

Presented below are water quality standards that are in effect for Clean Water Act purposes.

EPA is posting these standards as a convenience to users and has made a reasonable effort to assure their accuracy. Additionally, EPA has made a reasonable effort to identify parts of the standards that are not approved, disapproved, or are otherwise not in effect for Clean Water Act purposes.



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Tribal Water Quality Standards
Version: 1.0
Date: 07-16-2015

Tribal Water Quality Standards



TWENTY-NINE PALMS BAND OF MISSION INDIANS
Tribal Environmental Protection Agency
47-250 Dillon Road
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Prepared by:
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APPROVAL SIGNATURES

The signatures of the individuals below indicate concurrence with, and agreement to operate compliance with, procedures specified in this document.

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(Signature) (Date)

U.S EPA, Region IX
Water Office

(Signature) (Date)



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ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
CWA	Clean Water Act
DQOs	Data Quality Objectives
FOIA	Freedom of Information Act
NEPA	National Environmental Policy Act
NIST	National Institute of Standards and Technology
NPDES	National Pollution Discharge Elimination System
Permittee	Twenty-Nine Palms Enterprises Corp and other facilities located on the Twenty-Nine Palms Indian Reservation
Reservation	Twenty-Nine Palms Indian Reservation
Tribal EPA	Twenty-Nine Palms Band of Mission Indians Tribal EPA
TEPALAB	Twenty-Nine Palms Band of Mission Indians Tribal EPA Laboratory
THCP	Tribal Habitat Conservation Plan
TMDL	Total Maximum Daily Load
Tribe	Twenty-Nine Palms Band of Mission Indians
WQS	Water Quality Standards



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FORWARD

The Twenty-Nine Palms Band of Mission Indians (the Tribe), as a sovereign nation and a federally recognized Indian Tribe of Chemevuevi people, is establishing water quality standards for the protection of its water resources. To the Tribe, water is inseparable from our land and culture. In the past, the Chemevuevi had always sought to protect their precious natural resources and special places. The Tribe now recognizes the need to assert full authority over all the lands and waters of the Twenty-Nine Palms Reservation in order to protect them from current and future abuse.

The Twenty-Nine Palms Band of Mission Indians Tribal Council Resolution No. GC030206A, approved March 2, 2006, documents the decision of the Tribal Council to use their authority, when approved by the U.S. Environmental Protection Agency as described in Section 518 of the Federal Water Pollution Control Act (hereafter referred to as the "Clean Water Act"), to administer a water quality standards program. The standards for water quality in this document will guide the protection of Tribal waters for present and future generations.



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1. AUTHORITY, PURPOSES, AND APPLICABILITY

1.1 Authority

The Tribal Council of the Twenty-Nine Palms Band of Mission Indians ("Tribe) has the following authority to enact these Water Quality Standards ("Standards") for all waters within the exterior boundaries (see *Figures 1 and 2*) of the Twenty-Nine Palms Indian Reservation ("Reservation"), or otherwise subject to the jurisdiction of the Tribe:

1.1.1 *Inherent and aboriginal sovereign authority*

Under the U.S. Constitution, Indian tribes possess a nationhood status and retain inherent sovereign authority. Inherent in this sovereign authority is the power to make and enforce laws, administer justice, manage and control Indian lands, exercise tribal rights and **protect tribal trust resources**.

The Twenty-Nine Palms Band of Mission Indians is a federally-recognized Chemehuevi Indian Tribe. As a federally recognized Tribe, the tribe has inherent and aboriginal sovereign authority to protect and preserve natural resources on its lands including Tribal waters.

1.1.2 *Clean Water Act*

The Twenty-Nine Palms Band of Mission Indians **met all of the statutory and qualification criteria** and the U.S. Environmental Protection Agency, Region 9, San Francisco gave the Tribe authorization to administer the water quality standards and certification programs under the Clean Water Act in October 26, 2006 (see *Figure 3*).



1.2 Purposes

The purpose of these Standards contained herein is as follows:

- 1.2.1 To promote the health of Tribal waters and the people, plants, and wildlife that depends on them through holistic management and sustainable use;
- 1.2.2 To designate the existing and attainable uses for which the surface and ground waters of the Reservation shall be protected;
- 1.2.3 To prescribe water quality standards (narrative and numeric) to sustain the designated uses;
- 1.2.4 To assure that degradation of existing water quality does not occur; and
- 1.2.5 To promote the social welfare and economic well-being of the Tribe.
- 1.2.6 The standards contained herein are intended and shall be construed to be consistent with the Clean Water Act, which declares its objective to restore and maintain the chemical, physical, and biological integrity of the waters of the U.S. The Tribe shares that objective for its waters, and further adds the objective of restoring and maintaining the **cultural and spiritual integrity** of its waters.



FIGURE 1 – TWENTY-NINE PALMS RESERVATION: COACHELLA VALLEY SECTION

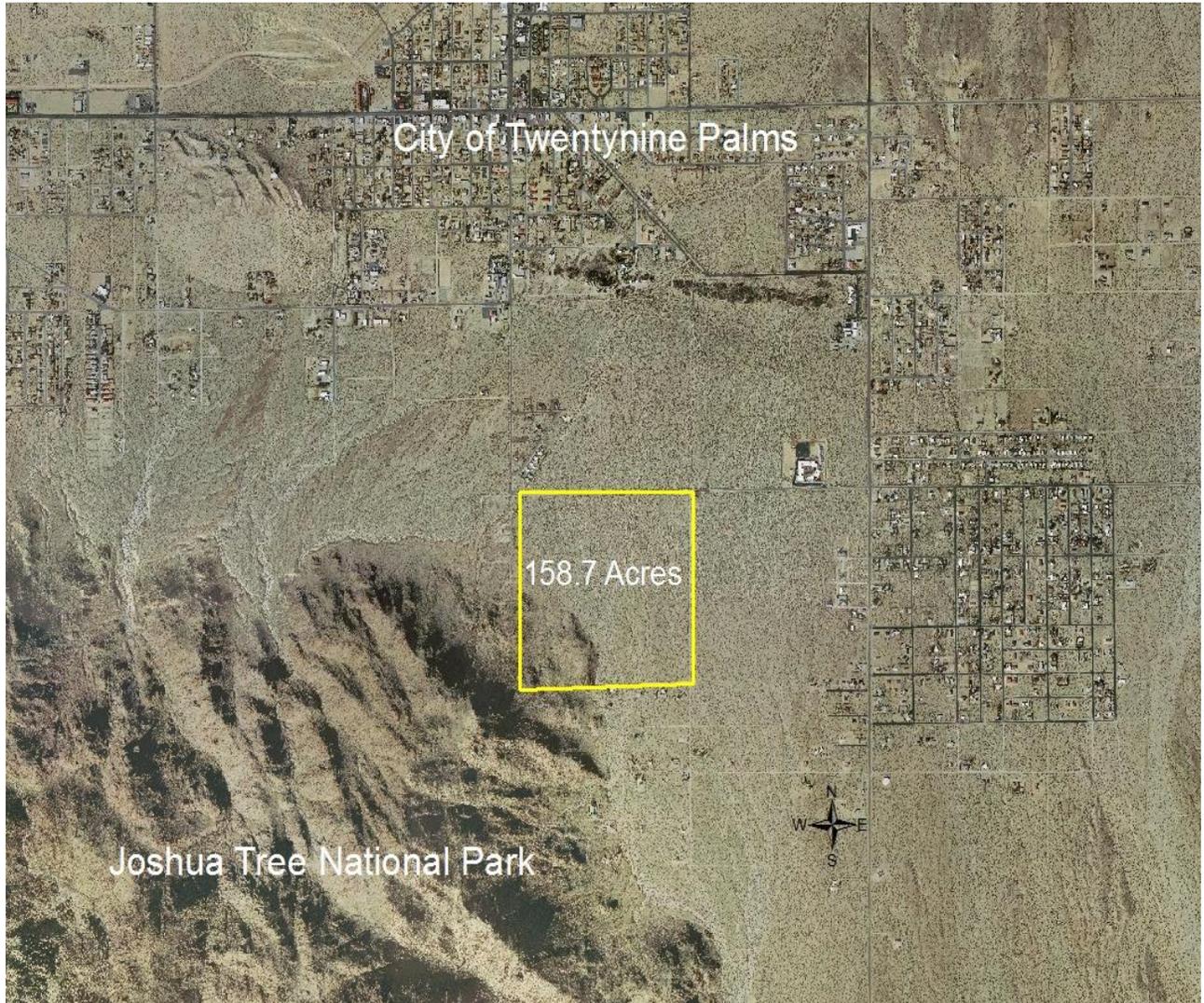




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FIGURE 2 – TWENTY-NINE PALMS RESERVATION: TWENTYNINE PALMS SECTION





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1.3 Applicability

1.3.1 *Clean Water Act*

1.3.1.1 The standards contained herein are intended and shall be construed to be consistent with the Clean Water Act, which declares its objective to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters."

1.3.1.2 The Clean Water Act also states that "it is the national goal that, wherever attainable, an interim goal of water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water be achieved by July 1, 1983."

FIGURE 3 – AUTHORIZATION OBTAINED FROM THE REGION IX U.S. EPA TO ADMINISTER THE WATER QUALITY STANDARDS AND CERTIFICATION PROGRAMS UNDER THE CLEAN WATER ACT





1.3.2 *State of California Water Quality Standards*

- 1.3.2.1 In pursuant to the Federal Clean Water Act, California water quality standards are "provisions of State or Federal law which consist of a designated use or uses for the waters of the United States and water quality criteria for such waters based upon such uses.
- 1.3.2.2 Water quality standards are to protect the public health or welfare, enhance the quality of water and serve the purposes of the Act."
- 1.3.2.3 Water quality objectives, as defined in the California Water Code (CWC) Section 13050(h), are "Limits or levels of water quality constituents or characteristics established for the reasonable protection of beneficial uses or the prevention of nuisance within a specific area."

1.3.3 *Twenty-Nine Palms Tribal Water Quality Standards*

- 1.3.3.1 Except as specifically provided herein, the Tribal Water Quality Standards Program applies to all waters within the exterior boundaries of the Reservation, including water situated wholly or partly within, or bordering upon the Reservation, including but not limited to all waters reserved by the Twenty-Nine Palms Band of Mission Indians since time immemorial.
- 1.3.3.2 The Tribe shares both the Federal and State objectives for its waters, and further adds the objective of restoring and maintaining the cultural and spiritual integrity of its waters.
- 1.3.3.3 Groundwater recharge, municipal domestic supply, agricultural supply, primary contact recreation, secondary contact recreation, culturally significant, wildlife and livestock habitat and warm freshwater habitat are other designated uses of the Tribal waters intended to be protected by these Standards. Any contamination that may result from such uses shall not lower the quality of the water below what is needed for life, including human recreation and protection and propagation of fish and wildlife that depend on Tribal waters.
- 1.3.3.4 Except as specifically provided herein, these Standards apply to all Tribal waters; that is, all waters within the exterior boundaries of the Reservation, including water situated wholly or partly within, or bordering



upon the Reservation, whether surface or subsurface, public or private.

1.3.4 *Exemptions*

- 1.3.4.1 Waters, which are not in immediate hydrologic/hydraulic connection with other surface or subsurface waters, such as some water troughs, constructed wetlands, and treatment lagoons, are excluded from these Standards.
- 1.3.4.2 Irrigation and drainage ditches and subsurface drainage systems are subject to exemptions under the CWA 40 C.F.R. §§ 122.3 (e), (f). Provision 1.3.3.5.2.
- 1.3.4.3 Artificially created conveyance systems such as irrigation ditches are also excluded; however, the standards do apply to the receiving bodies of water impacted by the effluent from such sources.
 - 1.3.4.3.1 The specified criteria apply to substances attributable to discharges, non-point sources, or instream activities.
 - 1.3.4.3.2 The criteria shall not apply to natural phenomena not brought about by human activity.

1.4 Triennial Review

- 1.4.1 Water Quality standards shall be reviewed on a triennial basis for the purposes of determining what revisions are necessary to comply with applicable Federal and Tribal regulations and water quality goals.
- 1.4.2 This process shall meet the requirements of Clean Water Act Section 303(c). For the Whitewater River section on the Twenty-Nine Palms Reservation and all other tribal waters, any water quality standards that do not include the goal uses specified in CWA Section 101(a)(2) shall be reexamined every three years to determine if any new information has become available.
- 1.4.3 If such new information indicates the CWA goal uses are attainable, the Tribe shall revise the standards accordingly.
- 1.4.4 Proposed revisions to the Tribe's water quality standards and the supporting information and analyses will be made available to the public prior to a public hearing.
- 1.4.5 Public hearings will be held in accordance with Tribal laws and USEPA requirements.



