. A pollutant is not from the same body of water if the groundwater contains the pollutant partially or entirely due to past or present human activity, such as industrial, commercial, or municipal operations, disposal actions, or treatment processes.
(iii) Water quality characteristics (e.g., temperature, pH, hardness) are similar in the intake and receiving waters.
(b) Applicability
(A) DEQ may establish site-specific criteria under this rule section only for carcinogenic pollutants.
(B) Site-specific criteria established under this rule section apply in the vicinity of the discharge for purposes of establishing permit limits for the specified permittee.
(C) The underlying waterbody criteria continue to apply for all other Clean Water Act programs.
(D) The site-specific background pollutant criterion will be effective when DEQ issues the permit for the specified permittee.
(E) DEQ will reevaluate any site-specific criteria developed under this procedure upon permit renewal.
(c) DEQ may establish a site-specific background pollutant criterion when all of the following conditions are met:
(A) The discharger has a currently effective NPDES permit;
(B) The mass of the pollutant discharged to the receiving waterbody does not exceed the mass of the intake pollutant from the same body of water, as defined in section (5)(a)(C) above, and therefore does not increase the total mass load of the pollutant in the receiving water body;
(C) DEQ has not assigned the discharger a TMDL wasteload allocation for the pollutant in question;
(D) The permittee uses any feasible pollutant reduction measures available and known to minimize the pollutant concentration in their discharge;
(E) The pollutant discharge has not been chemically or physically altered in a manner that causes adverse water quality impacts that would not occur if the intake pollutants were left in-stream; and,
(F) The timing and location of the pollutant discharge would not cause adverse water quality impacts that would not occur if the intake pollutant were left in-stream.
(d) The site-specific background pollutant criterion must be the most conservative of the following four values. Section (5)(e) of this rule describes the procedures for deriving these values.
(A) The projected in-stream pollutant concentration resulting from the current discharge concentration and any feasible pollutant reduction measures under (c)(D) above, after mixing with the receiving stream.
(B) The projected in-stream pollutant concentration resulting from the portion of the current discharge concentration associated with the intake pollutant mass after mixing with the receiving stream. This analysis ensures that there will be

no increase in the mass of the intake pollutant in the receiving water body as required by condition (c)(B) above.
(C) The projected in-stream pollutant concentration associated with a 3 percent increase above the background pollutant concentration as calculated:
(i) For the main stem Willamette and Columbia Rivers, using 25 percent of the harmonic mean flow of the waterbody.
(ii) For all other waters, using 100 percent of the harmonic mean flow or similar critical flow value of the waterbody.
(D) A criterion concentration value representing a human health risk level of 1 x 10-4. DEQ calculates this value using EPA's human health criteria derivation equation for carcinogens (EPA 2000), a risk level of 1 x 10-4, and the same values for the remaining calculation variables that were used to derive the underlying human health criterion.
(e) Procedure to derive a site-specific human health water quality criterion to address a background pollutant:
(A) DEQ will develop a flow-weighted characterization of the relevant flows and pollutant concentrations of the receiving waterbody, effluent and all facility intake pollutant sources to determine the fate and transport of the pollutant mass.
(i) The pollutant mass in the effluent discharged to a receiving waterbody may not exceed the mass of the intake pollutant from the same body of water.
(ii) Where a facility discharges intake pollutants from multiple sources that originate from the receiving waterbody and from other waterbodies, DEQ will calculate the flow-weighted amount of each source of the pollutant in the characterization.
(iii) Where a municipal water supply system provides intake water for a facility and the supplier provides treatment of the raw water that removes an intake water pollutant, the concentration and mass of the intake water pollutant must be determined at the point where the water enters the water supplier's distribution system.
(B) Using the flow weighted characterization developed in section (5)(e)(A), DEQ will calculate the in-stream pollutant concentration following mixing of the discharge into the receiving water. DEQ will use the resultant concentration to determine the conditions in section (5)(d)(A) and (B).
(C) Using the flow-weighted characterization, DEQ will calculate the in-stream pollutant concentration based on an increase of 3 percent above background pollutant concentration. DEQ will use the resultant concentration to determine the condition in Section (5)(d)(C).
(i) For the main stem Willamette and Columbia Rivers, DEQ will use 25 percent of the harmonic mean flow of the waterbody.
(ii) For all other waters, DEQ will use 100 percent of the harmonic mean flow or similar critical flow value of the waterbody.
(D) DEQ will select the most conservative of the following values as the site-specific water quality criterion.
(i) The projected in-stream pollutant concentration described in section (5)(e)(B);
(ii) The in-stream pollutant concentration based on an increase of 3 percent above background described in section (5)(e)(C); or
(iii) A water quality criterion based on a risk level of 1 x 10-4.
(f) Calculation of water quality based effluent limits based on a site-specific background pollutant criterion:
(A) For discharges to receiving waters with a site-specific background pollutant criterion, DEQ will use the site-specific criterion in the calculation of a numeric water quality based effluent limit.
(B) DEQ will compare the calculated water quality based effluent limits to any applicable aquatic toxicity or technology based effluent limits and select the most conservative for inclusion in the permit conditions.
(g) In addition to the water quality based effluent limits described in section (5)(f), DEQ will calculate a mass-based limit where necessary to ensure that the condition described in section (5)(c)(B) is met. Where mass-based limits are included, the permit will specify how DEQ will assess compliance with mass-based effluent limitations.
(h) The permit shall include a provision requiring DEQ to consider the re-opening of the permit and re-evaluation of the site-specific background pollutant criterion if new information shows the discharger no longer meets the conditions described in subsections (5)(c) and (e).
(i) Public Notification Requirements.

(A) If DEQ proposes to grant a site-specific background pollutant criterion, it must provide public notice of the proposal and hold a public hearing. The public notice may be included in the public notification of a draft NPDES permit or other draft regulatory decision that would rely on the criterion and will also be published on DEQ's water quality standards website;
(B) DEQ will publish a list of all site-specific background pollutant criteria approved according to this rule. DEQ will add the criterion to this list within 30 days of its effective date. The list will identify the:
(i) Permittee;
(ii) Site-specific background pollutant criterion and the associated risk level;
(iii) Waterbody to which the criterion applies;
(iv) Allowable pollutant effluent limit; and,
(v) How to obtain additional information about the criterion.
(6) Arsenic Reduction Policy: The inorganic arsenic criterion for the protection of human health from the combined consumption of organisms and drinking water is 2.1 micrograms per liter. While this criterion is protective of human health and more stringent than the federal maximum contaminant level (MCL) for arsenic in drinking water, which is 10 micrograms per liter, it is based on a higher risk level than EQC used to establish other human health criteria. This higher risk level recognizes that much of the risk is due to naturally high levels of inorganic arsenic in Oregon's waterbodies. In order to maintain the lowest human health risk from inorganic arsenic in drinking water, EQC determined that it is appropriate to adopt the following policy to limit the human contribution to that risk.
(a) It is EQC policy to reduce the addition of inorganic arsenic from new or existing anthropogenic sources to waters of the state within a surface water drinking water protection area to the maximum amount feasible. The requirements of this rule section (OAR 340-041-0033(6)) apply to sources that discharge to surface waters of the state with an ambient inorganic arsenic concentration equal to or lower than the applicable numeric inorganic arsenic criteria for the protection of human health.
(b) Definitions. As used in this section:
(A) "Add inorganic arsenic" means to discharge a net mass of inorganic arsenic from a point source (the mass of inorganic arsenic discharged minus the mass of inorganic arsenic taken into the facility from a surface water source).
(B) A "surface water drinking water protection area," means an area delineated as such by DEQ under the source water assessment program of the federal Safe Drinking Water Act, 42 U.S.C. § 300j 13. DEQ delineates these areas to protect public or community drinking water supplies that use surface water sources. These delineations are on DEQ's drinking water program Web page.
(C) "Potential to significantly increase inorganic arsenic concentrations in the public drinking water supply source water" means:
(i) A discharge will increase the concentration of inorganic arsenic in the receiving water by 10 percent or more after mixing with the harmonic mean flow of the receiving water; or
(ii) As an alternative, if sufficient data are available, the discharge will increase the concentration of inorganic arsenic in the surface water intake water of a public water system by 0.021 micrograms per liter or more based on a mass balance calculation.
(c) Following the effective date of this rule, applications for an individual NPDES permit or permit renewal received from industrial dischargers located in a surface water drinking water protection area and identified by DEQ as likely to add inorganic arsenic to the receiving water must include sufficient data to enable DEQ to determine whether:
(A) The discharge adds inorganic arsenic; and,
(B) The discharge has the potential to significantly increase inorganic arsenic concentrations in the public drinking water supply source water.
(d) Where DEQ determines that both conditions in subsection (c) of this section (6) are true, the industrial discharger must develop an inorganic arsenic reduction plan and propose all feasible measures to reduce its inorganic arsenic loading to the receiving water. The proposed plan, including proposed measures, monitoring and reporting requirements, and a schedule for those actions, will be described in the fact sheet and incorporated into the source's

NPDES permit after public comment and DEQ review and approval. In developing the plan, the source must:
(A) Identify how much it can minimize its inorganic arsenic discharge through pollution prevention measures, process changes, wastewater treatment, alternative water supply for groundwater users, or other possible pollution prevention and control measures;
(B) Evaluate the costs, feasibility and environmental impacts of the potential inorganic arsenic reduction and control measures;
(C) Estimate the predicted reduction in inorganic arsenic and the reduced human health risk expected to result from the control measures;
(D) Propose specific inorganic arsenic reduction or control measures, if feasible, and an implementation schedule; and,
(E) Propose monitoring and reporting requirements to document progress in plan implementation and the inorganic arsenic load reductions.
(e) In order to implement this section, DEQ will develop the following information and guidance within 120 days of the effective date of this rule and periodically update it as warranted by new information:
(A) A list of industrial sources or source categories, including industrial stormwater and sources covered by general permits likely to add inorganic arsenic to surface waters of the state. For industrial sources or source categories permitted under a general permit that have been identified by DEQ as likely sources of inorganic arsenic, DEQ will evaluate options for reducing inorganic arsenic during permit renewal or evaluation of Stormwater Pollution Control Plans.
(B) Quantitation limits for monitoring inorganic arsenic concentrations.
(C) Information and guidance to assist sources in estimating, according to subsection (d)(C) of this section, the reduced human health risk expected to result from inorganic arsenic control measures based on the most current EPA risk assessment.
(f) It is the policy of EQC that landowners engaged in agricultural or development practices on land where pesticides, fertilizers, or soil amendments containing arsenic are currently being or have previously been applied, implement conservation practices to minimize the erosion and runoff of inorganic arsenic to waters of the state or to a location where such material could readily migrate into waters of the state.