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- 1.4.6 The triennial review process will be ongoing, and public hearings will be held at least every three years following Twenty-Nine Palms Band of Mission Indians Tribal Council adoption of these standards.

1.5 Definition of Terms

- 1.5.1 **Acute toxicity:** The ability of a substance to cause severe biological harm, adverse health effects, or death from a single exposure or dose.
- 1.5.2 **Algae:** Simple rootless plants that grow in sunlit waters in relative proportion to the amounts of nutrients available, and which can adversely affect water quality by lowering the dissolved oxygen in the water.
- 1.5.3 **Anti-Degradation:** The policy set forth in Section 4 of these Standards whereby existing and designated uses, the level of water quality necessary to protect those uses, and general aquatic and riparian ecosystem health is maintained and protected.
- 1.5.4 **Assemblage:** An association of aquatic organisms of similar taxonomic classification living in the same area. Examples of assemblages include, but are not limited to, fish, macroinvertebrates, algae, and vascular plants.
- 1.5.5 **Attainment:** To meet the goal or standard. Attainment means that the water body is of sufficient quality chemically, biologically, and physically, to support the uses for which it is designated and to otherwise achieve the applicable water quality standards.
- 1.5.6 **Attainable Use:** The use of surface water, which meets water quality standards and all other characteristics necessary to support and maintain the use, as specified in Section III of these Standards, or which would support and maintain the use after the implementation of these Standards.
- 1.5.7 **Best Management Practices (BMP):** Practices undertaken to control, restrict, and diminish non-point sources of pollution, which are determined to be the most effective and practical means of preventing or reducing pollution of water bodies from non-point sources.
- 1.5.8 **Best Available Treatment Economically Achievable (BATEA):** As identified by USEPA, the most effective treatment technology that is available to effluent discharge permittees that does not cause widespread and substantial economic harm.
- 1.5.9 **Bioaccumulative:** Substances that increase in concentration in living organisms (that are slowly metabolized or excreted) as they breathe contaminated air, drink contaminated water, or eat contaminated food.



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- 1.5.10 **Biological condition:** The taxonomic composition, richness, and functional organization of an assemblage of aquatic organisms at a site or with a water body.
- 1.5.11 **Chronic toxicity:** The capacity of a substance to cause long-term poisonous health effects.
- 1.5.12 **Conveyance:** A route of transfer, for example, a pipe.
- 1.5.13 **Criteria:** Elements of water quality standards, expressed as constituent concentrations, levels, or narrative statements, representing a quality of water that supports a particular use. When criteria are met, water quality will generally protect the designated use.
- 1.5.14 **CWA:** Clean Water Act, the common name for the Federal Water Pollution Act.
- 1.5.15 **Color:** Color as used herein means true color as well as apparent color. True color is the color of the water from which turbidity has been removed. Apparent color includes not only the color due to substances in the water (true color), but also the color due to suspended matter.
- 1.5.16 **Designated Uses:** Those water uses identified in the Tribe's water quality standards for each water body, whether or not they are being attained.
- 1.5.17 **Dissolved Oxygen (D.O.):** The amount of oxygen dissolved in water or the amount of oxygen available for biochemical activity in water, commonly expressed as a concentration in milligrams per liter (mg/L).
- 1.5.18 **Domestic Water Supply:** Water that only requires disinfection in order to be usable for drinking or cooking.
- 1.5.19 **Drinking Water:** Water that does not require any treatment in order to be usable for drinking or cooking.
- 1.5.20 **Ecology:** The relationship of living things to one another and their environment, or the study of such relationships.
- 1.5.21 **Effluent:** Discharge into surface waters from other than natural sources.
- 1.5.22 **Environment:** The sum of all external conditions affecting the life, development, and survival of an organism.
- 1.5.23 **Ephemeral Stream:** A reach of a stream that flows temporarily in direct response to precipitation or snowmelt, the channel bed of which is above the water table (examples are washes and arroyos).
- 1.5.24 **Existing Uses:** Uses actually attained in a surface water body on or after November 28, 1975, whether or not they are referred to in these Standards. Some existing uses may not be included in these standards at this time.
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- 1.5.25 **Food Chain:** A sequence of organisms, each of which uses the next, lower member of the sequence as a food source.
- 1.5.26 **Functional Organization:** The number of species or abundance of organisms within an assemblage which perform the same or similar ecological functions.
- 1.5.27 **Fecal Coliform Bacteria:** The portion of the coliform group that is present in the gut or the feces of warm-blooded animals. Their presence serves as an indication of sewage or fecal contamination in water.
- 1.5.28 **Flow:** Natural discharge of a stream, spring, or artesian well; may include artificial discharge of effluent.
- 1.5.29 **Gathering of Medicinal or otherwise Culturally Significant Plants:** Collecting of plants by individual Tribal members for private use (in the home or as a cottage industry); specific plants may be recognized as significant by the Tribal Cultural Advisory Committee.
- 1.5.30 **Geometric Mean:** A mean calculated by converting all values to logarithms, averaging the logarithms, and determining the antilogarithm of that average.
- 1.5.31 **Groundwater:** Subsurface water that occurs beneath the water table (level of water in a well) in soils and geological formations that are fully saturated.
- 1.5.32 **Groundwater Recharge:** The replenishment of aquifers by seepage of surface runoff through sediments and rock formations.
- 1.5.33 **Human Health Criteria:** Criteria guidance published under section 304 (a) of the Clean Water Act and periodically updated based on the latest scientific information on the effect a pollutant concentration has on human health from consumption of fish and/or ingestion of water.
- 1.5.34 **Impaired:** A physical, biological, or chemical condition, in which a water body is not attaining the applicable water quality standards and uses for which it is designated.
- 1.5.35 **Implementation:** The act of giving practical effect to and ensuring of actual fulfillment by concrete measures.
- 1.5.36 **Indigenous:** Produced, growing, or living naturally in a particular region or environment according to current or historical records, including oral histories, compiled by Tribal, federal, or state agencies or published scientific literature.
- 1.5.37 **Industrial:** Human activities for the production of goods or services.
- 1.5.38 **Intermittent Water(s):** A stream or wetland that flows or contains water in response to both surface run-off and groundwater discharge with at least part of its channel or wetland bottom below the adjacent
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water table for some part of the year, which does not have a perennial flow or contain water perennially.

- 1.5.39 **Irrigation Use:** The use of water, after diversion, to promote the growth of crops.
- 1.5.40 **Lentic:** A still or slow moving aquatic environment, such as a lake, a reservoir, or a wetland.
- 1.5.41 **Livestock and Wildlife Use:** The use of water, by ingestion, by domestic livestock and other vertebrate animals.
- 1.5.42 **Lotic:** An aquatic environment consisting of moving water, such as a river or stream.
- 1.5.43 **Metric:** An expression of biological community composition, richness, or function that displays a predictable, measurable change in value along a gradient of pollution or other anthropogenic disturbance.
- 1.5.44 **Milligrams Per Liter (mg/L):** Unit of concentration expressed in terms of the number of milligrams contained in a volume of one liter; one milligram per liter is equivalent to one part per million (ppm) at unit density.
- 1.5.45 **Mixing Zone:** A designated area or location of a receiving water where waste waters and receiving waters mix and certain ambient water quality criteria do not need to be met.
- 1.5.46 **MPN:** Most Probable Number
- 1.5.47 **Municipal Water Supply:** Water system which supplies potable water to residents, tribal departments and enterprises.
- 1.5.48 **Narrative Standards:** A standard or criterion expressed in words rather than numerically.
- 1.5.49 **NPDES:** National Pollutant Discharge Elimination System
- 1.5.50 **NPS:** Nonpoint Source (Pollution)
- 1.5.51 **Non-attainment:** To not meet the goal or standard assigned to a water body or segment. Non-attainment means that the water body is not of sufficient quality either chemically, biologically, or physically, to support the uses for which it is designated or to otherwise fail to achieve the applicable water quality standards.
- 1.5.52 **Nuisance (species):** Non-indigenous or undesired species that negatively affect an ecosystem. Some introduced species may be non-indigenous, but may be desirable and therefore protected by these standards.
- 1.5.53 **Nonpoint Source:** Pollution that is not from a discernible, single source (e.g. sediment runoff from land).



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- 1.5.54 **NTU:** Nephelometric Turbidity Units; a measure of turbidity in water; see Turbidity.
- 1.5.55 **Nutrient:** A chemical element or inorganic compound taken in by green plants and used in organic synthesis (e.g. phosphorous and nitrogen).
- 1.5.56 **Objectionable:** Undesirable, offensive.
- 1.5.57 **Organoleptic:** Pertaining to taste and odor, as opposed to health effects.
- 1.5.58 **Outstanding Tribal Resource Water:** A tribal water body designated for protection under Tier 3 of the Tribe's antidegradation policy (see Section 4).
- 1.5.59 **PAH:** Polynuclear Aromatic Hydrocarbon
- 1.5.60 **Pathogens:** Microorganisms (bacteria, viruses, or parasites) that can cause disease in humans, animals, and plants, and can be found in sewage, runoff from farms or rural areas populated with domestic and/or wild animals, and in water used for swimming.
- 1.5.61 **Perennial Stream:** A stream or reach of a stream that flows continuously throughout the year, the upper surface of which is generally lower than the water table of the region adjoining the stream.
- 1.5.62 **Persistent:** Existing continuously or for a longer time than usual.
- 1.5.63 **pH:** The negative logarithm of the effective hydrogen-ion concentration in gram equivalents per liter.
- 1.5.64 **Picocurie (pCi):** That quantity of radioactive material producing 2.22 nuclear transformations per minute. **Point Source:** A discernible, confined, and discrete pollutant source, but not including return flows from irrigated agriculture.
- 1.5.65 **Primary Contact:** Any recreational or other water use in which there is prolonged and intimate contact with the water body, such as swimming and wading, involving considerable risk of ingesting water in quantities sufficient enough to pose a significant health hazard. Primary contact also means any use of water bodies for traditional or ceremonial purposes in which there is intimate contact with the water body that may pose a significant health risk. This contact may include, but is not limited to, ingestion or immersion.
- 1.5.66 **Priority Pollutant:** Those toxic pollutants listed by the Administrator of the U.S. Environmental Protection Agency as required in section 307(a) of the Clean Water Act.
- 1.5.67 **Reference site:** A site or water body which is determined by the Tribe to be representative of sites or waterbodies of similar type, and are least impaired with
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respect to habitat, water quality, watershed land use, and riparian and biological condition.

- 1.5.68 **Reference condition:** A physical, biological, and chemical condition that is determined by the Tribe to be characteristic of minimally impaired conditions with respect to habitat, water quality, watershed land use, and riparian and biological condition in lieu of an unimpaired reference site.
- 1.5.69 **Reservation:** Refers to all lands over which the Twenty-Nine Palms Band of Mission Indians has jurisdiction, including all land within the exterior boundaries of the Twenty-Nine Palms Indian reservation whether such land is held in trust or fee status.
- 1.5.70 **Richness Stream Descriptor:** The absolute number of taxa in an assemblage at a site or within a water body. A descriptive identifier for a water body used to distinguish conditions in addition to its designated use. For example-- an ephemeral water body.
- 1.5.71 **Secondary Contact Recreational Use:** Any recreational use of the water in which contact with the water need not occur and in which the probability of ingesting water is minimal, such as wading and boating.
- 1.5.72 **Standards:** See Water Quality Standards
- 1.5.73 **Stream Segment:** Any part, portion or subsection of a lotic surface water body. Stream segments include the entire width of a stream from one specified point at its upstream end to one specific point at its downstream end, unless specifically defined otherwise.
- 1.5.74 **Surface Water:** Water that stands or flows above ground level.
- 1.5.75 **Surface Water Body:** Any river, stream, lake, reservoir, spring, wetland or other natural conveyance that holds a quantity of water at some time.
- 1.5.76 **Taxonomic Composition:** The identity and abundance of species or taxonomic groupings within an assemblage of aquatic organisms at a site or with a water body.
- 1.5.77 **TDS:** Total Dissolved Solids.
- 1.5.78 **Technology-Based Controls:** The application of technology-based effluent limitations as required under Section 301(b) of the Clean Water Act.
- 1.5.79 **Toxic:** Harmful to living organisms.
- 1.5.80 **Toxic Pollutants:** Those pollutants or combinations of pollutants, which after discharge and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including but not



limited to malfunctions in reproduction), or physical deformations in such organisms or their offspring.