[NOTE: Tables 30 and 40 are found under OAR 340-041-8033.]

STATUTORY/OTHER AUTHORITY: ORS 468.020, 468B.030, 468B.035, 468B.048

STATUTES/OTHER IMPLEMENTED: ORS 468B.030, 468B.035, 468B.048

AMEND: 340-041-8033

RULE TITLE: Division 41 Tables and Figures

NOTICE FILED DATE: 03/14/2024

RULE SUMMARY: Deleting Table 31, adding new criteria for acrolein, aluminum, carbaryl, and diazinon, and updating the state's aquatic life criteria for cadmium and tributyltin.

RULE TEXT:

(1) Table 30: Aquatic Life Water Quality Criteria for Toxic Pollutants. This table, referenced in OAR 340-041-0033, contains information about the applicability and content of the criteria contained in the table.

(2) Table 40: Human Health Water Quality Criteria for Toxic Pollutants. This table, referenced in OAR 340-041-0033, contains information about the applicability and content of the criteria contained in the table.

STATUTORY/OTHER AUTHORITY: ORS 468.020, 468B.030, 468B.035, 468B.048

STATUTES/OTHER IMPLEMENTED: ORS 468B.030, 468B.035, 468B.048

State of Oregon Department of Environmental Quality

# OAR 340-041-8033

## Table 30

### Aquatic Life Water Quality Criteria for Toxic Pollutants

The concentration for each compound listed in Table 30 is a criterion established for waters of the state in order to protect aquatic life. The aquatic life criteria apply to waterbodies where the protection of fish and aquatic life is a designated use. All values are expressed as micrograms per liter (µg/L). Compounds are listed in alphabetical order with the corresponding information: the Chemical Abstract Service (CAS) number, whether there is a human health criterion for the pollutant (i.e. “y”= yes, “n” = no), and the associated aquatic life freshwater and saltwater acute and chronic criteria. *Italicized* pollutants are not identified as priority pollutants by EPA. Dashes in the table column indicate that there is no aquatic life criterion.

Unless otherwise noted in the table below, the acute criterion is the Criterion Maximum Concentration (CMC) applied as a one-hour average concentration, and the chronic criterion is the Criterion Continuous Concentration (CCC) applied as a 96-hour (4 days) average concentration. The CMC and CCC criteria may not be exceeded more than once every three years. Footnote A, associated with eleven pesticide pollutants in Table 30, describes the exception to the frequency and duration of the toxics criteria stated in this paragraph.

## OAR 340-041-8033
## Table 30
## Aquatic Life Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Human Health Criterion | Freshwater (µg/L) | | Saltwater (µg/L) | |
|---|---|---|---|---|---|---|---|
| | | | | Acute Criterion (CMC) | Chronic Criterion (CCC) | Acute Criterion (CMC) | Chronic Criterion (CCC) |
| 1 | Acrolein | 107028 | y | 3.0 | 3.0 | -- | -- |
| *NOTE: These acrolein criteria are not applicable for Clean Water Act purposes until approved by EPA.* | | | | | | | |
| 2 | Aldrin | 309002 | y | 3 [A] | -- | 1.3 [A] | -- |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | |
| 3 | *Alkalinity* | | n | -- | 20,000 [B] | -- | -- |

# OAR 340-041-8033
# Table 30
# Aquatic Life Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Human Health Criterion | Freshwater (µg/L) | | Saltwater (µg/L) | |
|---|---|---|---|---|---|---|---|
| | | | | Acute Criterion (CMC) | Chronic Criterion (CCC) | Acute Criterion (CMC) | Chronic Criterion (CCC) |
| [B] *Criterion shown is the minimum (i.e. CCC in water may not be below this value in order to protect aquatic life).* | | | | | | | |
| 4 | *Aluminum* | 7429905 | n | *See* **O, P** | *See* **O, P** | -- | -- |
| [O] *The freshwater criterion for aluminum is a function of the pH, dissolved organic carbon, and total hardness in the water column. Acute (CMC) and chronic (CCC) freshwater aluminum criteria values shall be calculated using the 2018 Aluminum Criteria Calculator (Aluminum Criteria Calculator V.2.0.xlsx), or a calculator in R or other software package using the same 1985 Guidelines calculation approach and underlying model equations as in the Aluminum Criteria Calculator V.2.0.xlsx, as defined in EPA's Final Aquatic Life Ambient Water Quality Criteria for Aluminum (EPA 822-R-18-001). See also endnote O for procedures and information.*<br>[P] *Oregon will use analytical methods that measure the bioavailable fraction of aluminum unless total recoverable aluminum measurements are required by Federal regulations.*<br>*Note: These aluminum criteria are not applicable for CWA purposes until approved by EPA and, if necessary, EPA withdraws the federal criteria for Oregon. The currently applicable federally promulgated criteria may be found at 40 CFR 131.47.* | | | | | | | |
| 5 | *Ammonia* | 7664417 | n | *The ammonia criteria are pH and temperature dependent — See ammonia criteria Tables 30(a)-(c) at end of Table 30.*[M] | *The ammonia criteria are pH, temperature and salinity dependent. Values for saltwater criteria (total ammonia) can be calculated from the tables specified in Ambient Water Quality Criteria for Ammonia (Saltwater)—1989 (EPA 440/5-88-004)*<br>*See DEQ's calculator for calculating saltwater ammonia criteria at: http://www.deq.state.or.us/wq/standards/toxics.htm* | | |

# OAR 340-041-8033
# Table 30
# Aquatic Life Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Human Health Criterion | Freshwater (µg/L) | | Saltwater (µg/L) | |
|---|---|---|---|---|---|---|---|
| | | | | Acute Criterion (CMC) | Chronic Criterion (CCC) | Acute Criterion (CMC) | Chronic Criterion (CCC) |
| [M] *The acute criteria in Table 30(a) apply in waterbodies where salmonids are a designated use in OAR 340-041-0101 through OAR 340-041-0340. The acute criteria in Table 30(b) apply in waterbodies where salmonids are not a designated use. The chronic criteria in Table 30(c) apply where fish and aquatic life is a designated use. It is not necessary to account for the presence or absence of salmonids or the presence of any early life stage of fish for the chronic criteria. Refer to DEQ's beneficial use website at: http://www.deq.state.or.us/wq/standards/uses.htm for additional information on salmonid beneficial use designations, including tables and maps.* | | | | | | | |
| 6 | Arsenic | 7440382 | y | 340 [C, D] | 150 [C, D] | 69 [C, D] | 36 [C, D] |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.*<br>[D] *Criterion is applied as total inorganic arsenic (i.e. arsenic (III) + arsenic (V)).* | | | | | | | |
| 7 | BHC Gamma (Lindane) | 58899 | y | 0.95 | 0.08 [A] | 0.16 [A] | -- |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | |
| 8 | Cadmium | 7440439 | n | *See* **C, F** | *See* **C, F** | 33 [C] | 7.9 [C] |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.*<br>[F] *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use the formula under expanded endnote F at bottom of Table 30.*<br><br>*NOTE: The federally promulgated freshwater acute cadmium criterion in 40 CFR 131.46 remains applicable for CWA purposes until EPA approves the freshwater acute cadmium criterion specified in Table 30 Endnotes C and F. The following saltwater cadmium criteria remain applicable until EPA approves the revised criteria in Table 30: the cadmium acute (CMC) is 40 µg/L and the chronic (CCC) is 8.8 µg/L, both expressed in terms of "dissolved" concentrations in the water column.* | | | | | | | |
| 9 | *Carbaryl* | 63252 | n | 2.1 | 2.1 | 1.6 | -- |
| *NOTE: These carbaryl criteria are not applicable for Clean Water Act purposes until approved by EPA.* | | | | | | | |
| 10 | Chlordane | 57749 | y | 2.4 [A] | 0.0043 [A] | 0.09 [A] | 0.004 [A] |

# OAR 340-041-8033
# Table 30
# Aquatic Life Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Human Health Criterion | Freshwater (µg/L) | | Saltwater (µg/L) | |
|---|---|---|---|---|---|---|---|
| | | | | Acute Criterion (CMC) | Chronic Criterion (CCC) | Acute Criterion (CMC) | Chronic Criterion (CCC) |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | |
| 11 | *Chloride* | 16887006 | n | 860,000 | 230,000 | -- | -- |
| 12 | *Chlorine* | 7782505 | n | 19 | 11 | 13 | 7.5 |
| 13 | *Chlorpyrifos* | 2921882 | n | 0.083 | 0.041 | 0.011 | 0.0056 |
| 14 | Chromium III | 16065831 | n | *See* **C, F** | *See* **C, F** | -- | -- |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.* [F] *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | |
| 15 | Chromium VI | 18540299 | n | 16 [C] | 11 [C] | 1100[C] | 50[C] |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.* | | | | | | | |
| 16 | Copper | 7440508 | y | *See* **C, N** | *See* **C, N** | 4.8 [C] | 3.1 [C] |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.* [N] *The freshwater criterion for copper is a function of the concentration of ions, alkalinity, organic carbon, pH and temperature in the water column. To calculate the criterion, use the Biotic Ligand Model referenced in endnote N at the bottom of Table 30. The acute copper criterion (CMC) is applied as a one-hour average concentration. The chronic criterion (CCC) is applied as a 96-hour (4 days) average concentration. See endnote N also for procedures and information.* | | | | | | | |
| 17 | Cyanide | 57125 | y | 22 [J] | 5.2 [J] | 1 [J] | 1 [J] |
| [J] *This criterion is expressed as µg free cyanide (CN)/L.* | | | | | | | |
| 18 | DDT 4,4' | 50293 | y | 1.1 [A, G] | 0.001 [A, G] | 0.13 [A, G] | 0.001 [A, G] |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* [G] *This criterion applies to DDT and its metabolites (i.e. the total concentration of DDT and its metabolites should not exceed this value).* | | | | | | | |