- 1.5.81 **Treatment Lagoon:** An impound for liquid wastes designed to accomplish some degree of biochemical treatment.
- 1.5.82 **Tribe:** The Twenty-Nine Palms Band of Mission Indians.
- 1.5.83 **Tribal Waters:** All waters over which the Tribe has jurisdiction and that satisfy the federal definition of "waters of the U.S." found at 40 CFR 122.2. **See Section 1 – Purpose and Authority.**
- 1.5.84 **Turbidity:** The degree to which water is cloudy or muddy in physical appearance due to suspended silt or organic matter.
- 1.5.85 **Use Attainability Analysis (UAA):** A structured scientific assessment of the factors affecting attainment of a use for a body of water, which may include physical, chemical, biological, and economic factors as referred to in 40 C.F.R. Section 131.10 (g).
- 1.5.86 **Violation (of water quality standards):** An action, or negligent lack thereof, by an individual, business or government that causes water pollution of Tribal Waters in excess of the criteria set forth in these standards, including damaging effects on the biological criteria of these standards.
- 1.5.87 **Warm water Habitat:** A stream reach, lake, or impoundment where the water temperature and other characteristics are suitable for the support of warm water fish such as, but not limited to, indigenous fishes including Desert-Mountain Sucker, Sonoran Sucker, Speckled Dace, as well as non-natives such as Largemouth Bass, Smallmouth Bass, Channel Catfish, and Flathead Catfish.
- 1.5.88 **Wastewater:** Water that has been adversely affected in quality by human activities.
- 1.5.89 **Water Contaminant:** Any substance that alters the physical, chemical, or biological qualities of water.
- 1.5.90 **Waterfowl:** A swimming bird or a bird that frequents water.
- 1.5.91 **Water Quality Standards:** The water quality goals of a water body (or portion of the water body) designating the use or uses to be made of the water and establishing criteria necessary to protect those uses.
- 1.5.92 **Waters of the Tribe:** All ponds, streams, springs, sub-surface waters, seeps, wetlands, canals, irrigation and drainage ditches, and all other surface and groundwaters which arise on, border, transverse, or underlie the Twenty-Nine Palms Reservation or are otherwise within the jurisdiction of the Tribe and which contain water at some point in the



year and are connected to other waters via surface or below ground flows. Figures 1 and 2 in Appendix D illustrate the extent and location of Tribal waters and the interaction between surface water and groundwater on the Reservation.

- 1.5.93 **Watershed:** The land area that drains into a stream, lake, or wetland.
- 1.5.94 **Water Quality Standards:** Provisions of State, Tribal, or Federal law that primarily consist of a designated use or uses for specific Tribal waters or waters of the United States, and water quality criteria for those waters based upon such uses. Water quality standards also provide policies for the prevention of degradation of quality, mixing zone policies, and site-specific requirements. Ultimately, water quality standards are to protect public health or welfare, enhance the quality of the water and serve the purposes of the Clean Water Act.
- 1.5.95 **Wetland(s):** Any area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, such as swamps, marshes, bogs, and similar areas. This includes wetlands created, restored, or enhanced as part of a mitigation procedure. This does not include wetlands intentionally constructed from non-wetland sites outside waters of the Reservation.
- 1.5.96 **Wildlife:** Living things and especially mammals, birds, and fishes which are neither human nor domesticated.

1.6 General Standards

- 1.6.1 The general standards in this document shall be maintained at all times and apply to all tribal waters including perennial, ephemeral, and intermittent streams, and to all ponds, lakes, standing waters, sub-surface waters, wetlands, and springs on the Twenty-Nine Palms Reservation.
- 1.6.2 The criteria assigned are the ones required to sustain all designated uses of the tribal waters.µ
- 1.6.3 The Tribal Council of the Twenty-Nine Palms Band of Mission Indians shall approve and issue surface water designations for all tribal waters and shall determine the suitability of tribal surface waters for primary contact purposes.
- 1.6.4 The numeric and narrative criteria contained in this document will be part of the permitting and management process for all dischargers who are subject to regulation by the Twenty-Nine Palms Tribe and/or Federal government.



1.6.5 The standards shall be used in existing permitting and management processes, or new processes that may be created, in order to determine when a designated use is threatened.

1.6.6 If standards are exceeded, and if it is determined that such exceedance would impair a designated use, then the permitting or management processes will be expected to require treatment technologies for regulated point sources and to implement such best management practices as are applicable for regulated non-point sources.

1.7 Tribal Environmental Protection Agency

1.7.1 The Tribe's Environmental Protection Agency (Tribal EPA) shall work in cooperation with other Tribal entities, the U.S. Environmental Protection Agency (USEPA), and other appropriate agencies to implement these water quality standards.

1.7.2 The responsibilities of the Tribal EPA are detailed in the Implementation Plan section of this document.

1.8 Adoption and Revision

1.8.1 The Tribal Council has exclusive authority to adopt and modify this water quality standard document.

1.8.2 The Tribal Council also may revise the standards from time to time:

1.8.2.1 If deemed necessary through use attainability analysis; or

1.8.2.2 As the need arises; or

1.8.2.3 As a result of updated scientific information.

1.9 Public Hearings

1.9.1 Pursuant to Section 303(3) of the Clean Water Act, and 33 U.S.C. § 1313(c), the Twenty-Nine Palms Band of Mission Indians shall hold public hearings at least once each three-year period for the purpose of reviewing and, as appropriate, modifying and adopting water quality standards.

1.9.2 Public hearings will be held in accordance with the Twenty-Nine Palms Band of Mission Indians Tribal law, as well as 40 C.F.R. Part 130 (USEPA's Water Quality Management Regulation), and 40 C.F.R. Part 25 (USEPA's Public Participation Regulation).

1.9.3 The Tribe shall also hold public hearings before modifying or amending Tribal water quality standards or incorporating, by reference, any regulations into the Tribal water quality standards.



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- 1.9.4 Revisions shall incorporate relevant scientific and engineering advances with respect to water quality and waste water treatment.
- 1.9.4.1 Errors resulting from inadequate or erroneous data, human or clerical oversight will be subject to correction by the Tribal Council.
 - 1.9.4.2 The discovery of such errors does not render the remaining and unaffected standards invalid.

1.10 Use Attainability Analyses

- 1.10.1 In the event that monitoring of water quality identifies waters where attainable water quality is less than existing water quality standards, or the Tribal Council wishes to remove a designated use, provided that the designated use is not an actual existing use, the standards may be modified to reflect attainability.
- 1.10.2 Such modifications shall be carried out in accordance with use attainability analysis procedures set forth in 40 C.F.R. § 131.10 or other appropriate methods.
- 1.10.3 To remove a designated use, the use attainability analysis must demonstrate that attaining the designated use is not feasible for any of the following reasons:
- 1.10.3.1 Naturally occurring pollutant concentrations prevent the attainment of the use;
 - 1.10.3.2 Natural ephemeral, intermittent or low-flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of a sufficient volume of effluent discharges without violating water conservation or other applicable requirements to enable uses to be met;
 - 1.10.3.3 Human caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;
 - 1.10.3.4 Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in attainment of the use;
 - 1.10.3.5 Physical conditions related to the natural features of the water body, such as the lack of proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water



- quality, preclude attainment of aquatic life protection uses;
- 1.10.3.6 Controls more stringent than those required by Sections 301(b) and 306 of the Clean Water Act, 33 U.S.C. § 1311(b) & 1316 would result in substantial economic and social impact.

1.11 Separability

If any provision of the Tribal Water Quality Standards (Standards) or the application of any provisions of the Standards should be held to be invalid, the application of such provision to other persons or circumstances and the remainder of the Standards shall not be affected thereby.

1.12 Variances

The Tribal Council may allow variances from Tribal Water Quality Standards on a case-by-case basis.

- 1.12.1 A variance may be allowed in certain cases where the appropriateness of specific criteria is questionable.
- 1.12.2 The variance provides a period of time during which issues concerning the appropriateness of the criteria may be resolved.
- 1.12.3 A variance shall be valid for no more than three years.
- 1.12.4 Variances are not renewable but may be reissued again upon adequate justification.
- 1.12.5 A variance shall be granted only after appropriate public participation.
- 1.12.6 Variances will be allowed by anticipated non-attainment of water quality standards due to one or more of the reasons listed in 40 C.F.R. § 131.10(g).
- 1.12.7 Variances shall be for specific pollutants, time-limited, and shall not forego the current designated use. Where a designated use for a waterbody is not now attainable but can be expected to make reasonable progress towards water quality, variances are to be issued rather than removing the designated use for that water body.

1.13 Short Term Variances

- 1.13.1 The Twenty-Nine Palms Tribal Environmental Protection Agency (Tribal EPA) may authorize short-term activities that may cause temporary violations of the water quality standards if the Twenty-Nine Palms Tribe



determines that such activities are necessary to accommodate legitimate uses or emergencies or to protect public health and welfare.

- 1.13.2 A short term exceedance will only be allowed for activities that are not likely to cause permanent or long-term impairment of beneficial uses, such as, but not limited to, riparian restoration activities, bank stabilization, mosquito abatement, algae and weed control, tracers used in hydrological studies or activities which result in overall enhancement or maintenance of beneficial uses.
- 1.13.3 Such authorization shall not be granted for activities which could result in the adverse impact on any species designated as sensitive by the Tribe.
- 1.13.4 The Tribal EPA shall specify the degree of variance, the time limit and restoration procedures where applicable.
- 1.13.5 Nothing herein shall be intended to supersede existing Twenty-Nine Palms Band of Mission Indians and federal permitting processes or requirements.

1.14 Dispute Resolution Mechanism

- 1.14.1 Should a dispute due to differing water quality standards arise between the Twenty-Nine Palms Band of Mission Indians and the State of California, the Tribe shall follow the Dispute Resolution Mechanism set forth in 40 C.F. R. § 131.7.
- 1.14.2 Should a dispute due to differing water quality standards arise between the Tribe and a neighboring Indian Tribe, the Tribe shall seek to resolve the dispute through inter-tribal discussions, mediation, or non-binding arbitration.



2. DESIGNATED USES

For each of the major surface water sources that are to be protected it is essential to designate beneficial uses. The following classifications represent existing and potential uses of all water resources on the Twenty-Nine Palms Reservation: groundwater recharge, municipal and domestic supply, agricultural, recreation, culturally significant, wildlife and livestock habitat and warm freshwater habitat. The codes used are defined in **Table 1**:

TABLE 1 - DESCRIPTION OF DESIGNATED WATER USE CATEGORIES

Type	Code	Description
Groundwater Recharge	GWR	Uses of water include natural or artificial recharge.
Municipal Domestic Supply	MUN	Uses of water for municipal, domestic and community water systems.
Agricultural Supply	AGR	Uses of water include pasture and crop irrigation, stock watering, horticulture, and support of vegetation for range grazing, as well as other miscellaneous uses in support of farming and ranching.
Primary Contact Recreation	REC-I	Uses of water include recreational activities involving actual body contact with the water where ingestion of water is reasonably possible. These include, but are not limited to, swimming, wading, and the use of natural hot springs.
Secondary Contact Recreation	REC-II	Use of water includes recreational activities that involve the presence of water but do not require contact with it, such as gathering, hiking, boating, hunting, fishing, sightseeing, and aesthetic enjoyment of scenery.
Culturally Significant	CUL	Uses of water include the traditional use of a stream/spring for cultural purposes by members of the Tribe. This may involve body contact with the water and provision of adequate flow for ceremonial purposes. Other activities may include plant gathering



		in or around water bodies, with limit or no direct contact with water.
Wildlife and Livestock Habitat	WILD	Uses of water include those that support terrestrial ecosystems including, but not limited to, the preservation and enhancement of terrestrial habitats, vegetation, wildlife, livestock, and the water and food sources.
Warm Freshwater Habitat	WARM	Uses of water include those which support warm water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

These beneficial use designations in conjunction with local water quality objectives and historical water quality data were used to help designate and assess the degree of support for beneficial uses, following the format presented in *Colorado River Basin Region 7 Water Quality Control Plan 2005*.