# OAR 340-041-8033
# Table 30
# Aquatic Life Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Human Health Criterion | Freshwater (µg/L) | | Saltwater (µg/L) | |
|---|---|---|---|---|---|---|---|
| | | | | Acute Criterion (CMC) | Chronic Criterion (CCC) | Acute Criterion (CMC) | Chronic Criterion (CCC) |
| 19 | *Demeton* | 8065483 | n | -- | 0.1 | -- | 0.1 |
| 20 | *Diazinon* | 333415 | n | 0.17 | 0.17 | 0.82 | 0.82 |
| *NOTE: These diazinon criteria are not applicable for Clean Water Act purposes until approved by EPA.* | | | | | | | |
| 21 | Dieldrin | 60571 | y | 0.24 | 0.056 | 0.71[A] | 0.0019[A] |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | |
| 22 | Endosulfan | 115297 | n | 0.22 [A, H] | 0.056 [A, H] | 0.034 [A, H] | 0.0087 [A, H] |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* [H] *This value is based on the criterion published in Ambient Water Quality Criteria for Endosulfan (EPA 440/5-80-046) and should be applied as the sum of alpha- and beta-endosulfan.* | | | | | | | |
| 23 | Endosulfan Alpha | 959988 | y | 0.22 [A] | 0.056 [A] | 0.034 [A] | 0.0087 [A] |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | |
| 24 | Endosulfan Beta | 33213659 | y | 0.22 [A] | 0.056 [A] | 0.034 [A] | 0.0087 [A] |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | |
| 25 | Endrin | 72208 | y | 0.086 | 0.036 | 0.037 [A] | 0.0023 [A] |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | |
| 26 | *Guthion* | 86500 | n | -- | 0.01 | -- | 0.01 |
| 27 | Heptachlor | 76448 | y | 0.52 [A] | 0.0038 [A] | 0.053 [A] | 0.0036 [A] |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | |
| 28 | Heptachlor Epoxide | 1024573 | y | 0.52 [A] | 0.0038 [A] | 0.053 [A] | 0.0036 [A] |
| [A] *See expanded endnote A at bottom of Table 30 for alternate frequency and duration of this criterion.* | | | | | | | |
| 29 | *Iron (total)* | 7439896 | n | -- | 1000 | -- | -- |

# OAR 340-041-8033
# Table 30
# Aquatic Life Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Human Health Criterion | Freshwater (µg/L) | | Saltwater (µg/L) | |
|---|---|---|---|---|---|---|---|
| | | | | Acute Criterion (CMC) | Chronic Criterion (CCC) | Acute Criterion (CMC) | Chronic Criterion (CCC) |
| 30 | Lead | 7439921 | n | *See* **C , F** | *See* **C , F** | 210 [C] | 8.1 [C] |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.*<br>[F] *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | |
| 31 | *Malathion* | 121755 | n | -- | 0.1 | -- | 0.1 |
| 32 | Mercury (total) | 7439976 | n | 2.4 | 0.012 | 2.1 | 0.025 |
| 33 | *Methoxychlor* | 72435 | y | -- | 0.03 | -- | 0.03 |
| 34 | *Mirex* | 2385855 | n | -- | 0.001 | -- | 0.001 |
| 35 | Nickel | 7440020 | y | *See* **C , F** | *See* **C , F** | 74 [C] | 8.2 [C] |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.*<br>[F] *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | |
| 36 | *Parathion* | 56382 | n | 0.065 | 0.013 | -- | -- |
| 37 | Pentachlorophenol | 87865 | y | *See* **I** | *See* **I** | 13 | 7.9 |
| [I] *Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMC=(exp(1.005(pH)-4.869); CCC=exp(1.005(pH)-5.134).* | | | | | | | |
| 38 | *Phosphorus Elemental* | 7723140 | n | -- | -- | -- | 0.1 |
| 39 | Polychlorinated Biphenyls (PCBs) | NA | y | 2 [K] | 0.014 [K] | 10 [K] | 0.03 [K] |
| [K] *This criterion applies to total PCBs (e.g.* determined as Aroclors or congeners) | | | | | | | |
| 40 | Selenium | 7782492 | y | *See* **C** , **L** | 4.6 [C] | 290 [C] | 71 [C] |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.* | | | | | | | |

# OAR 340-041-8033
# Table 30
# Aquatic Life Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Human Health Criterion | Freshwater (µg/L) | | Saltwater (µg/L) | |
|---|---|---|---|---|---|---|---|
| | | | | Acute Criterion (CMC) | Chronic Criterion (CCC) | Acute Criterion (CMC) | Chronic Criterion (CCC) |
| [L] *The CMC=(1/[(f1/CMC1)+(f2/CMC2)]µg/L) * CF where f1 and f2 are the fractions of total selenium that are treated as selenite and selenate, respectively, and CMC1 and CMC2 are 185.9 µg/L and 12.82 µg/L, respectively. See expanded endnote F for the Conversion Factor (CF) for selenium.* | | | | | | | |
| 41 | Silver | 7440224 | n | *See* **C** , **F** | 0.10 [C] | 1.9 [C] | -- |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.* [F] *The freshwater acute criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | |
| 42 | *Sulfide Hydrogen Sulfide* | 7783064 | n | -- | 2 | -- | 2 |
| 43 | Toxaphene | 8001352 | y | 0.73 | 0.0002 | 0.21 | 0.0002 |
| 44 | *Tributyltin (TBT)* | 688733 | n | 0.46 | 0.072 | 0.42 | 0.0074 |
| *NOTE: The freshwater chronic and saltwater acute and chronic criteria for tributyltin are not applicable for Clean Water Act purposes until the revised Table 30 values are approved by EPA. The freshwater acute criterion is not changing and is applicable. The following tributyltin criteria remain applicable until EPA approves the revised criteria shown in Table 30: the freshwater chronic (CCC) is 0.063 µg/L, the saltwater acute (CMC) is 0.37 µg/L, and the saltwater chronic (CCC) is 0.01 µg/L.* | | | | | | | |
| 45 | Zinc | 7440666 | y | *See* **C , F** | *See* **C , F** | 90 [C] | 81 [C] |
| [C] *Criterion is expressed in terms of "dissolved" concentrations in the water column.* [F] *The freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. To calculate the criterion, use formula under expanded endnote F at bottom of Table 30.* | | | | | | | |

**Expanded Endnotes A, F, N, O**

## Endnote A: Alternate Frequency and Duration for Certain Pesticides

This criterion is based on EPA recommendations issued in 1980 that were derived using guidelines that differed from EPA's 1985 Guidelines which update minimum data requirements and derivation procedures. The CMC may not be exceeded at any time and the CCC may not be exceeded based on a 24-hour average. The CMC may be applied using a one hour averaging period not to be exceeded more than once every three years, if the CMC values given in Table 30 are divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.

**Endnote F: Equations for Hardness-Dependent Freshwater Metals Criteria and Conversion Factor Table**

The freshwater criterion for this metal is expressed as dissolved with two significant figures, and is a function of hardness (mg/L) in the water column. Criteria values based on hardness are calculated using the following formulas (CMC refers to the acute criterion; CCC refers to the chronic criterion):

**CMC** = $(\exp(m_A*[\ln(\text{hardness})] + b_A))*CF$ f

**CCC** = $(\exp(m_C*[\ln(\text{hardness})] + b_C))*CF$

"CF" is the conversion factor used for converting a metal criterion expressed as the total recoverable fraction in the water column to a criterion expressed as the dissolved fraction in the water column.

| Values for Calculating Hardness-Dependent Metals Criteria | | | | |
|---|---|---|---|---|
| **Chemical** | **$m_A$** | **$b_A$** | **$m_C$** | **$b_C$** |
| Cadmium | 0.9789 | -3.866 | 0.7409 | -4.719 |
| Chromium III | 0.8190 | 3.7256 | 0.8190 | 0.6848 |
| Lead | 1.273 | -1.460 | 1.273 | -4.705 |
| Nickel | 0.8460 | 2.255 | 0.8460 | 0.0584 |
| Silver | 1.72 | -6.59 | -- | -- |
| Zinc | 0.8473 | 0.884 | 0.8473 | 0.884 |

The conversion factors (CF) below must be used in the equations above for the hardness-dependent metals in order to convert total recoverable metals criteria to dissolved metals criteria. For metals that are not hardness-dependent (i.e. arsenic, chromium VI, selenium, and silver (chronic)), or are saltwater criteria, the criterion value associated with the metal in Table 30 already reflects a dissolved criterion based on its conversion factor below.

| Conversion Factor (CF) Table for Dissolved Metals | | | | |
|---|---|---|---|---|
| Chemical | Freshwater | | Saltwater | |
| | Acute | Chronic | Acute | Chronic |
| Arsenic | 1.000 | 1.000 | 1.000 | 1.000 |
| Cadmium | 1.136672-[(ln hardness)(0.041838)] | 1.101672-[(ln hardness)(0.041838)] | 0.994 | 0.994 |
| Chromium III | 0.316 | 0.860 | -- | -- |
| Chromium VI | 0.982 | 0.962 | 0.993 | 0.993 |
| Copper | N/A | N/A | 0.83 | 0.83 |
| Lead | 1.46203-[(ln hardness)(0.145712)] | 1.46203-[(ln hardness)(0.145712)] | 0.951 | 0.951 |
| Nickel | 0.998 | 0.997 | 0.990 | 0.990 |
| Selenium | 0.996 | 0.922 | 0.998 | 0.998 |
| Silver | 0.85 | 0.85 | 0.85 | -- |
| Zinc | 0.978 | 0.986 | 0.946 | 0.946 |