Water quality objectives are narrative and numeric criteria that were developed to ensure the continued support of existing and proposed designated uses of water resources. Use designations outlined in these water quality standards apply to all tribal waters of the Twenty-Nine Palms Band of Mission Indians' Reservation. Use designations for the Whitewater River, the Reservation's largest water body and only perennial water body, are shown in Table 2 below, however the same designated uses will apply to ephemeral streams.

TABLE 2 - SURFACE WATER USE DESIGNATION

Water Body	GWR	MUN	AGR	REC-I	REC-II	CUL	WILD	WARM
Whitewater River	X	X	X	X	X	X	X	X



3. CRITERIA

Tribal waters shall be free of contaminants in such quantity and duration as may, with reasonable probability, injure human health, animal or plant life, or property, or unreasonably interfere with the public welfare, or the use of property. In addition, the following narrative standards apply to all Tribal waters, unless stricter standards are imposed.

3.1 NARRATIVE CRITERIA

3.1.1 Aesthetic Qualities

All waters shall be free from substances attributable to wastewater of domestic or industrial origin or other discharges which adversely affect designated uses, such as but not limited to:

- Settling to form objectionable deposits;
- Floating as debris, scum, grease, oil, wax, or other matter that may cause nuisances; and
- Producing objectionable color, odor, taste, or turbidity.

3.1.2 Tainting Substances

Water shall be free of unnatural materials which individually or in combination produce undesirable flavors in the edible portions of aquatic organisms.

3.1.3 Toxicity

All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in human, plant, animal, or indigenous aquatic life. Compliance with this objective will be determined by use of indicator organisms, analyses of species diversity, population density, growth anomalies, 96-hour bioassay or bioassays of appropriate duration or other appropriate methods as specified by the Twenty-Nine Palms Tribal EPA. Effluent limits based upon bioassays of effluent will be prescribed where appropriate, additional numerical receiving water objectives for specific toxicants will be established as sufficient data becomes available, and source control of toxic substances will be encouraged. The survival of aquatic life in surface waters subjected to a waste discharge or other controllable water quality factors, shall not be less than that for the same water body in areas unaffected by the waste discharge, or other control water which is consistent with the requirements for



"experimental water" as described in the newest Edition of Standard Methods for Examination of Water and Wastewater, 18th Edition. As a minimum, compliance with this objective as stated in the previous sentence shall be evaluated with a 96-hour bioassay. Toxic monitoring of the appropriate surface waters will be conducted as appropriate to gather baseline data as time and resources allow.

3.1.4 Temperature

The natural receiving water temperature of surface waters shall not be altered by discharges of wastewater unless it can be demonstrated that such alteration in temperature does not adversely affect designated uses.

3.1.5 Suspended or Settleable solids

Discharges of wastes or wastewater shall not contain suspended or settleable solids in concentrations which increase the turbidity of receiving waters, unless it can be demonstrated that such alteration in turbidity does not adversely affect designated uses.

3.1.6 Total Dissolved Solids

Discharges of wastes or wastewater shall not increase the total dissolved solids content of receiving waters, unless it can be demonstrated that such an increase in total dissolved solids does not adversely affect designated uses of receiving waters.

3.1.7 Biostimulatory Substances

Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses.

3.1.8 Sediment

The suspended sediment load and suspended sediment discharge rate to surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.

3.1.9 Turbidity

Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses.



3.2 NUMERIC CRITERIA

3.2.1 pH

Since the Reservation waters are somewhat alkaline, pH shall range from 6.5-9.0. Discharges shall not cause any changes in pH detrimental to beneficial water uses.

3.2.2 Dissolved Oxygen

The dissolved oxygen concentration shall not be reduced below the following minimum levels at any time:

Waters designated	Minimum Level
Warm water habitat (WARM)	5.0 mg/L
Cold water habitat (COLD)	8.0 mg/L
Warm and cold water habitat (WARM and COLD)	8.0 mg/L

3.2.3 Bacteria

In waters designated for water contact recreation (REC I) or non-contact water recreation (REC II), the following bacterial objectives apply. Although the objectives are expressed as *E. coli* and enterococci bacteria, they address pathogenic microorganisms in general (e.g., bacteria, viruses, and fungi). Based on a statistically sufficient number of samples (generally not less than five samples equally spaced over a 30-day period), the geometric mean of the indicated bacterial densities should not exceed one or the other of the following:

Bacteria	REC I (MPN per 100 mL)	REC II (MPN per 100 mL)
<i>E. coli</i>	126	630
Enterococcus	33	165
Fecal Coliform*	100	400

*The fecal coliform concentration based on a minimum of not less than five samples for any 30-day period, shall not exceed a log mean of 200 MPN per 100 ml, nor shall more than **ten percent** of total samples during any 30-day period exceed 400 MPN per 100 mL.

Nor shall any one sample exceed the following maximum allowable level:

Bacteria	REC I (MPN per 100 mL)	REC II (MPN per 100 mL)
<i>E. coli</i>	400	2000
Enterococcus	100	500



Note that Enterococcus and *E. coli* bacteria are being used as traditional indicator microorganisms until better and similarly practical tests become readily available to more specifically target pathogens.

Because Fecal Coliform, Enterococcus and *E. coli* regrowth is an issue in the warm/temperate climate of the Coachella Valley, an anaerobic indicator organism is needed. Total *Bacteroidales* bacteria analysis by qPCR (TEPA Method MB0015C) shows a strongly positive correlation with Enterococcus, as measured using ASTM D6503-99, and will be used to validate the traditional methods:

Bacteria	REC I (*MBN per 100 mL)	REC II (*MBN per 100 mL)
Total <i>Bacteroides</i>	15	35

*MBN = Million Bacteroides Number

3.2.4 Radionuclides

Radionuclides shall not be present in waters in concentrations which are deleterious to human, plant, animal or aquatic life or that result in the accumulation of radionuclides in the food web to an extent which presents a hazard to human, plant, animal or aquatic life.

Waters designated for use as domestic or municipal supply (MUN) shall not contain concentrations of radionuclides in excess of the limits specified in the California Code of Regulations, Title 22, Chapter 15, Article 5, Section 64443, as listed below:

Constituent	Maximum Contaminant Level (pc/L)
Combined Radium-226 and Radium-228	5
Gross Alpha particle activity *	15
Tritium	20,000
Strontium-90	8
Gross Beta particle activity	50
Uranium	20

*Including Radium-226 but excluding Radon and Uranium



3.2.5 Priority Toxic Pollutants and other Chemicals

No individual chemical or combination of chemicals shall be present in concentrations that adversely affect beneficial uses. There shall be no increase in hazardous chemical concentrations found in bottom sediments or aquatic life. Tribal waters shall not contain concentrations of chemical constituents in excess of the limits specified in the U.S. EPA 2002 National Recommended Water Quality Criteria (See Priority Toxic Pollutants Table in Appendix A) with the exception of Arsenic, which shall not exceed the National Drinking Water Standard of 10 µg/L.

3.2.6 Fluoride

Limiting Concentrations of Fluoride are temperature-dependent, and are as follows:

Annual Average of Maximum Fluoride Concentration

Daily Air Temperature		Fluoride Concentrations (mg/L)			
<i>Fahrenheit</i>	<i>Celsius</i>	<i>Lower</i>	<i>Optimum</i>	<i>Upper</i>	<i>Maximum Contaminant Level</i>
Below 53.8	Below 12.1	0.9	1.2	1.7	2.4
53.8 to 58.3	12.1 to 14.6	0.8	1.1	1.5	2.2
58.4 to 63.8	14.7 to 17.6	0.8	1.0	1.3	2.0
63.9 to 70.6	17.7 to 21.4	0.7	0.9	1.2	1.8
70.7 to 79.2	21.5 to 26.2	0.7	0.8	1.0	1.6
79.3 to 90.5	26.3 to 32.5	0.6	0.7	0.8	1.4
Above 90.5	Above 32.5	0.5	0.6	0.6	1.2

3.2.7 Dioxins

Dioxins are known to be some of the most toxic manmade compounds. No dioxin compounds will be discharged to any water within the Reservation boundaries. For further information, refer to the U.S. EPA 2002 National Recommended Water Quality Criteria (See Appendix A).



3.2.8 Ammonia

Ammonia is a form of nitrogen which exists in aquatic environments and causes direct toxic effects on aquatic life. Some potential sources of ammonia include municipal effluent discharges, animal waste, and agricultural runoff. No discharge of ammonia to any water within the Reservation shall be permitted. Tribal waters of the Twenty-Nine Palms Reservation shall not exceed standards outlined in the U.S. EPA 2013 Aquatic Life Ambient Water Quality Criteria for Ammonia – Freshwater (See table below).

2013 Final Aquatic Life Criteria for Ammonia (Magnitude, Frequency, and Duration) (mg TAN/L) pH 7.0, T=20°C	
<i>Acute (1-hour average)</i>	17
<i>Chronic (30-day rolling average)</i>	1.9*
*Not to exceed 2.5 times the Criteria Continuous Concentration as a 4-day average within the 30-days, i.e. 4.8 mg TAN/L at pH 7 and 20°C, more than once in three years on average.	
Criteria frequency; Not to be exceeded more than once in three years on average.	

3.2.9 Carcinogenic Substances

Risk-based criteria for carcinogenic substances shall be applied such that the upper-bound excess cancer risk is less than or equal to one in 1,000,000, which means the probability of one excess cancer per million people exposed.

4. ANTI-DEGRADATION POLICY

Twenty-Nine Palms Band of Mission Indians antidegradation policy is based on the three tiered Federal policy in 40 CFR 131.12. It applies to all Reservation surface waters.

4.1 Tier 1

4.1.1 Existing in-stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

4.2 Tier 2

4.2.1 Where the quality of waters exceed the level necessary to support the propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the Tribe



finds, after appropriate intergovernmental coordination and public participation, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located.

- 4.2.2 In allowing such degradation or lower water quality, the Tribe shall assure water quality adequate to protect existing uses fully.
- 4.2.3 Further, the Tribe shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources; and
- 4.2.4 All cost-effective and reasonable best management practices for nonpoint source control.

4.3 Tier 3

- 4.3.1 In those cases where a potential impairment of water quality associated with a thermal discharge is involved, the antidegradation policy and implementing method shall be consistent with Section 316 of the Clean Water Act.
- 4.3.2 See Appendix C, Anti-degradation Implementation Procedures, for specific procedures to determine the course of action in the event of a potential for degradation or necessary enforcement action.
- 4.3.3 Where high quality waters constitute such a designation, an Outstanding Tribal Resource Water (OTRW) designation may be adopted.
- 4.3.4 The level of water quality of these waters shall be maintained and protected. These may include, but not be limited to, waters that have outstanding water quality, unique aquatic ecology, or recreational, ceremonial, or aesthetic characteristics that qualify them for such a designation by the Tribe.
- 4.3.5 See definition of Outstanding Tribal Resource Water above. See Section 11 and Appendix C for more information regarding OTRW designation.



5. IMPLEMENTATION OF STANDARDS

5.1 Implementation Procedures

Implementation Procedures for the Anti-degradation Policy are as follows:

- 5.1.1 The Environmental Department of the Tribe shall implement these Standards, including but not limited to its anti-degradation policy, by establishing and maintaining controls on the discharge of pollutants to surface waters. The Tribe may adopt additional regulations and procedures for compliance with the Standards. Unless and until the Tribe asserts primary responsibility for NPDES permitting, the USEPA shall work together with the Tribe to develop, issue, and enforce permits for dischargers within the Reservation in accordance with the Standards set forth herein.
- 5.1.2 To the extent required to ensure compliance with these Standards, the Environmental Department and other Tribal departments, and outside agencies as requested by the Tribe shall:
 - 5.1.2.1 Monitor water quality (chemical, physical, and biological) to assess the effectiveness of pollution controls and to determine whether the Standards are being attained.
 - 5.1.2.2 Obtain and assess information pertinent to the actual environmental effect of any effluent discharge, using data that accurately represents the quality and quantity of the effluent and receiving water, with due consideration of all factors that bear on the actual or attainable use of a receiving water.
 - 5.1.2.3 Advise any prospective discharger in writing, as needed, of requirements for obtaining a permit to discharge, including any additional permit requirements that the Tribe may enact.
 - 5.1.2.4 Maintain and review the adequacy of existing databases and obtain additional data when required.
 - 5.1.2.5 Assess the probable impact of effluent discharges on receiving waters with regard to designated uses, anti-degradation policy, and numeric and narrative standards.
 - 5.1.2.6 Require the highest and best degree of wastewater treatment, practicable and commensurate with protecting and maintaining designated uses and the existing water quality of the receiving water, with consideration of the long-term Tribal objectives for the economy and the environment.
 - 5.1.2.7 Follow USEPA-approved procedures to develop water quality-based effluent limitations and comment on technology-based effluent limitations, as appropriate, for inclusion in any Tribal or federal permit issued to a discharger.
 - 5.1.2.9 Institute and coordinate water pollution control activities with other Tribal entities and local, state, and federal agencies as appropriate.
 - 5.1.2.10 Develop and pursue monitoring and inspection programs to ensure that:



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- 5.1.2.11 Dischargers comply with requirements of these Standards.
 - 5.1.2.12 Satisfy the requirements of any regulations the Tribe enacts, or permits the Tribe issues, subsequent to the adoption of these Standards.
 - 5.1.2.13 Determine whether the Standards are being attained.
 - 5.1.2.14 Assist the Tribal Water Department in providing continuing technical training for wastewater treatment facility operators through training and certification programs.
 - 5.1.2.15 Encourage in conjunction with other Tribal entities and outside agencies, the development and implementation of BMP's to control non-point sources of pollutants to achieve compliance with these Standards.
 - 5.1.2.16 Ensure that the provisions for tribal participation required by Tribal policies and applicable provisions of the Clean Water Act are followed.
 - 5.1.2.17 Provide technical support as is required to accomplish the objectives of these Standards, including recommending to the Tribal Council any permitting or management regulations consistent with the purposes of these Standards.