*NOTE: Cadmium values $m_A$, $b_A$, and the freshwater acute CF in Endnote F are not applicable until the freshwater acute cadmium criterion in Table 30 is approved by EPA. Until then the federally promulgated freshwater acute cadmium criterion at 40 CFR 131.46 remains applicable for CWA purposes.*

## Endnote N: Deriving freshwater copper criteria

The freshwater copper criteria at any time are the Biotic Ligand Model (BLM) derived Instantaneous Water Quality Criteria (IWQC) output based on a concurrently measured set of model input parameter values. The Biotic Ligand Model uses multiple ambient water quality parameters to derive 1-hour acute exposure (CMC) and 96-hour chronic exposure (CCC) water quality criteria (IWQC) for copper based on the site specific water chemistry that determines the toxicity of copper to aquatic life. If measured data for one or more of the model input parameters used to derive the acute and chronic IWQC is not available, the procedures in section (1) or (2) of this endnote will be used as specified to substitute an estimate or a default value for the missing input parameter. BLM results (IWQC) based on sufficient measured input parameter data are more accurate and supersede results based on estimates or default values. The acceptable BLM software to calculate the IWQC include version 2.2.3, referenced in "Aquatic Life Ambient Freshwater Quality Criteria – Copper": EPA-822-R-07-001, February 2007, and version 2.2.4. The criteria are expressed as dissolved copper in micrograms per liter (to the nearest one-tenth).

(1) Input Parameter Substitution and Estimation Procedures to Derive BLM Criteria (IWQC)

If the measured value for any input parameter needed to derive an IWQC using the BLM is not available, DEQ will substitute an estimated input parameter value according to the procedures described in this section [Endnote N (1)]. If the data required to determine the estimated parameter value is not available, DEQ will use default values derived according to the procedures in Endnote N (2).

(a) Total recoverable concentration measurements will be substituted for dissolved concentration measurements that are not available. For alkalinity, calcium, chloride, magnesium, potassium, sodium and sulfate, total recoverable concentration measurements will be used as a direct substitute for dissolved concentration measurements. Total organic carbon (TOC) measurements will be multiplied by 0.83 to convert the TOC value to an equivalent dissolved organic carbon (DOC) value; except where sufficient TOC and DOC data are available for a site, DEQ will calculate and apply a site-specific translator in place of 0.83 to convert TOC values to DOC for use in the BLM.

(b) Alkalinity, calcium, chloride, magnesium, potassium, sodium and sulfate:
If data for any of these BLM input parameters are missing from a particular dataset, DEQ will estimate its value based on the relationship of the ion or alkalinity to specific conductance measurements for that data set using the regression analysis equations in Table 1. Specific conductance measurements must be concurrent with the other BLM input parameters dataset.

| Table N-1 | |
|---|---|
| **Parameter** | **Regression Equation** |
| Alkalinity | $Alk. = \exp^{(0.88 \cdot [\ln(SpC)] - 0.41)}$ |
| Calcium | $Ca = \exp^{(0.96 \cdot [\ln(SpC)] - 2.29)}$ |
| Chloride | $Cl = \exp^{(1.15 \cdot [\ln(SpC)] - 3.82)}$ |
| Magnesium | $Mg = \exp^{(0.91 \cdot [\ln(SpC)] - 3.09)}$ |
| Potassium | $K = \exp^{(0.84 \cdot [\ln(SpC)] - 3.74)}$ |
| Sodium | $Na = \exp^{(0.86 \cdot [\ln(SpC)] - 2.22)}$ |
| Sulfate | $SO_4 = \exp^{(1.45 \cdot [\ln(SpC)] - 5.59}$ |

Where, “SpC” is a measurement of specific conductance in µmhos/cm, “ln” is the natural logarithm, and “exp” is a mathematical constant that is the base of the natural logarithm.

(c) pH
If concurrent pH data is missing from the sample dataset, DEQ will use a representative pH value determined by interpolating from data available for the site or proximate monitoring locations where conditions (such as type of water body, stream flow and geology) are similar to the site. DEQ will use the available data and methods to produce the best practicable estimate of pH for the site and time for which the IWQC is being derived.

(d) Temperature
If concurrent temperature data is missing from the sample dataset, DEQ will use a monthly mean temperature based on data available for the site or proximate monitoring locations where conditions (such as type of water body and stream flow) are similar to the site.

(e) Humic Acid
If sufficient high quality data on the percentage of humic acid as a proportion of DOC is available for a site, DEQ will use that value in the BLM in place of the default value of 10% used in the model.

(2) Default Action Values

If the measured value for DOC, alkalinity, calcium, chloride, magnesium, potassium, sodium or sulfate is not available to derive an IWQC using the BLM, and the parameter value cannot be estimated as specified in section (1) above, DEQ will use a conservative input value for the missing parameter as described in this section [Endnote N (2)] to derive a default action value using the Biotic Ligand Model. The default action value will be used for Clean Water Act purposes until measured or estimated input parameter data are available to derive accurate copper criteria (IWQC) based on site specific water chemistry.

(a) The default input parameter values for DOC, alkalinity calcium, chloride, magnesium, potassium, sodium and sulfate will be the percentile value from the

distribution of the high quality data available for surface waters in the region as shown in Table N-2.

**Table N-2**
**Percentile of data distribution to be used as default value by region**

| Region | DOC percentile | Alkalinity and Ions percentile |
|---|---|---|
| Willamette | 20th | 20th |
| Coastal | 20th | 20th |
| Cascades | 20th | 20th |
| Eastern | 15th | 15th |
| Columbia River | 20th | 20th |

(b) The regional default values for each parameter and region will be updated periodically as additional high quality data becomes available and is added to DEQ's database.
(c) The regional default values for each parameter are available on DEQ's website.
(d) The regions listed in Table N-2 are comprised of the following EPA Level III ecoregions or waterbody:
(i) Willamette: the Willamette Valley
(ii) Coastal: Coast Range and Klamath Mountains
(iii) Cascades: Cascades
(iv) Eastern: Eastern Cascades Slopes and Foothills, Columbia Plateau, Blue Mountains, Northern Basin and Range and Snake River Plain
(v) Columbia River: Columbia River mainstem in Oregon

(3) General Policies
(a) The copper BLM derives instantaneous criteria results (IWQC) that vary at a site over time reflecting the effect of local water chemistry on copper toxicity to aquatic organisms. DEQ will apply the BLM criteria for Clean Water Act purposes to protect the water body during the most bioavailable or toxic conditions.
(b) For assessing waters of the state, DEQ will use approaches that give preference to the use of BLM criteria derived with site-specific measured input parameter data.

**Endnote O: Deriving freshwater aluminum criteria**

Freshwater aluminum criteria values are calculated from a concurrently measured set of Aluminum Criteria Calculator (ACC) input parameter values. The input parameter values are based on the site and time specific water chemistry that determines the toxicity of aluminum to aquatic life. If measured data for one or more of the ACC input parameters is not available, the procedures in section (1), (2), or (3) of this endnote will be used, in the order listed, as specified to substitute an estimated or a default value for the missing input parameter or to apply default criteria derived using ecoregional data.

Criteria values based on sufficient concurrent measured input parameter data are more accurate, preferred, and supersede results based on estimates, default values or applied default ecoregional criteria values. The criteria are expressed as total recoverable in micrograms per liter (to two significant figures). Oregon will use analytical methods that measure the bioavailable fraction of aluminum unless total recoverable aluminum measurements are required by Federal regulations.

(1) Input Parameter Estimation Procedures to Derive Aluminum Criteria Values

If the measured value for one or more input parameters needed to derive an aluminum criteria value using the ACC is not available, DEQ will substitute a calculated or estimated input value according to the procedures described in this section [Endnote O (1)].

(a) DOC
DEQ will use total organic carbon (TOC) measurements to estimate DOC measurements that are not available. Total organic carbon (TOC) measurements will be multiplied by 0.83 to convert the TOC value to an equivalent dissolved organic carbon (DOC) value; except where sufficient TOC and DOC data are available for a site, DEQ will calculate and apply a site-specific translator in place of 0.83 to convert TOC values to DOC for use in the Aluminum Criteria Calculator. If neither DOC nor TOC measurements are available, substitute a default DOC value as described in Endnote O (2).

(b) Total Hardness
If total hardness is not available, DEQ will estimate total hardness by substituting dissolved hardness as an input parameter for the Aluminum Criteria Calculator. If neither total nor dissolved hardness data are available, DEQ will use the equation in Table O-1 to estimate total hardness using specific conductance. Specific conductance measurements must be concurrent with the other input parameters for the Aluminum Criteria Calculator. If total hardness cannot be estimated from concurrent data, DEQ will apply the applicable ecoregional default aluminum criterion described in Endnote O (3).

**Table O-1**
**Equation to estimate total hardness from specific conductance**

| Parameter | Regression Equation |
|---|---|
| Total Hardness | Total Hardness = $\exp^{(1.050\cdot[\ln(SpC)] - 1.211)}$ |

Where, “SpC” is a measurement of specific conductance in µmhos/cm, “ln” is the natural logarithm, and “exp” is a mathematical constant that is the base of the natural logarithm.

(2) Applying a Default Value for DOC to Derive Aluminum Criteria Values

If concurrently measured DOC is not available to derive a criteria value using the ACC and DOC cannot be estimated as specified in Endnote O (1)(a) above, DEQ will use a conservative

default DOC input value as described in this section [Endnote O (2)] to derive the criteria value. The default DOC input value will be used for Clean Water Act purposes until measured or estimated DOC input data are available to derive aluminum criteria values based on site-specific water chemistry.