5.2 Public Notification

Any proposed amendments of these Standards must be carried out according to Tribal policies regarding community review of Tribal standards.

Amendments of these Standards shall also comply with applicable requirements of the Federal Clean Water Act



6. WATER QUALITY SAMPLING AND ANALYSES

6.1 Methodology

All methods of sample collection, preservation, and analysis shall be in accordance with procedures prescribed by the latest edition of EPA's authoritative analytical references. Such references include the latest editions of any of the following authorities: (1) American Public Health Association's "Standard Methods for the Examination of Water and Wastewater" (21st Edition); (2) EPA Publication 600/4-79-020: "Methods for Chemical Analysis of Water and Wastes" (March, 1983); or (3) "Guidelines Establishing Test Procedures for the Analysis of Pollutants" (40 C.F.R. Part 136); and by approved Tribal quality assurance plans.

6.2 Bacteriological Surveys

In conducting such surveys, the monthly geometric mean shall be used in assessing attainment of standards when a minimum of five samples is collected in a 30-day period. No single sample shall exceed the upper limit for bacterial concentration, as set forth in Section V, when less than five samples are collected in a 30-day period.

6.3 Sampling Procedures

The sampling procedures outlined in the most recent versions of the Twenty-Nine Palms Band of Mission Indians' approved quality assurance plans shall be followed.

Total *Bacteroidales* is determined using a *Simplified EPA Method B for Total Bacteroidales in Fresh Ambient Water by TaqMan® Quantitative Polymerase Chain Reaction (qPCR) Assay using Applied Biosystems StepOne Plus* (SOP submitted under separate cover). A comparative study of FIB discharge from the Valley Sanitary District Wastewater Treatment Plant in Indio, California from 8/3/2011 to 8/6/2013 (3 years) revealed a strong correlation ($r = 0.81$) between Total *Bacteroidales* and Enterococcus present in effluent entering the Whitewater River (see **Figure 5**). Numeric WQS for Total *Bacteroidales* for REC I (15 MBN per 100 mL) and REC II (35 MBN per 100 mL) are based on comparable Enterococcus WQS for REC I (100 MPN per 100 mL) and REC II (500 MPN per 100 mL).



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Figure 4 – Twenty-Nine Palms Surface Water

Whitewater River Sampling Sites

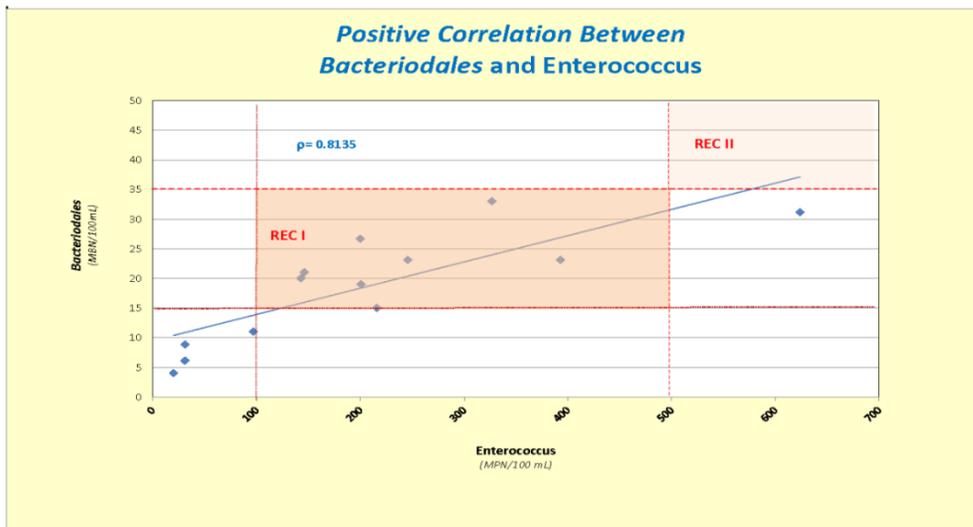




FIGURE 5 – COMPARATIVE STUDY OF FIB DISCHARGE FROM VALLEY SANITARY DISTRICT WASTEWATER TREATMENT PLANT IN INDIO, CALIFORNIA

Comparative Study of FIB Discharge from Valley Sanitary District Wastewater Treatment Plant Indio, California									
Sampling Date	Lab ID	Sampling Site	Site Description	Total Bacteroidales (MBN/100 mL)	E. coli (MPN/100 mL)	Fecal Coliform (MPN/100 mL)	Total Coliform (MPN/100mL)	Enterococcus (MPN/100 mL)	
08/03/11	2011-008-2	SW-1D	VSDWTP Discharge Pipe	9		71		1,210	31
09/14/11	2011-012-2	SW-1D	VSDWTP Discharge Pipe	27	6	21		10,800	200
11/03/11	2011-014-2	SW-1D	VSDWTP Discharge Pipe	4	1	1		556	20
11/30/11	2011-016-3	SW-1D	VSDWTP Discharge Pipe	21	2	10		1,333	146
12/14/11	2011-017-4	SW-1D	VSDWTP Discharge Pipe	11	1	10		11,000	97
01/25/12	2012-003-2	SW-1D	VSDWTP Discharge Pipe	19	2	4		1,990	201
02/29/12	2012-008-2	SW-1D	VSDWTP Discharge Pipe	15	25	33		857	216
06/06/12	2012-015-2	SW-1D	VSDWTP Discharge Pipe	23	12	15		2,400	393
09/05/12	2012-018-2	SW-1D	VSDWTP Discharge Pipe	6	0	2		743	31
12/19/12	2012-021-2	SW-1D	VSDWTP Discharge Pipe	23	3	5		233	246
03/27/13	2013-004-2	SW-1D	VSDWTP Discharge Pipe	31	2	15		413	624
06/19/13	2013-010-2	SW-1D	VSDWTP Discharge Pipe	33	2	29		1,664	327
08/06/13	2013-011-2	SW-1D	VSDWTP Discharge Pipe	20	1	16		1,046	143

Correlative FIB Analysis					
	Bacteroidales	E. coli	Fecal Coliform	Total Coliform	Enterococcus
Bacteroidales	1				
E. coli	0.027505459	1			
Fecal Coliform	-0.010503737	0.651788768	1		
Total Coliform	0.041740464	-0.050617501	-0.038877192	1	
Enterococcus	0.81352458	0.177971754	-0.069404797	-0.13496515	1



MPN = Most Probable Number
 MBN = Million Bacteroidales Number
 ρ = Correlation Coefficient



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APPENDIX A – U.S. EPA NATIONAL RECOMMENDED WATER QUALITY CRITERIA: 2002



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United States
Environmental Protection
Agency

Office of Water
Office of Science and Technology
(4304T)

EPA-822-R-02-047
November 2002



National Recommended Water Quality Criteria: 2002



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NOTICE

This document has been reviewed by the Health and Ecological Criteria Division, Office of Science and Technology, U.S. Environmental Protection Agency, and approved for publication.



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I Introduction

The U.S. Environmental Protection Agency (EPA) is publishing an updated compilation of its national recommended water quality criteria for 158 pollutants, developed pursuant to section 304(a) of the Clean Water Act (CWA or the Act). Section 304(a)(1) of the Act requires EPA to develop and publish, and from time to time revise, criteria for water quality accurately reflecting the latest scientific knowledge. Water quality criteria developed under section 304(a) are based solely on data and scientific judgments on the relationship between pollutant concentrations and environmental and human health effects. Section 304(a) criteria do not reflect consideration of economic impacts or the technological feasibility of meeting the chemical concentrations in ambient water.

The recommended water quality criteria contained in this document provide guidance for states and tribes authorized to establish water quality standards under the CWA to protect human health and aquatic life. Under the CWA, states and authorized tribes are to establish water quality standards to protect designated uses. Such standards are used in implementing a number of environmental programs, including setting discharge limits in National Pollutant Discharge Elimination System (NPDES) permits. While this document constitutes the EPA's guidance regarding ambient concentrations for various pollutants, this document does not substitute for the CWA or EPA's regulations; nor is it a regulation itself. Thus, it cannot impose legally binding requirements on the EPA, states, authorized tribes or the regulated community, and might not apply to a particular situation based upon the circumstances. State and tribal decision-makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance when appropriate. The EPA may change this guidance in the future.

II What is in this Updated Compilation?

EPA developed an updated compilation of its national recommended water quality criteria (NRWQC) for pollutants. The criteria in this document supercede any Clean Water Act (CWA) section 304(a) water quality criteria published in EPA's previous criteria compilations including: the "Blue Book," "Red Book," "Gold Book" and EPA's last compilation of national recommended water quality criteria published on December 10, 1998 (63 FR 68354 or *National Recommended Water Quality Criteria—Correction*, April 1999, EPA 822-Z-99-001). Many of the human health criteria in this compilation have been revised based on EPA's new methodology for deriving human health criteria (See: *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (2000), EPA-822-B-00-004, October 2000). Water quality criteria contained in this document may be superceded by the publication of section 304(a) water quality criteria subsequent to the publication of this document.

This compilation is presented as a summary table containing EPA's water quality criteria for 158 pollutants. For each set of criteria, EPA lists a **Federal Register** citation, EPA document number or Integrated Risk Information System (IRIS) entry (www.epa.gov/iris/index.html). Information pertinent to the derivation of individual criteria may be found in the cited references or footnotes. Still, these references may not be a single complete source of information for the



criteria derivation. You may need to refer to more than one document for complete information. A calculation matrix that contains all of the components (e.g., cancer potency factors (q1*s), reference doses (RfDs) and bioconcentration factors (BCFs)) and formulas used to derive the human health criteria in the compilation is available at <http://www.epa.gov/waterscience/criteria/>. EPA does not have national recommended water quality criteria for pollutants with no criteria listed.

The national recommended water quality criteria include: previously published criteria that are unchanged, criteria that have been recalculated from earlier criteria (63 FR68354, 12/10/1998) and newly calculated criteria based on peer-reviewed assessments and data.

The Agency intends to revise this compilation of national recommended water quality criteria from time to time to keep states and authorized tribes informed as to the most current recommended section 304(a) water quality criteria.

III What is the Relationship Between These Criteria and Your State or Tribal Water Quality Standards?

As part of the water quality standards triennial review process defined in Section 303(c)(1) of the CWA, the states and authorized tribes are responsible for maintaining and revising water quality standards. Water quality standards consist of designated uses, water quality criteria to protect those uses, a policy for antidegradation, and general policies for application and implementation. Section 303(c)(1) requires States and Tribes to review, and modify if appropriate, their water quality standards at least once every three years.

States and authorized tribes must adopt water quality criteria that protect designated uses. Protective criteria are based on a sound scientific rationale and contain sufficient parameters or constituents to protect the designated uses. Criteria may be expressed in either narrative or numeric form. States and authorized tribes have four options when adopting water quality criteria for which EPA has published section 304(a) criteria. They can: (1) establish numerical values based on recommended section 304(a) criteria; (2) adopt section 304(a) criteria modified to reflect site-specific conditions; (3) adopt criteria derived using other scientifically defensible methods; or (4) establish narrative criteria where numeric criteria cannot be determined (40 CFR 131.11).

Consistent with 40 CFR131.21 (See: *EPA Review and Approval of State and Tribal Water Quality Standards* (65 FR 24641, April 27, 2000)), water quality criteria adopted by law or regulation by States and Tribes prior to May 30, 2000, are in effect for CWA purposes unless superseded by federal regulations (see, for example, the *National Toxics Rule*, 40 CFR 131.36; *Water Quality Standards for Idaho*, 40 CFR 131.33). New or revised water quality criteria adopted into law or regulation by States and Tribes on or after May 30, 2000 are in effect for CWA purposes only after EPA approval.



IV What is the Status of Existing Recommended Criteria While They Are Under Revision?

Water quality criteria published by EPA remain the Agency's recommended water quality criteria until EPA revises or withdraws the criteria. For example, while undertaking recent reassessments of certain chemicals, EPA has consistently supported the use of the existing section 304(a) criteria for these chemicals and considers them to be scientifically sound until the Agency reevaluates the 304(a) criteria, subjects the criteria to appropriate peer review, and subsequently publishes revised 304(a) criteria.

V What's New in the Compilation?

Human Health Criteria

Revised Human Health Criteria

EPA revised the methodology it uses to develop water quality criteria for protection of human health. The revised methodology entitled, *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (2000) (EPA-822-B-00-004, October 2000) and a **Federal Register** notice (65 FR 66443, 11/3/2000) both describe the Agency's current approach for deriving national recommended water quality criteria to protect human health.

EPA has revised many of the human health criteria in the compilation based on this new methodology. By and large, these represent partial updates of the 304(a) criteria as described in both the draft Methodology revisions and the **Federal Register** notice that accompanied the final Methodology (65 FR 66443). EPA received much support for revising criteria based on partially updated components of the criteria equations as a way of increasing the frequency of scientific improvements to the nationally recommended criteria that currently available information would allow. For a water quality criterion revision based on a partial update to be considered acceptable to EPA, a component of the criterion (e.g., the toxicological risk assessment) would need to be comprehensive (e.g., a new or revised RfD or cancer dose-response assessment, as opposed to simply a new scaling factor), should stand alone and be based on new national or local data. These recalculations of water quality criteria integrate an updated national default freshwater/estuarine fish consumption rate (17.5 g/day) and, in some cases, previously determined relative source contribution (RSC) values obtained from primary drinking water standards as well as new cancer potency information from the Agency's Integrated Risk Information System (IRIS).

EPA has not revised the human health criteria in today's compilation to include bioaccumulation factors (BAFs) based on the 2000 Methodology. The BAF component of criteria development is comparatively time- and resource-intensive. As previously indicated, EPA received support for partial updates rather than waiting a substantially longer period of time for BAFs to be developed. EPA also received support for the idea of not automatically developing BAFs for all of the currently published criteria, but rather revising criteria for



pollutants of high priority and national importance. EPA intends to focus its limited resources on developing BAFs for pollutants that the Agency considers highest priority in terms of toxicological concern, frequency of occurrence and bioaccumulation potential. EPA is in the process of determining candidate pollutants for BAF derivations. The human health criteria were developed with BCFs or field-measured BAFs previously developed using the 1980 Methodology. The BCFs used in deriving these criteria are consistent with BCFs used in promulgating human health criteria for priority toxic pollutants in rules such as the 1992 *National Toxics Rule* and the 2000 *California Toxics Rule*.

Not all of EPA's national recommended water quality criteria for protection of human health were revised in this compilation. Criteria currently undergoing major reassessments, such as arsenic, chloroform and nickel, were not revised at this time. Water quality criteria that predate EPA's 1980 human health methodology were not revised for this effort. EPA believes revisions for these criteria, which include barium, 2,4-D and 2,4,5-TP, iron, manganese, methoxychlor, nitrates and solids (dissolved) and salinity may warrant major reassessments. Updated IRIS information and/or RSC values are available for vinyl chloride, 1,1-dichloroethylene, 1,3-dichloropropene, thallium, chlorobenzene, cyanide, ethylbenzene, toluene, 1,2-trans-dichloroethylene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, hexachlorocyclopentadiene, 1,2,4-trichlorobenzene, Lindane and Endrin. Yet, EPA did not update the criteria for the preceding 15 chemicals in this document. EPA intends to publish revisions for the aforementioned chemicals in a separate **Federal Register** notice, soliciting scientific views regarding these revisions.

New IRIS information was available and incorporated for benzene. EPA revised the criteria for benzene based on the new cancer slope factors, which are presented in IRIS as a range. The set of risk estimates falling within this interval reflects both the inherent uncertainties in the risk assessment of benzene and the limitations of the epidemiological studies in determining dose-response and exposure data. EPA modeled the unit risk values for the carcinogenicity of benzene from epidemiological data on occupationally exposed humans. The unit risk is expressed as a range rather than a single value because in the case of this particular pollutant there is no scientific basis for choosing a single result from various model estimates. (See IRIS Benzene CASRN 71-43-2 (01/19/2000) at: www.epa.gov/iris/subst/0276.htm). The resulting ranges of criteria for protection of human health from consumption of water and organisms and consumption of organisms only are 0.61- 2.2 ug/L and 14- 51 ug/L, respectively. The Agency calculated the criteria as ranges, but is recommending the use of the upper limits in the criteria table. EPA considers any criterion in each range scientifically defensible, yet only the upper limit of each range is presented to establish the upper bound of the average ambient concentration that should not be exceeded.

For copper and asbestos, the Agency chose to base the section 304(a) water quality criteria on the Agency's drinking water maximum contaminant levels (MCLs) or action levels which are established on drinking water regulation methodologies.

A notice of intent to revise or develop human health criteria for arsenic, methylmercury and carbofuran was published in the **Federal Register** on October 12, 2000 (65 FR 60664). This



notice informed the public that EPA was in the process of revising or developing criteria for these pollutants and solicited any significant scientific information the public may be aware of that was not identified in EPA's literature search. A human health criterion for methylmercury is now available. Work is ongoing for arsenic and carbofuran.

Methylmercury

On January 8, 2001, EPA announced the availability of a recommended water quality criterion for methylmercury (66 FR 1344). In the January 8, 2001 notice, EPA withdrew its previous ambient human health water quality criteria for mercury (see 63 FR 68354, December 10, 1998; correction in 64 FR 19781, April 22, 1999) as the recommended section 304(a) water quality criteria. This updated compilation contains the new methylmercury criterion. This new water quality criterion describes the concentration of methylmercury in freshwater and estuarine fish and shellfish tissue that should not be exceeded to protect consumers of fish and shellfish among the general population. EPA expects the criterion recommendation to be used as guidance by states, tribes, and EPA in establishing or updating water quality standards for waters of the United States and in issuing fish and shellfish consumption advisories. This is the first time EPA has issued a water quality criterion expressed as a fish and shellfish tissue value rather than as a water column value. This approach is a direct consequence of the scientific consensus that consumption of contaminated fish and shellfish is the primary human route of exposure to methylmercury. EPA recognizes that this approach differs from traditional water column criteria, and will pose implementation challenges. In the January 8, 2001 notice EPA provided suggested approaches for relating the fish and shellfish tissue criterion to concentrations of methylmercury in the water column. EPA also plans to develop more detailed guidance to assist states and authorized tribes with implementation of the methylmercury criterion in water quality standards and related programs.

Dioxin

The section 304(a) water quality criteria for dioxin contained in this compilation is expressed in terms of 2,3,7,8-Tetrachloro-dibenzo-p-dioxin (2,3,7,8-TCDD) and should be used in conjunction with the national/international convention of toxicity equivalence factors (TEF/TEQs) to account for the additive effects of other dioxin-like compounds (dioxins). EPA supports the use of either the 1989 interim procedures or the 1998 World Health Organization (WHO) TEF scheme, but prefers the 1998 WHO TEF scheme because it is based on more recent data and is internationally accepted. (See: *Update to the Interim Procedures for Estimating Risks Associated with Exposures to Mixtures of Chlorinated Dibenzo-p-dioxins and -dibenzofurans*, EPA/625/3-89/016, March 1989 and Van den Berg M., 1998). By applying the TEF/TEQ approach, the other highly toxic dioxins will be properly taken into account.



Aquatic Life Criteria

Revised Definition of Total PCBs for Aquatic Life Criteria

The aquatic life criteria for Polychlorinated Biphenyls (PCBs) in this compilation apply to total PCBs. The definition of total PCBs is the sum of all homolog, all isomer, all congener, or all Aroclor analyses. The aquatic life criteria contained in the previous publication of the NRWQC (63 FR 68354, 12/10/1998) were based on total PCB concentrations, but the definition of total PCBs only applied to the sum of seven particular Aroclors (1242, 1254, 1221, 1232, 1248, 1260 and 1016, CAS numbers 53469219, 11097691, 11104282, 11141165, 12672296, 11096825, and 12674112, respectively). This revision of the aquatic life criteria harmonizes the total PCB definition with that used for EPA's human health criteria for PCBs.

Saltwater Dissolved Oxygen (Cape Cod to Cape Hatteras)

This new compilation of NRWQC contains saltwater criteria for dissolved oxygen (D.O.). EPA's new water quality criteria are the result of a 10-year research effort to produce sufficient information to support their development. The water quality criteria presented today represent EPA's best estimates, based on the data available, of D.O. concentrations necessary to protect aquatic life and uses associated with aquatic life.

EPA published saltwater criteria for dissolved oxygen because hypoxia (low dissolved oxygen) is a significant problem for certain coastal waters that receive runoff containing nutrients (e.g., nitrogen, phosphorous) and other oxygen demanding biological wastes. Excessive amounts of nutrients in aquatic systems stimulate algal growth which can deplete available dissolved oxygen required to maintain healthy fish and shellfish populations. EPA's Environmental Monitoring and Assessment Program (EMAP) for the estuaries in the Virginian Province (defined as Cape Cod to Cape Hatteras) has shown that 25% of the area of the Virginian Province exhibits dissolved oxygen concentrations of less than 5 mg/L. For many fish and shellfish, extended periods of D.O. below 5 mg/L can cause adverse effects to larval life stages. EMAP also has generated field observations that correlate many of the biologically degraded benthic areas with low dissolved oxygen in the lower water column. These two reports emphasize that hypoxia is a major concern within the Virginian Province, among other coastal locations of the United States.

The geographic scope of the saltwater dissolved oxygen water quality criteria are limited to coastal saltwaters of the Virginian Province of the Atlantic coast of the United States (i.e., southern Cape Cod, MA, to Cape Hatteras, NC). However, the saltwater dissolved oxygen criteria can be applied elsewhere if the species and data used to derive the criteria for the Virginia Province are applicable to location-specific biological, physical, and water quality conditions. EPA believes that the overall approach for deriving marine water quality criteria for D.O. contained in *Ambient Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Cod to Cape Hatteras* is applicable to regions outside the Virginian Province.



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For additional information see: *Ambient Water Quality Criteria for Dissolved Oxygen (Saltwater): Cape Cod to Cape Hatteras* (EPA-822R-00-012).

Freshwater Aquatic Life Criteria for Ammonia

This compilation includes EPA's latest revision (1999) of the freshwater aquatic life criteria for ammonia. The new water quality criteria reflect research and data since 1984, including the pH and temperature relationship of the acute and chronic criteria and the averaging period of the chronic criterion. The revised acute criterion for ammonia is now dependent on pH and fish species, and the chronic criterion is dependent on pH and temperature. At lower temperatures, the chronic criterion incorporates the presence or absence of early life stages of fish. The temperature dependency results in a gradual increase in the criterion as temperature decreases. At temperatures below 15 °C the criterion is more stringent, when early life stages of fish are expected to be present. EPA's recommendations in the 1999 criteria represent a change from both the 1984 chronic ammonia criterion, which was dependent mainly on pH, and from the 1998 ammonia criteria, in which the chronic criterion was dependent on pH and the presence of early life stages of fish.

For additional information see: *1999 Update of Ambient Water Quality Criteria for Ammonia* (EPA-822-R-99-014).