(a) The default input parameter values for DOC will be the percentile value from the distribution of the high-quality data available for surface waters in the region as shown in Table O-2.

**Table O-2**
**Percentile of data distribution to be used as default value by region**

| Region | DOC percentile |
|---|---|
| Willamette | 15th |
| Coastal | 30th |
| Cascades | 20th |
| Eastern | 15th |
| Columbia River | 10th |

b) The regional default DOC values will be updated periodically as additional high-quality data become available and are added to DEQ's database.

(c) The resulting regional default input values for DOC are shown on DEQ's website.

(d) The regions listed in Table O-2 are the same as those defined in Endnote N(2)(d).

(3) Applying Aluminum Default Ecoregional Criteria

If data for pH is missing or hardness is missing and cannot be estimated as described in Endnote O (1)(b), DEQ will apply an ecoregional default aluminum criteria value.

(a) The default ecoregional acute (CMC) and chronic (CCC) criteria values will be the 10th percentile value from the distribution of all ACC outputs calculated from concurrently measured high quality input data available for Oregon surface waters by EPA Level III ecoregion with the Columbia River mainstem treated separately.

(b) The ecoregional default aluminum criteria values will be updated periodically as additional high quality data become available and are added to DEQ's database.

(c) The resulting ecoregional default aluminum criteria values are shown on DEQ's website.

(4) General Policies

(a) The ACC produces criteria values that vary at a site over time reflecting the effect of local water chemistry on aluminum toxicity to aquatic organisms. To apply the aluminum criteria for Clean Water Act purposes, criteria values based on ambient water chemistry conditions must protect the water body over the full range of water chemistry conditions, including during conditions when aluminum is most toxic.

(b) When applying the aluminum criteria, DEQ will use approaches that give preference to the use of ACC criteria values based on concurrently measured or estimated input parameter data, as described in Endnote O (1), (2), and (3) in the order listed, and concurrently measured aluminum data.

**Table 30(a): Ammonia Acute Criteria Values (One-hour Average)—**Salmonid Species Present
Temperature and pH-Dependent and expressed as Total Ammonia Nitrogen (mg/L TAN)

Criteria cannot be exceeded more than once every three years

$$Acute\ Criterion = MIN\left(\left(\frac{0.275}{1+10^{7.204-pH}}+\frac{39.0}{1+10^{pH-7.204}}\right),\left(0.7249\times\left(\frac{0.0114}{1+10^{7.204-pH}}+\frac{1.6181}{1+10^{pH-7.204}}\right)\times\left(23.12\times 10^{0.036\times(20-T)}\right)\right)\right)$$

| | Temperature (°C) | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **pH** | **0-14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** |
| **6.5** | 33 | 33 | 32 | 29 | 27 | 25 | 23 | 21 | 19 | 18 | 16 | 15 | 14 | 13 | 12 | 11 | 9.9 |
| **6.6** | 31 | 31 | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 17 | 16 | 14 | 13 | 12 | 11 | 10 | 9.5 |
| **6.7** | 30 | 30 | 29 | 27 | 24 | 22 | 21 | 19 | 18 | 16 | 15 | 14 | 13 | 12 | 11 | 9.8 | 9.0 |
| **6.8** | 28 | 28 | 27 | 25 | 23 | 21 | 20 | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.2 | 8.5 |
| **6.9** | 26 | 26 | 25 | 23 | 21 | 20 | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.4 | 8.6 | 7.9 |
| **7.0** | 24 | 24 | 23 | 21 | 20 | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.4 | 8.6 | 8.0 | 7.3 |
| **7.1** | 22 | 22 | 21 | 20 | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.3 | 8.5 | 7.9 | 7.2 | 6.7 |
| **7.2** | 20 | 20 | 19 | 18 | 16 | 15 | 14 | 13 | 12 | 11 | 9.8 | 9.1 | 8.3 | 7.7 | 7.1 | 6.5 | 6.0 |
| **7.3** | 18 | 18 | 17 | 16 | 14 | 13 | 12 | 11 | 10 | 9.5 | 8.7 | 8.0 | 7.4 | 6.8 | 6.3 | 5.8 | 5.3 |
| **7.4** | 15 | 15 | 15 | 14 | 13 | 12 | 11 | 9.8 | 9.0 | 8.3 | 7.7 | 7.0 | 6.5 | 6.0 | 5.5 | 5.1 | 4.7 |
| **7.5** | 13 | 13 | 13 | 12 | 11 | 10 | 9.2 | 8.5 | 7.8 | 7.2 | 6.6 | 6.1 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 |
| **7.6** | 11 | 11 | 11 | 10 | 9.3 | 8.6 | 7.9 | 7.3 | 6.7 | 6.2 | 5.7 | 5.2 | 4.8 | 4.4 | 4.1 | 3.8 | 3.5 |
| **7.7** | 9.6 | 9.6 | 9.3 | 8.6 | 7.9 | 7.3 | 6.7 | 6.2 | 5.7 | 5.2 | 4.8 | 4.4 | 4.1 | 3.8 | 3.5 | 3.2 | 3.0 |
| **7.8** | 8.1 | 8.1 | 7.9 | 7.2 | 6.7 | 6.1 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 | 3.7 | 3.4 | 3.2 | 2.9 | 2.7 | 2.5 |
| **7.9** | 6.8 | 6.8 | 6.6 | 6.0 | 5.6 | 5.1 | 4.7 | 4.3 | 4.0 | 3.7 | 3.4 | 3.1 | 2.9 | 2.6 | 2.4 | 2.2 | 2.1 |
| **8.0** | 5.6 | 5.6 | 5.4 | 5.0 | 4.6 | 4.2 | 3.9 | 3.6 | 3.3 | 3.0 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 | 1.9 | 1.7 |
| **8.1** | 4.6 | 4.6 | 4.5 | 4.1 | 3.8 | 3.5 | 3.2 | 3.0 | 2.7 | 2.5 | 2.3 | 2.1 | 2.0 | 1.8 | 1.7 | 1.5 | 1.4 |
| **8.2** | 3.8 | 3.8 | 3.7 | 3.5 | 3.1 | 2.9 | 2.7 | 2.4 | 2.3 | 2.1 | 1.9 | 1.8 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 |
| **8.3** | 3.1 | 3.1 | 3.1 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 | 1.9 | 1.7 | 1.6 | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.96 |
| **8.4** | 2.6 | 2.6 | 2.5 | 2.3 | 2.1 | 2.0 | 1.8 | 1.7 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.93 | 0.86 | 0.79 |
| **8.5** | 2.1 | 2.1 | 2.1 | 1.9 | 1.8 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 0.98 | 0.90 | 0.83 | 0.77 | 0.71 | 0.65 |
| **8.6** | 1.8 | 1.8 | 1.7 | 1.6 | 1.5 | 1.3 | 1.2 | 1.1 | 1.0 | 0.96 | 0.88 | 0.81 | 0.75 | 0.69 | 0.63 | 0.59 | 0.54 |
| **8.7** | 1.5 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.94 | 0.87 | 0.80 | 0.74 | 0.68 | 0.62 | 0.57 | 0.53 | 0.49 | 0.45 |
| **8.8** | 1.2 | 1.2 | 1.2 | 1.1 | 1.0 | 0.93 | 0.86 | 0.79 | 0.73 | 0.67 | 0.62 | 0.57 | 0.52 | 0.48 | 0.44 | 0.41 | 0.37 |
| **8.9** | 1.0 | 1.0 | 1.0 | 0.93 | 0.85 | 0.79 | 0.72 | 0.67 | 0.61 | 0.56 | 0.52 | 0.48 | 0.44 | 0.40 | 0.37 | 0.34 | 0.32 |
| **9.0** | 0.88 | 0.88 | 0.86 | 0.79 | 0.73 | 0.67 | 0.62 | 0.57 | 0.52 | 0.48 | 0.44 | 0.41 | 0.37 | 0.34 | 0.32 | 0.29 | 0.27 |

**Table 30(b): Ammonia Acute Criteria Values (One-hour Average*)—**Salmonid Species Absent
Temperature and pH-Dependent and expressed as Total Ammonia Nitrogen (mg/L TAN)

Criteria cannot be exceeded more than once every three years

$$Acute\ Criterion = 0.7249 \times \frac{0.0114}{1+10^{7.204-pH}} + \frac{1.6181}{1+10^{pH-7.204}} \times MIN\left(51.93, 23.12 \times 10^{0.036\times(20-T)}\right)$$

| | Temperature (°C) | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **pH** | **0-10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** |
| **6.5** | 51 | 48 | 44 | 41 | 37 | 34 | 32 | 29 | 27 | 25 | 23 | 21 | 19 | 18 | 16 | 15 | 14 | 13 | 12 | 11 | 9.9 |
| **6.6** | 49 | 46 | 42 | 39 | 36 | 33 | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 17 | 16 | 14 | 13 | 12 | 11 | 10 | 9.5 |
| **6.7** | 46 | 44 | 40 | 37 | 34 | 31 | 29 | 27 | 24 | 22 | 21 | 19 | 18 | 16 | 15 | 14 | 13 | 12 | 11 | 9.8 | 9.0 |
| **6.8** | 44 | 41 | 38 | 35 | 32 | 30 | 27 | 25 | 23 | 21 | 20 | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.2 | 8.5 |
| **6.9** | 41 | 38 | 35 | 32 | 30 | 28 | 25 | 23 | 21 | 20 | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.4 | 8.6 | 7.9 |
| **7.0** | 38 | 35 | 33 | 30 | 28 | 25 | 23 | 21 | 20 | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.4 | 8.6 | 7.9 | 7.3 |
| **7.1** | 34 | 32 | 30 | 27 | 25 | 23 | 21 | 20 | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.3 | 8.5 | 7.9 | 7.2 | 6.7 |
| **7.2** | 31 | 29 | 27 | 25 | 23 | 21 | 19 | 18 | 16 | 15 | 14 | 13 | 12 | 11 | 9.8 | 9.1 | 8.3 | 7.7 | 7.1 | 6.5 | 6.0 |
| **7.3** | 27 | 26 | 24 | 22 | 20 | 18 | 17 | 16 | 14 | 13 | 12 | 11 | 10 | 9.5 | 8.7 | 8.0 | 7.4 | 6.8 | 6.3 | 5.8 | 5.3 |
| **7.4** | 24 | 22 | 21 | 19 | 18 | 16 | 15 | 14 | 13 | 12 | 11 | 9.8 | 9.0 | 8.3 | 7.7 | 7.0 | 6.5 | 6.0 | 5.5 | 5.1 | 4.7 |
| **7.5** | 21 | 19 | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.2 | 8.5 | 7.8 | 7.2 | 6.6 | 6.1 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 |
| **7.6** | 18 | 17 | 15 | 14 | 13 | 12 | 11 | 10 | 9.3 | 8.6 | 7.9 | 7.3 | 6.7 | 6.2 | 5.7 | 5.2 | 4.8 | 4.4 | 4.1 | 3.8 | 3.5 |
| **7.7** | 15 | 14 | 13 | 12 | 11 | 10 | 9.3 | 8.6 | 7.9 | 7.3 | 6.7 | 6.2 | 5.7 | 5.2 | 4.8 | 4.4 | 4.1 | 3.8 | 3.5 | 3.2 | 2.9 |
| **7.8** | 13 | 12 | 11 | 10 | 9.3 | 8.5 | 7.9 | 7.2 | 6.7 | 6.1 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 | 3.7 | 3.4 | 3.2 | 2.9 | 2.7 | 2.5 |
| **7.9** | 11 | 9.9 | 9.1 | 8.4 | 7.7 | 7.1 | 6.6 | 3.0 | 5.6 | 5.1 | 4.7 | 4.3 | 4.0 | 3.7 | 3.4 | 3.1 | 2.9 | 2.6 | 2.4 | 2.2 | 2.1 |
| **8.0** | 8.8 | 8.2 | 7.6 | 7.0 | 6.4 | 5.9 | 5.4 | 5.0 | 4.6 | 4.2 | 3.9 | 3.6 | 3.3 | 3.0 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 | 1.9 | 1.7 |
| **8.1** | 7.2 | 6.8 | 6.3 | 5.8 | 5.3 | 4.9 | 4.5 | 4.1 | 3.8 | 3.5 | 3.2 | 3.0 | 2.7 | 2.5 | 2.3 | 2.1 | 2.0 | 1.8 | 1.7 | 1.5 | 1.4 |
| **8.2** | 6.0 | 5.6 | 5.2 | 4.8 | 4.4 | 4.0 | 3.7 | 3.4 | 3.1 | 2.9 | 2.7 | 2.4 | 2.3 | 2.1 | 1.9 | 1.8 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 |
| **8.3** | 4.9 | 4.6 | 4.3 | 3.9 | 3.6 | 3.3 | 3.1 | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 | 1.9 | 1.7 | 1.6 | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.96 |
| **8.4** | 4.1 | 3.8 | 3.5 | 3.2 | 3.0 | 2.7 | 2.5 | 2.3 | 2.1 | 2.0 | 1.8 | 1.7 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.93 | 0.86 | 0.79 |
| **8.5** | 3.3 | 3.1 | 2.9 | 2.7 | 2.4 | 2.3 | 2.1 | 1.9 | 1.8 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 0.98 | 0.90 | 0.83 | 0.77 | 0.71 | 0.65 |
| **8.6** | 2.8 | 2.6 | 2.4 | 2.2 | 2.0 | 1.9 | 1.7 | 1.6 | 1.5 | 1.3 | 1.2 | 1.1 | 1.0 | 0.96 | 0.88 | 0.81 | 0.75 | 0.69 | 0.63 | 0.58 | 0.54 |
| **8.7** | 2.3 | 2.2 | 2.0 | 1.8 | 1.7 | 1.6 | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.94 | 0.87 | 0.80 | 0.74 | 0.68 | 0.62 | 0.57 | 0.53 | 0.49 | 0.45 |
| **8.8** | 1.9 | 1.8 | 1.7 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.93 | 0.86 | 0.79 | 0.73 | 0.67 | 0.62 | 0.57 | 0.52 | 0.48 | 0.44 | 0.41 | 0.37 |
| **8.9** | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.93 | 0.85 | 0.79 | 0.72 | 0.67 | 0.61 | 0.56 | 0.52 | 0.48 | 0.44 | 0.40 | 0.37 | 0.34 | 0.32 |
| **9.0** | 1.4 | 1.3 | 1.2 | 1.1 | 1.0 | 0.93 | 0.86 | 0.79 | 0.73 | 0.67 | 0.62 | 0.57 | 0.52 | 0.48 | 0.44 | 0.41 | 0.37 | 0.34 | 0.32 | 0.29 | 0.27 |

## Table 30(c): Ammonia Chronic Criteria Values (30-day Rolling Average*)

Temperature and pH-Dependent and expressed as Total Ammonia Nitrogen (mg/L TAN)

* The highest four-day average within the 30-day averaging period must not be more than 2.5 times the chronic value

Criteria cannot be exceeded more than once every three years

$$Chronic\ Criterion = 0.8876 \times \left(\frac{0.0278}{1+10^{7.688-pH}} + \frac{1.1994}{1+10^{pH-7.688}}\right) \times \left(2.126 \times 10^{0.028\times(20-MAX(T,7))}\right)$$

| | Temperature (°C) | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **pH** | **0-7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** | **27** | **28** | **29** | **30** |
| **6.5** | 4.9 | 4.6 | 4.3 | 4.1 | 3.8 | 3.6 | 3.3 | 3.1 | 2.9 | 2.8 | 2.6 | 2.4 | 2.3 | 2.1 | 2.0 | 1.9 | 1.8 | 1.6 | 1.5 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 |
| **6.6** | 4.8 | 4.5 | 4.3 | 4.0 | 3.8 | 3.5 | 3.3 | 3.1 | 2.9 | 2.7 | 2.5 | 2.4 | 2.2 | 2.1 | 2.0 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.3 | 1.2 | 1.1 |
| **6.7** | 4.8 | 4.5 | 4.2 | 3.9 | 3.7 | 3.5 | 3.2 | 3.0 | 2.8 | 2.7 | 2.5 | 2.3 | 2.2 | 2.1 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 | 1.1 |
| **6.8** | 4.6 | 4.4 | 4.1 | 3.8 | 3.6 | 3.4 | 3.2 | 3.0 | 2.8 | 2.6 | 2.4 | 2.3 | 2.1 | 2.0 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.1 |
| **6.9** | 4.5 | 4.2 | 4.0 | 3.7 | 3.5 | 3.3 | 3.1 | 2.9 | 2.7 | 2.5 | 2.4 | 2.2 | 2.1 | 2.0 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 | 1.1 | 1.0 |
| **7.0** | 4.4 | 4.1 | 3.8 | 3.6 | 3.4 | 3.2 | 3.0 | 2.8 | 2.6 | 2.4 | 2.3 | 2.2 | 2.0 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.1 | 0.99 |
| **7.1** | 4.2 | 3.9 | 3.7 | 3.5 | 3.2 | 3.0 | 2.8 | 2.7 | 2.5 | 2.3 | 2.2 | 2.1 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 | 1.1 | 1.0 | 0.95 |
| **7.2** | 4.0 | 3.7 | 3.5 | 3.3 | 3.1 | 2.9 | 2.7 | 2.5 | 2.4 | 2.2 | 2.1 | 2.0 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.3 | 1.2 | 1.1 | 1.0 | 0.96 | 0.90 |
| **7.3** | 3.8 | 3.5 | 3.3 | 3.1 | 2.9 | 2.7 | 2.6 | 2.4 | 2.2 | 2.1 | 2.0 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.3 | 1.2 | 1.1 | 1.0 | 0.97 | 0.91 | 0.85 |
| **7.4** | 3.5 | 3.3 | 3.1 | 2.9 | 2.7 | 2.5 | 2.4 | 2.2 | 2.1 | 2.0 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.3 | 1.2 | 1.1 | 1.0 | 0.96 | 0.90 | 0.85 | 0.79 |
| **7.5** | 3.2 | 3.0 | 2.8 | 2.7 | 2.5 | 2.3 | 2.2 | 2.1 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 | 1.1 | 1.0 | 0.95 | 0.89 | 0.83 | 0.78 | 0.73 |
| **7.6** | 2.9 | 2.8 | 2.6 | 2.4 | 2.3 | 2.1 | 2.0 | 1.9 | 1.8 | 1.6 | 1.5 | 1.4 | 1.4 | 1.3 | 1.2 | 1.1 | 1.1 | 0.98 | 0.92 | 0.86 | 0.81 | 0.76 | 0.71 | 0.67 |
| **7.7** | 2.6 | 2.4 | 2.3 | 2.2 | 2.0 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.1 | 1.0 | 0.94 | 0.88 | 0.83 | 0.78 | 0.73 | 0.68 | 0.64 | 0.60 |
| **7.8** | 2.3 | 2.2 | 2.1 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 | 1.1 | 1.0 | 0.95 | 0.89 | 0.84 | 0.79 | 0.74 | 0.69 | 0.65 | 0.61 | 0.57 | 0.53 |
| **7.9** | 2.1 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.2 | 1.1 | 1.0 | 0.95 | 0.89 | 0.84 | 0.79 | 0.74 | 0.69 | 0.65 | 0.61 | 0.57 | 0.53 | 0.50 | 0.47 |
| **8.0** | 1.8 | 1.7 | 1.6 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.1 | 1.0 | 0.94 | 0.88 | 0.83 | 0.78 | 0.73 | 0.68 | 0.64 | 0.60 | 0.56 | 0.53 | 0.50 | 0.44 | 0.44 | 0.41 |
| **8.1** | 1.5 | 1.5 | 1.4 | 1.3 | 1.2 | 1.1 | 1.1 | 0.99 | 0.92 | 0.87 | 0.81 | 0.76 | 0.71 | 0.67 | 0.63 | 0.59 | 0.55 | 0.52 | 0.49 | 0.46 | 0.43 | 0.40 | 0.38 | 0.35 |
| **8.2** | 1.3 | 1.2 | 1.2 | 1.1 | 1.0 | 0.96 | 0.90 | 0.84 | 0.79 | 0.74 | 0.70 | 0.65 | 0.61 | 0.57 | 0.54 | 0.50 | 0.47 | 0.44 | 0.42 | 0.39 | 0.37 | 0.34 | 0.32 | 0.30 |
| **8.3** | 1.1 | 1.1 | 0.99 | 0.93 | 0.87 | 0.82 | 0.76 | 0.72 | 0.67 | 0.63 | 0.59 | 0.55 | 0.52 | 0.49 | 0.46 | 0.43 | 0.40 | 0.38 | 0.35 | 0.33 | 0.31 | 0.29 | 0.27 | 0.26 |
| **8.4** | 0.95 | 0.89 | 0.84 | 0.79 | 0.74 | 0.69 | 0.65 | 0.61 | 0.57 | 0.53 | 0.50 | 0.47 | 0.44 | 0.41 | 0.39 | 0.36 | 0.34 | 0.32 | 0.30 | 0.28 | 0.26 | 0.25 | 0.23 | 0.22 |
| **8.5** | 0.80 | 0.75 | 0.71 | 0.67 | 0.62 | 0.58 | 0.55 | 0.51 | 0.48 | 0.45 | 0.42 | 0.40 | 0.37 | 0.35 | 0.33 | 0.31 | 0.29 | 0.27 | 0.25 | 0.24 | 0.22 | 0.21 | 0.20 | 0.18 |
| **8.6** | 0.68 | 0.64 | 0.60 | 0.56 | 0.53 | 0.49 | 0.46 | 0.43 | 0.41 | 0.38 | 0.36 | 0.33 | 0.31 | 0.29 | 0.28 | 0.26 | 0.24 | 0.23 | 0.21 | 0.20 | 0.19 | 0.18 | 0.16 | 0.15 |
| **8.7** | 0.57 | 0.54 | 0.51 | 0.47 | 0.44 | 0.42 | 0.39 | 0.37 | 0.34 | 0.32 | 0.30 | 0.28 | 0.27 | 0.25 | 0.23 | 0.22 | 0.21 | 0.19 | 0.18 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 |
| **8.8** | 0.49 | 0.46 | 0.43 | 0.40 | 0.38 | 0.35 | 0.33 | 0.31 | 0.29 | 0.27 | 0.26 | 0.24 | 0.23 | 0.21 | 0.20 | 0.19 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.13 | 0.12 | 0.11 |
| **8.9** | 0.42 | 0.39 | 0.37 | 0.34 | 0.32 | 0.30 | 0.28 | 0.27 | 0.25 | 0.23 | 0.22 | 0.21 | 0.19 | 0.18 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.12 | 0.11 | 0.10 | 0.09 |
| **9.0** | 0.36 | 0.34 | 0.32 | 0.30 | 0.28 | 0.26 | 0.24 | 0.23 | 0.21 | 0.20 | 0.19 | 0.18 | 0.17 | 0.16 | 0.15 | 0.14 | 0.13 | 0.12 | 0.11 | 0.11 | 0.10 | 0.09 | 0.09 | 0.08 |