Cadmium

EPA revised its aquatic life criteria for cadmium. A notice was published in the **Federal Register** (65 FR 50201, 8/17/2000) announcing the availability of the peer review draft and soliciting any significant scientific input from the public. EPA has addressed the peer review comments and significant issues raised by the public. A notice of availability for the completed document, entitled *2001 Update of Ambient Water Quality Criteria for Cadmium* (EPA-822-R-01-001) was published in the **Federal Register** on April 12, 2001 (66 FR18935).

Guidance on the Calculation of Hardness-Dependent Metals Criteria

Freshwater aquatic life criteria for certain metals are expressed as a function of hardness because hardness can affect the toxicities of these metals. Hardness is used as a surrogate for a number of water quality characteristics which affect the toxicity of metals. Increasing hardness has the effect of decreasing the toxicity of metals. Water quality criteria to protect aquatic life may be calculated at different concentrations of hardness measured in milligrams per liter (mg/L) as calcium carbonate (CaCO₃).

Appendix B of this document presents the hardness-dependent equations for freshwater metals criteria. The specific values in the table are calculated at a hardness of 100 mg/L (CaCO₃) for illustrative purposes only. The hardness equations included in this compilation were developed based on results from laboratory toxicity tests that were conducted in fresh waters encompassing a range of hardness values. Although the amount of data and the strength of the



relationship vary for different metals, almost all data for hardness and toxicity are in the 20 to 400 mg/L hardness range.

In the past, EPA recommended that when the hardness of fresh surface water is less than 25 mg/L, 304(a) criteria concentrations be calculated as if the hardness is 25 mg/L. Available toxicity data in this range for copper, zinc and cadmium (EPA 440/5-84-031, EPA 440/5-87-003, and EPA-822-R-01-001) are somewhat limited, and are quite limited for silver, lead, chromium III and nickel (EPA 440/5-80-071, EPA 440/5-84-027, EPA 440/5-84-029 and EPA 440/5-86-004). Even fewer data are available below 20 mg/L hardness for copper, zinc and cadmium and none are available for silver, lead, chromium III and nickel. EPA evaluated these limited data, available in the current metals' criteria documents, and determined that they are inconclusive. Capping hardness at 25 mg/L without additional data or justification may result in criteria that provide less protection than that intended by EPA's *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* (EPA 822/R-85-100) or "the Guidelines." Therefore, EPA now recommends that hardness not be capped at 25 mg/L, or any other hardness on the low end. If there is a state or tribal regulatory requirement that hardness be capped at 25 mg/L, or if there are any situation-specific questions about the applicability of the hardness-toxicity relationship, a Water Effect Ratio (WER) procedure should be used to provide the level of protection intended by the Guidelines. When an ambient hardness of less than 25 mg/L is used to establish criteria for lead or cadmium, the hardness dependent Conversion Factor (CF) should not exceed one.

For hardness over 400 mg/L, EPA recommends two options: (1) calculate the criterion using a default WER of 1.0 and using a hardness of 400 mg/L in the hardness equation; or (2) calculate the criterion using a WER and the actual ambient hardness of the surface water in the equation. The second option is expected to result in the level of protection intended in the Guidelines whereas the first option is thought to result in an even more protective aquatic life criterion. At high hardness there is an indication that hardness and related inorganic water quality characteristics do not have as much of an effect on toxicity of metals as they do at lower hardnesses. Related water quality characteristics do not correlate as well at higher hardnesses as they do at lower hardnesses. There is also increased uncertainty in this range because very limited data are available to clearly quantify the relationship between hardness and toxicity. Therefore, if hardness is over 400 mg/L as CaCO₃, EPA continues to recommend that a hardness of 400 mg/L be used with a default WER of 1.0; alternatively, the WER and actual hardness of the surface water may be used.

Where applicable water quality standards require the use of a default hardness (e.g., 25 mg/L) to calculate a criterion, states and authorized tribes should use the WER procedure to adjust that criterion so that it provides the level of protection intended by the Guidelines. As the WER is inherently a site-specific procedure, any WER developed for a given site would be applicable only for that site unless its applicability at other sites is demonstrated. In any case, states and authorized tribes electing to use the WER Guidance should ensure that their water quality standards provide for them. Consistent with the "Performance-Based Approach" discussed in detail in EPA's recent modification of its implementing regulations at 40 CFR



131.21 (See 65 FR 24641, April 27, 2000), EPA encourages states and authorized tribes to identify all opportunities for adoption, and EPA approval of, such site-specific criteria. A performance-based approach relies on the adoption of a standard method or process (e.g., WER procedures) into state or tribal water quality standards, rather than adoption of a specific outcome (e.g., a site-specific criterion). When such an approach is sufficiently detailed and has suitable safeguards to ensure predictable, repeatable outcomes, EPA approval of the approach can serve as approval of the outcomes as well.

National Guidance on the Applicability of Freshwater and Saltwater Criteria

EPA recommends that the aquatic life criteria in this compilation apply as follows:

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

Nutrient Criteria

EPA recently developed section 304(a) water quality criteria for nutrients because excessive levels of nutrients are a major cause of the nonattainment of designated uses and more scientific information is needed to evaluate and address these conditions. Availability of these nutrient criteria recommendations was announced in the **Federal Register** on January 9, 2001 (66 FR1671). EPA's nutrient criteria will cover four major types of waterbodies: lakes and reservoirs, rivers and streams, estuarine and coastal areas, and wetlands across 14 major ecoregions of the United States. EPA's section 304(a) criteria are intended to provide for the protection and propagation of aquatic life and recreation. To support the development of the nutrient criteria, EPA published Technical Guidance Manuals that describe a process for assessing nutrient conditions in the four waterbody types. (For example See: *Nutrient Criteria Technical Guidance Manual: Lakes and Reservoirs*, April 2000; *Nutrient Criteria Technical Guidance Manual: Rivers and Streams*, July 2000; *Nutrient Criteria Technical Guidance Manual: Estuarine and Coastal Marine Waters*, October 2001). This information is intended to serve as a starting point for the states, authorized tribes and others to develop more refined



nutrient criteria, as appropriate, using EPA waterbody-specific technical guidance manuals and other scientifically defensible approaches.

In cases where no new ecoregional nutrient criteria are available, the phosphate phosphorus information presented in the Gold Book (*Quality Criteria for Water: 1986*, EPA 440/5-86-001) may still be applicable. The phosphate phosphorus information in the Gold Book address eutrophication in freshwater systems on a national basis without any consideration of regional differences that may occur. The new ecoregional nutrient criteria recommendations reflect regional differences in eutrophication for different water body types and ecological conditions. The criteria in the compilation for elemental phosphorus is based on the toxic effects of phosphorus to aquatic organisms and is not intended to prevent eutrophication.

VI Comments on the December 10, 1998 National Recommended Water Quality Criteria Compilation

When the national recommended water quality criteria compilation was published in 1998, the Agency requested comment and observations on the compilation format and on the revised criteria development process. No comments were received on the format or process. Comments were, however, received on specific criteria and errors in formulas. The comments stated that certain criteria did not reflect the latest scientific knowledge and also that some criteria were derived based on data where an improper form of chemical was tested because of bioavailability issues. The errors in the formulas have been corrected. EPA does not agree that an improper form of the specified chemicals was tested.

VII Where Can I Find More Information About Water Quality Criteria and Water Quality Standards?

For more information about water quality criteria and Water Quality Standards refer to the following: *Water Quality Standards Handbook* (EPA 823-B94-005a); *Advanced Notice of Proposed Rule Making (ANPRM)*, (63FR36742); *Draft Strategy for Water Quality Standards and Criteria: Strengthening the Foundation of Programs to Protect and Restore the Nation's Water* (EPA-823-R-02-001, May 2002); *Water Quality Criteria and Standards Plan -- Priorities for the Future* (EPA 822-R-98-003); *Guidelines and Methodologies Used in the Preparation of Health Effects Assessment Chapters of the Consent Decree Water Criteria Documents* (45FR79347); *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health* (2000), EPA-822-B-00-004, October 2000); *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses* (EPA 822/R-85-100); *National Strategy for the Development of Regional Nutrient Criteria* (EPA 822-R-98-002); and *EPA Review and Approval of State and Tribal Water Quality Standards* (65FR24641).

These publications may also be accessed through EPA's National Service Center for Environmental Publications (NSCEP, previously NCEPI) or on the Office of Science and Technology's Homepage (www.epa.gov/OST).



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VIII What Are the National Recommended Water Quality Criteria?

The following compilation and its associated footnotes and notes presents the EPA's latest national recommended water quality criteria.



NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR PRIORITY TOXIC POLLUTANTS

Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		FR Cite/Source
		CMC (ug/L)	CCC (ug/L)	CMC (ug/L)	CCC (ug/L)	Water + Organism (ug/L)	Organism Only (ug/L)	
1 Antimony	7440360					5.6 B	640 B	63FR66443
2 Arsenic	7440382	340 ADK	150 ADK	69 AD,bb	36 AD,bb	0.018 C.M.S	0.14 C.M.S	63FR31682 57FR60848
3 Beryllium	7440417					Z		63FR31682
4 Cadmium	7440439	2.0 DEK,bb	0.25 DEK,bb	40 D,bb	8.8 D,bb	Z		EPA-822-R-01-001 63FR31682
5a Chromium (III)	16065831	570 DEK	74 DEK			Z _{Total}		EPA820/B-96-001 63FR31682
5b Chromium (VI)	18540299	16 DK	11 DK	1,100 D,bb	50 D,bb	Z _{Total}		63FR31682
6 Copper	7440508	13 DEK,cc	9.0 DEK,cc	4.8 D,cc,ff	3.1 D,cc,ff	1,300 U		63FR31682
7 Lead	7439921	65 DE,bb,gg	2.5 DE,bb,gg	210 D,bb	8.1 D,bb			63FR31682
8a Mercury	7439976	1.4 D,K,hh	0.77 D,K,hh	1.8 D,ee,hh	0.94 D,ee,hh		0.3 mg/kg J	62FR42160
8b Methylmercury	22967926							EPA823-R-01-001
9 Nickel	7440020	470 DEK	52 DEK	74 D,bb	8.2 D,bb	610 B	4,600 B	63FR31682
10 Selenium	7782492	LRT	5.0 T	290 D,bb,dd	71 D,bb,dd	170 Z	4200	62FR42160 63FR31682 63FR66443
11 Silver	7440224	3.2 DEG		1.9 D,G				63FR31682
12 Thallium	7440280					1.7 B	6.3 B	63FR31682



Priority Pollutant	CAS Number	Freshwater			Human Health For Consumption of Water + Organism Only			FR Cite/Source	
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water + Organism Only (µg/L)		
13	Zinc	7440666	120 DEK	120 DEK	90 D,bb	81 D,bb	7,400 U	26,000 U	63FR31682 63FR66443
14	Cyanide	57125	22 KQ	5.2 KQ	1 Q,bb	1 Q,bb	700 B	220,000 B,H	EPA820-B-96-001 57FR60848
15	Asbestos	1332214					7 million fibers/L, I		57FR60848
16	2,3,7,8-TCDD (Dioxin)	1746016					5.0E-9 C	5.1E-9 C	63FR66443
17	Acrolein	107028					190	290	63FR66443
18	Acrylonitrile	107131					0.051 BC	0.25 BC	63FR66443
19	Benzene	71432					2.2 BC	51 BC	IRIS 01/19/00 &63FR66443
20	Bromoform	75252					4.3 BC	140 BC	63FR66443
21	Carbon Tetrachloride	56235					0.23 BC	1.6 BC	63FR66443
22	Chlorobenzene	108907					680 BZ,U	21,000 B,H,U	63FR31682
23	Chlorodibromomethane	124481					0.40 BC	13 BC	63FR66443
24	Chloroethane	75003							
25	2-Chloroethylvinyl Ether	110758							
26	Chloroform	67663					5.7 CP	470 CP	62FR42160
27	Dichlorobromomethane	75274					0.55 BC	17 BC	63FR66443