State of Oregon Department of Environmental Quality

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## Table 40

### Human Health Water Quality Criteria for Toxic Pollutants

*Effective April 18, 2014*

## Human Health Criteria Summary

The concentration for each pollutant listed in Table 40 was derived to protect Oregonians from potential adverse health impacts associated with long-term exposure to toxic substances associated with consumption of fish, shellfish, and water. The “organism only” criteria are established to protect fish and shellfish consumption and apply to waters of the state designated for fishing. The “water + organism” criteria are established to protect the consumption of drinking water, fish, and shellfish, and apply where both fishing and domestic water supply (public and private) are designated uses. All criteria are expressed as micrograms per liter (µg/L), unless otherwise noted. Pollutants are listed in alphabetical order. Additional information includes the Chemical Abstract Service (CAS) number, whether the criterion is based on carcinogenic effects (can cause cancer in humans), and whether there is an aquatic life criterion for the pollutant (i.e. “y”= yes, “n” = no). All the human health criteria were calculated using a fish consumption rate of 175 grams per day unless otherwise noted. A fish consumption rate of 175 grams per day is approximately equal to 23 8-ounce fish meals per month. For pollutants categorized as carcinogens, values represent a cancer risk of one additional case of cancer in one million people (i.e. $10^{-6}$), unless otherwise noted. All metals criteria are for total metal concentration, unless otherwise noted. Italicized pollutants represent non-priority pollutants.

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## Table 40

## Human Health Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Carcinogen | Aquatic Life Criterion | Human Health Criteria for the Consumption of: | |
|---|---|---|---|---|---|---|
| | | | | | Water + Organism (µg/L) | Organism Only (µg/L) |
| 1 | Acenaphthene | 83329 | n | n | 95 | 99 |
| 2 | Acrolein | 107028 | n | n | 0.88 | 0.93 |
| 3 | Acrylonitrile | 107131 | y | n | 0.018 | 0.025 |
| 4 | Aldrin | 309002 | y | y | 0.0000050 | 0.0000050 |
| 5 | Anthracene | 120127 | n | n | 2900 | 4000 |
| 6 | Antimony | 7440360 | n | n | 5.1 | 64 |
| 7 | Arsenic (inorganic) [A] | 7440382 | y | y | 2.1 | 2.1(freshwater) 1.0 (saltwater) |
| [A] *The arsenic criteria are expressed as total inorganic arsenic. The "organism only" freshwater criterion is based on a risk level of approximately 1 x $10^{-5}$, and the "water + organism" criterion is based on a risk level of 1 x $10^{-4}$.* | | | | | | |
| 8 | Asbestos [B] | 1332214 | y | n | 7,000,000 fibers/L | -- |
| [B] *The human health risks from asbestos are primarily from drinking water, therefore no "organism only" criterion was developed. The "water + organism" criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | | |
| 9 | *Barium* [C] | 7440393 | n | n | 1000 | -- |
| [C] *The human health criterion for barium is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the 1986 EPA Gold Book. Human health risks are primarily from drinking water, therefore no "organism only" criterion was developed. The "water + organism" criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | | |
| 10 | Benzene | 71432 | y | n | 0.44 | 1.4 |
| 11 | Benzidine | 92875 | y | n | 0.000018 | 0.000020 |
| 12 | Benz(a)anthracene | 56553 | y | n | 0.0013 | 0.0018 |

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## Table 40

## Human Health Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Carcinogen | Aquatic Life Criterion | Human Health Criteria for the Consumption of: | |
|---|---|---|---|---|---|---|
| | | | | | Water + Organism (µg/L) | Organism Only (µg/L) |
| 13 | Benzo(a)pyrene | 50328 | y | n | 0.0013 | 0.0018 |
| 14 | Benzo(b)fluoranthene 3,4 | 205992 | y | n | 0.0013 | 0.0018 |
| 15 | Benzo(k)fluoranthene | 207089 | y | n | 0.0013 | 0.0018 |
| 16 | BHC Alpha | 319846 | y | n | 0.00045 | 0.00049 |
| 17 | BHC Beta | 319857 | y | n | 0.0016 | 0.0017 |
| 18 | BHC Gamma (Lindane) | 58899 | n | y | 0.17 | 0.18 |
| 19 | Bromoform | 75252 | y | n | 3.3 | 14 |
| 20 | Butylbenzyl Phthalate | 85687 | n | n | 190 | 190 |
| 21 | Carbon Tetrachloride | 56235 | y | n | 0.10 | 0.16 |
| 22 | Chlordane | 57749 | y | y | 0.000081 | 0.000081 |
| 23 | Chlorobenzene | 108907 | n | n | 74 | 160 |
| 24 | Chlorodibromomethane | 124481 | y | n | 0.31 | 1.3 |
| 25 | Chloroethyl Ether bis 2 | 111444 | y | n | 0.020 | 0.053 |
| 26 | Chloroform | 67663 | n | n | 260 | 1100 |
| 27 | Chloroisopropyl Ether bis 2 | 108601 | n | n | 1200 | 6500 |
| 28 | Chloromethyl ether, bis | 542881 | y | n | 0.000024 | 0.000029 |
| 29 | Chloronaphthalene 2 | 91587 | n | n | 150 | 160 |
| 30 | Chlorophenol 2 | 95578 | n | n | 14 | 15 |

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## Table 40

## Human Health Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Carcinogen | Aquatic Life Criterion | Human Health Criteria for the Consumption of: | |
|---|---|---|---|---|---|---|
| | | | | | Water + Organism (µg/L) | Organism Only (µg/L) |
| 31 | Chlorophenoxy Herbicide (2,4,5,-TP) [D] | 93721 | n | n | 10 | -- |
| [D] *The Chlorophenoxy Herbicide (2,4,5,-TP) criterion is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the 1986 EPA Gold Book. Human health risks are primarily from drinking water, therefore no "organism only" criterion was developed. The "water + organism" criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | | |
| 32 | Chlorophenoxy Herbicide (2,4-D) [E] | 94757 | n | n | 100 | -- |
| [E] *The Chlorophenoxy Herbicide (2,4-D) criterion is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the 1986 EPA Gold Book. Human health risks are primarily from drinking water, therefore no "organism only" criterion was developed. The "water + organism" criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | | |
| 33 | Chrysene | 218019 | y | n | 0.0013 | 0.0018 |
| 34 | Copper [F] | 7440508 | n | y | 1300 | -- |
| [F] *Human health risks from copper are primarily from drinking water, therefore no "organism only" criterion was developed. The "water + organism" criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | | |
| 35 | Cyanide [G] | 57125 | n | y | 130 | 130 |
| | [G] *The cyanide criterion is expressed as total cyanide (CN)/L.* | | | | | |
| 36 | DDD 4,4' | 72548 | y | n | 0.000031 | 0.000031 |
| 37 | DDE 4,4' | 72559 | y | n | 0.000022 | 0.000022 |
| 38 | DDT 4,4' | 50293 | y | y | 0.000022 | 0.000022 |
| 39 | Dibenz(a,h)anthracene | 53703 | y | n | 0.0013 | 0.0018 |
| 40 | Dichlorobenzene(m) 1,3 | 541731 | n | n | 80 | 96 |

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## Table 40
## Human Health Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Carcinogen | Aquatic Life Criterion | Human Health Criteria for the Consumption of: | |
|---|---|---|---|---|---|---|
| | | | | | Water + Organism (µg/L) | Organism Only (µg/L) |
| 41 | Dichlorobenzene(o) 1,2 | 95501 | n | n | 110 | 130 |
| 42 | Dichlorobenzene(p) 1,4 | 106467 | n | n | 16 | 19 |
| 43 | Dichlorobenzidine 3,3' | 91941 | y | n | 0.0027 | 0.0028 |
| 44 | Dichlorobromomethane | 75274 | y | n | 0.42 | 1.7 |
| 45 | Dichloroethane 1,2 | 107062 | y | n | 0.35 | 3.7 |
| 46 | Dichloroethylene 1,1 | 75354 | n | n | 230 | 710 |
| 47 | Dichloroethylene trans 1,2 | 156605 | n | n | 120 | 1000 |
| 48 | Dichlorophenol 2,4 | 120832 | n | n | 23 | 29 |
| 49 | Dichloropropane 1,2 | 78875 | y | n | 0.38 | 1.5 |
| 50 | Dichloropropene 1,3 | 542756 | y | n | 0.30 | 2.1 |
| 51 | Dieldrin | 60571 | y | y | 0.0000053 | 0.0000054 |
| 52 | Diethyl Phthalate | 84662 | n | n | 3800 | 4400 |
| 53 | Dimethyl Phthalate | 131113 | n | n | 84000 | 110000 |
| 54 | Dimethylphenol 2,4 | 105679 | n | n | 76 | 85 |
| 55 | Di-n-butyl Phthalate | 84742 | n | n | 400 | 450 |
| 56 | Dinitrophenol 2,4 | 51285 | n | n | 62 | 530 |
| 57 | *Dinitrophenols* | 25550587 | n | n | 62 | 530 |
| 58 | Dinitrotoluene 2,4 | 121142 | y | n | 0.084 | 0.34 |

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## Table 40

## Human Health Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Carcinogen | Aquatic Life Criterion | Human Health Criteria for the Consumption of: | |
|---|---|---|---|---|---|---|
| | | | | | Water + Organism (µg/L) | Organism Only (µg/L) |
| 59 | Dioxin (2,3,7,8-TCDD) | 1746016 | y | n | 0.00000000051 | 0.00000000051 |
| 60 | Diphenylhydrazine 1,2 | 122667 | y | n | 0.014 | 0.020 |
| 61 | Endosulfan Alpha | 959988 | n | y | 8.5 | 8.9 |
| 62 | Endosulfan Beta | 33213659 | n | y | 8.5 | 8.9 |
| 63 | Endosulfan Sulfate | 1031078 | n | n | 8.5 | 8.9 |
| 64 | Endrin | 72208 | n | y | 0.024 | 0.024 |
| 65 | Endrin Aldehyde | 7421934 | n | n | 0.030 | 0.030 |
| 66 | Ethylbenzene | 100414 | n | n | 160 | 210 |
| 67 | Ethylhexyl Phthalate bis 2 | 117817 | y | n | 0.20 | 0.22 |
| 68 | Fluoranthene | 206440 | n | n | 14 | 14 |
| 69 | Fluorene | 86737 | n | n | 390 | 530 |
| 70 | Heptachlor | 76448 | y | y | 0.0000079 | 0.0000079 |
| 71 | Heptachlor Epoxide | 1024573 | y | y | 0.0000039 | 0.0000039 |
| 72 | Hexachlorobenzene | 118741 | y | n | 0.000029 | 0.000029 |
| 73 | Hexachlorobutadiene | 87683 | y | n | 0.36 | 1.8 |
| 74 | *Hexachlorocyclo-hexane-Technical* | 608731 | y | n | 0.0014 | 0.0015 |
| 75 | Hexachlorocyclopentadiene | 77474 | n | n | 30 | 110 |
| 76 | Hexachloroethane | 67721 | y | n | 0.29 | 0.33 |

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## Table 40

## Human Health Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Carcinogen | Aquatic Life Criterion | Human Health Criteria for the Consumption of: | |
|---|---|---|---|---|---|---|
| | | | | | Water + Organism (µg/L) | Organism Only (µg/L) |
| 77 | Indeno(1,2,3-cd)pyrene | 193395 | y | n | 0.0013 | 0.0018 |
| 78 | Isophorone | 78591 | y | n | 27 | 96 |
| 79 | Manganese [H] | 7439965 | n | n | -- | 100 |
| [H] *The "fish consumption only" criterion for manganese applies only to salt water and is for total manganese. This EPA recommended criterion predates the 1980 human health methodology and does not utilize the fish ingestion BCF calculation method or a fish consumption rate.* | | | | | | |
| 80 | Methoxychlor [I] | 72435 | n | y | 100 | -- |
| [I] *The human health criterion for methoxychlor is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the1986 EPA Gold Book. Human health risks are primarily from drinking water, therefore no "organism only" criterion was developed. The "water + organism" criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | | |
| 81 | Methyl Bromide | 74839 | n | n | 37 | 150 |
| 82 | Methyl-4,6-dinitrophenol 2 | 534521 | n | n | 9.2 | 28 |
| 83 | Methylene Chloride | 75092 | y | n | 4.3 | 59 |
| 84 | Methylmercury (mg/kg) [J] | 22967926 | n | n | -- | 0.040 mg/kg |
| [J] *This value is expressed as the fish tissue concentration of methylmercury. Contaminated fish and shellfish is the primary human route of exposure to methylmercury.* | | | | | | |
| 85 | Nickel | 7440020 | n | y | 140 | 170 |
| 86 | Nitrates [K] | 14797558 | n | n | 10000 | -- |
| [K] *The human health criterion for nitrates is the same as originally published in the 1976 EPA Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value was also published in the 1986 EPA Gold Book. Human health risks are primarily from drinking water, therefore no "organism only" criterion was developed. The "water + organism" criterion is based on the Maximum Contaminant Level (MCL) established under the Safe Drinking Water Act.* | | | | | | |

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## Table 40

## Human Health Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Carcinogen | Aquatic Life Criterion | Human Health Criteria for the Consumption of: | |
|---|---|---|---|---|---|---|
| | | | | | Water + Organism (µg/L) | Organism Only (µg/L) |
| 87 | Nitrobenzene | 98953 | n | n | 14 | 69 |
| 88 | Nitrosamines | 35576911 | y | n | 0.00079 | 0.046 |
| 89 | Nitrosodibutylamine, N | 924163 | y | n | 0.0050 | 0.022 |
| 90 | Nitrosodiethylamine, N | 55185 | y | n | 0.00079 | 0.046 |
| 91 | Nitrosodimethylamine, N | 62759 | y | n | 0.00068 | 0.30 |
| 92 | Nitrosodi-n-propylamine, N | 621647 | y | n | 0.0046 | 0.051 |
| 93 | Nitrosodiphenylamine, N | 86306 | y | n | 0.55 | 0.60 |
| 94 | Nitrosopyrrolidine, N | 930552 | y | n | 0.016 | 3.4 |
| 95 | Pentachlorobenzene | 608935 | n | n | 0.15 | 0.15 |
| 96 | Pentachlorophenol | 87865 | y | y | 0.15 | 0.30 |
| 97 | Phenol | 108952 | n | n | 9400 | 86000 |
| 98 | Polychlorinated Biphenyls (PCBs) [L] | NA | y | y | 0.0000064 | 0.0000064 |
| [L] *This criterion applies to total PCBs (e.g. determined as Aroclors or congeners).* | | | | | | |
| 99 | Pyrene | 129000 | n | n | 290 | 400 |
| 100 | Selenium | 7782492 | n | y | 120 | 420 |
| 101 | Tetrachlorobenzene, 1,2,4,5- | 95943 | n | n | 0.11 | 0.11 |
| 102 | Tetrachloroethane 1,1,2,2 | 79345 | y | n | 0.12 | 0.40 |
| 103 | Tetrachloroethylene | 127184 | y | n | 0.24 | 0.33 |

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## Table 40

## Human Health Water Quality Criteria for Toxic Pollutants

| No. | Pollutant | CAS Number | Carcinogen | Aquatic Life Criterion | Human Health Criteria for the Consumption of: | |
|---|---|---|---|---|---|---|
| | | | | | Water + Organism (µg/L) | Organism Only (µg/L) |
| 104 | Thallium | 7440280 | n | n | 0.043 | 0.047 |
| 105 | Toluene | 108883 | n | n | 720 | 1500 |
| 106 | Toxaphene | 8001352 | y | y | 0.000028 | 0.000028 |
| 107 | Trichlorobenzene 1,2,4 | 120821 | n | n | 6.4 | 7.0 |
| 108 | Trichloroethane 1,1,2 | 79005 | y | n | 0.44 | 1.6 |
| 109 | Trichloroethylene | 79016 | y | n | 1.4 | 3.0 |
| 110 | Trichlorophenol 2,4,6 | 88062 | y | n | 0.23 | 0.24 |
| 111 | Trichlorophenol, 2, 4, 5- | 95954 | n | n | 330 | 360 |
| 112 | Vinyl Chloride | 75014 | y | n | 0.023 | 0.24 |
| 113 | Zinc | 7440666 | n | y | 2100 | 2600 |