Priority Pollutant	CAS Number	Freshwater			Human Health For Consumption of:			FR Cite/Source
		CMC (µg/L)	CCC (µg/L)	Saltwater CMC (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)		
28 1,1-Dichloroethane	75343							
29 1,2-Dichloroethane	107062				0.38 BC	37 BC		65FR66443
30 1,1-Dichloroethylene	75354				0.057 C	3.2 C		65FR66443
31 1,2-Dichloropropane	78875				0.50 BC	15 BC		65FR66443
32 1,3-Dichloropropene	542756				10	1,700		57FR60848
33 Ethylbenzene	100414				3,100 B	29,000 B		65FR31682
34 Methyl Bromide	74839				47 B	1,500 B		65FR66443
35 Methyl Chloride	74873							65FR31682
36 Methylene Chloride	75092				4.6 BC	590 BC		65FR66443
37 1,1,2-Tetrachloroethane	79345				0.17 BC	4.0 BC		65FR66443
38 Tetrachloroethylene	127184				0.69 C	3.3 C		65FR66443
39 Toluene	108883				6,800 BZ	200,000 B		65FR31682
40 1,2-Trans-Dichloroethylene	156605				700 BZ	140,000 B		65FR31682
41 1,1,1-Trichloroethane	71556				Z			65FR31682
42 1,1,2-Trichloroethane	79005				0.59 BC	16 BC		65FR66443
43 Trichloroethylene	79016				2.5 C	30 C		65FR66443
44 Vinyl Chloride	75014				2.0 C	530 C		57FR60848



Priority Pollutant	CAS Number	Freshwater			Saltwater			Human Health For Consumption of:		FR Cite/Source
		CMC (ug/L)	CCC (ug/L)	CMC (ug/L)	CCC (ug/L)	Water + Organism (ug/L)	Organism Only (ug/L)			
45 2-Chlorophenol	95578					81 BU	150 BU	65FR66443		
46 2,4-Dichlorophenol	120832					77 BU	290 BU	65FR66443		
47 2,4-Dimethylphenol	105679					380 B	850 BU	65FR66443		
48 2-Methyl-4,6-Dinitrophenol	534521					13	280	65FR66443		
49 2,4-Dinitrophenol	51285					69 B	5,300 B	65FR66443		
50 2-Nitrophenol	88755									
51 4-Nitrophenol	100027									
52 3-Methyl-4-Chlorophenol	59507					U	U			
53 Pentachlorophenol	87865	19 FK	15 FK	13 bb	7.9 bb	0.27 BC	3.0 B.C.H	65FR31682 65FR66443		
54 Phenol	108952					21,000 BU	1,700,000 BU	65FR66443		
55 2,4,6-Trichlorophenol	88062					1.4 BC	2.4 B.C.U	65FR66443		
56 Acenaphthene	83329					670 BU	990 BU	65FR66443		
57 Acenaphthylene	208968									
58 Anthracene	120127					8,300 B	40,000 B	65FR66443		
59 Benzidine	92875					0.000086 BC	0.00020 BC	65FR66443		
60 Benzo(a)Anthracene	56553					0.0038 BC	0.018 BC	65FR66443		
61 Benzo(a)Pyrene	50328					0.0038 BC	0.018 BC	65FR66443		



Priority Pollutant	CAS Number	Freshwater			Human Health For Consumption of:			FR Cite/Source
		CMC (ug/L)	CCC (ug/L)	Saltwater CMC (ug/L)	Water + Organism (ug/L)	Organism Only (ug/L)		
62 Benzo(b)Fluoranthene	205992				0.0038 BC	0.018 BC	65FR66443	
63 Benzo(g,h,i)Perylene	191242							
64 Benzo(k)Fluoranthene	207089				0.0038 BC	0.018 BC	65FR66443	
65 Bis(2-Chloroethoxy)Methane	111911							
66 Bis(2-Chloroethyl)Ether	111444				0.030 BC	0.53 BC	65FR66443	
67 Bis(2-Chloroisopropyl)Ether	108601				1,400 B	65,000 B	65FR66443	
68 Bis(2-Ethylhexyl)Phthalate ^x	117817				1.2 BC	2.2 BC	65FR66443	
69 4-Bromophenyl Phenyl Ether	101553							
70 Butylbenzyl Phthalate ^w	85687				1,500 B	1,900 B	65FR66443	
71 2-Chloronaphthalene	91587				1,000 B	1,600 B	65FR66443	
72 4-Chlorophenyl Phenyl Ether	7005723							
73 Chrysene	218019				0.0038 BC	0.018 BC	65FR66443	
74 Dibenzo(a,h)Anthracene	53703				0.0038 BC	0.018 BC	65FR66443	
75 1,2-Dichlorobenzene	95501				2,700 B	17,000 B	65FR31682	
76 1,3-Dichlorobenzene	541731				320	960	65FR66443	
77 1,4-Dichlorobenzene	106467				400 Z	2,600	65FR31682	
78 3,3'-Dichlorobenzidine	91941				0.021 BC	0.028 BC	65FR66443	



Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of:		FR Cite/Source
		CMC (ug/L)	CCC (ug/L)	CMC (ug/L)	CCC (ug/L)	Water + Organism (ug/L)	Organism Only (ug/L)	
79 Diethyl Phthalate ^w	84662					17,000 B	44,000 B	65FR66443
80 Dimethyl Phthalate ^w	131113					270,000	1,100,000	65FR66443
81 Di-n-Butyl Phthalate ^w	84742					2,000 B	4,500 B	65FR66443
82 2,4-Dinitrotoluene	121142					0.11 C	3.4 C	65FR66443
83 2,6-Dinitrotoluene	606202							
84 Di-n-Octyl Phthalate	117840							
85 1,2-Diphenylhydrazine	122667					0.036 BC	0.20 BC	65FR66443
86 Fluoranthene	206440					130 B	140 B	65FR66443
87 Fluorene	86737					1,100 B	5,300 B	65FR66443
88 Hexachlorobenzene	118741					0.00028 BC	0.00029 BC	65FR66443
89 Hexachlorobutadiene	87683					0.44 BC	18 BC	65FR66443
90 Hexachlorocyclopentadiene	77474					240 UZ	17,000 HU	57FR60848
91 Hexachloroethane	67721					1.4 BC	3.3 BC	65FR66443
92 Ideno(1,2,3-cd)Pyrene	193395					0.0038 BC	0.018 BC	65FR66443
93 Isophorone	78591					35 BC	960 BC	65FR66443
94 Naphthalene	91203							
95 Nitrobenzene	98953					17 B	690 BHU	65FR66443



Priority Pollutant	CAS Number	Freshwater			Saltwater			Human Health For Consumption of Water + Organism Only		FR Cite/Source
		CMC (ug/L)	CCC (ug/L)	CMC (ug/L)	CCC (ug/L)	Water + Organism (ug/L)	Organism Only (ug/L)			
96 N-Nitrosodimethylamine	62759					0.00069 BC	3.0 BC	65FR66443		
97 N-Nitrosodi-n-Propylamine	621647					0.0050 BC	0.51 BC	65FR66443		
98 N-Nitrosodiphenylamine	86306					3.3 BC	6.0 BC	65FR66443		
99 Phenanthrene	85018									
100 Pyrene	129000					830 B	4,000 B	65FR66443		
101 1,2,4-Trichlorobenzene	120821					260	940	IRIS11/01/96		
102 Aldrin	309002	3.0 G		1.3 G		0.000049 BC	0.000050 BC	65FR31682 65FR66443		
103 alpha-BHC	319846					0.0026 BC	0.0049 BC	65FR66443		
104 beta-BHC	319857					0.0091 BC	0.017 BC	65FR66443		
105 gamma-BHC (Lindane)	58899	0.95 K		0.16 G		0.019 C	0.063 C	65FR31682 65FR66443		
106 delta-BHC	319868									
107 Chlordane	57749	2.4 G	0.0043 G _{sw}	0.09 G	0.004 G _{sw}	0.00080 BC	0.00081 BC	65FR31682 65FR66443		
108 4,4'-DDT	50293	1.1 G _{ii}	0.001 G _{swii}	0.13 G _{ii}	0.001 G _{swii}	0.00022 BC	0.00022 BC	65FR31682 65FR66443		
109 4,4'-DDE	72559					0.00022 BC	0.00022 BC	65FR66443		
110 4,4'-DDD	72548					0.00031 BC	0.00031 BC	65FR66443		



Priority Pollutant	CAS Number	Freshwater			Saltwater			Human Health For Consumption of:		FR Cite/Source
		CMC (ug/L)	CCC (ug/L)	CMC (ug/L)	CMC (ug/L)	CCC (ug/L)	Water + Organism (ug/L)	Organism Only (ug/L)		
111 Dieldrin	60571	0.24 K	0.056 KO	0.71 G	0.0019 G _{aa}	0.000052 BC	0.000054 BC	65FR31682 65FR66443		
112 alpha-Endosulfan	959988	0.22 GY	0.056 GY	0.034 GY	0.0087 GY	62 B	89 B	65FR31682 65FR66443		
113 beta-Endosulfan	33213659	0.22 GY	0.056 GY	0.034 GY	0.0087 GY	62 B	89 B	65FR31682 65FR66443		
114 Endosulfan Sulfate	1031078					62 B	89 B	65FR66443		
115 Endrin	72208	0.086 K	0.036 KO	0.037 G	0.0023 G _{aa}	0.76 B	0.81 BH	65FR31682		
116 Endrin Aldehyde	7421934					0.29 B	0.30 BH	65FR66443		
117 Heptachlor	76448	0.52 G	0.0038 G _{aa}	0.053 G	0.0036 G _{aa}	0.000079 BC	0.000079 BC	65FR31682 65FR66443		
118 Heptachlor Epoxide	1024573	0.52 GY	0.0038 G _{V,aa}	0.053 GY	0.0036 G _{V,aa}	0.000039 BC	0.000039 BC	65FR31682 65FR66443		
119 Polychlorinated Biphenyls PCBs:			0.014 N _{aa}		0.03 N _{aa}	0.00064 BC,N	0.00064 BC,N	65FR31682 65FR66443		
120 Toxaphene	8001352	0.73	0.0002 aa	0.21	0.0002 aa	0.00028 BC	0.00028 BC	65FR31682 65FR66443		

Footnotes:

A. This recommended water quality criterion was derived from data for arsenic (III), but is applied here to total arsenic, which might imply that arsenic (III) and arsenic (V) are equally toxic to aquatic life and that their toxicities are additive. In the arsenic criteria document (EPA 440/5-84-033, January 1985), Species Mean Acute Values are given for both arsenic (III) and arsenic (V) for five species and the ratios of the SMAVs for each species range from 0.6 to 1.7.



- Chronic values are available for both arsenic (III) and arsenic (V) for one species; for the fathead minnow, the chronic value for arsenic (V) is 0.29 times the chronic value for arsenic (III). No data are known to be available concerning whether the toxicities of the forms of arsenic to aquatic organisms are additive.
- B** This criterion has been revised to reflect The Environmental Protection Agency's $q1^*$ or RfD , as contained in the Integrated Risk Information System (IRIS) as of May 17, 2002. The fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.
- C** This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5} , move the decimal point in the recommended criterion one place to the right).
- D** Freshwater and saltwater criteria for metals are expressed in terms of the dissolved metal in the water column. The recommended water quality criteria value was calculated by using the previous 304(a) aquatic life criteria expressed in terms of total recoverable metal, and multiplying it by a conversion factor (CF). The term "Conversion Factor" (CF) represents the recommended conversion factor 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. (Conversion Factors for saltwater CCCs are not currently available. Conversion factors derived for saltwater CMCs have been used for both saltwater CMCs and CCCs). See "Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria," October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center, USEPA, 401 M St., SW, mail code RC-4100, Washington, DC 20460; and 40CFR§131.36(b)(1).
- E** The Freshwater criterion for this metal is expressed as a function of hardness (mg/L) in the water column. The value given here corresponds to a hardness of 100 mg/L. Criteria values for other hardness may be calculated from the following: $CMC (dissolved) = \exp(\ln_c [\ln(\text{hardness})] + b_c)$ (CF), or CCC $(dissolved) = \exp(\ln_c [\ln(\text{hardness})] + b_c)$ (CF) and the parameters specified in Appendix B- Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent
- F** Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: $CMC = \exp(1.005(\text{pH}) - 4.869)$; $CCC = \exp(1.005(\text{pH}) - 5.134)$. Values displayed in table correspond to a pH of 7.8.
- G** This Criterion is based on 304(a) aquatic life criterion issued in 1980, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endosulfan (EPA 440/5-80-046), Endrin (EPA 440/5-80-047), Heptachlor (EPA 440/5-80-052), Hexachlorocyclohexane (EPA 440/5-80-054), Silver (EPA 440/5-80-071). The Minimum Data Requirements and derivation procedures were different in the 1980 Guidelines than in the 1985 Guidelines. For example, a "CMC" derived using the 1980 Guidelines was derived to be used as an instantaneous maximum. If assessment is to be done using an averaging period, the values given should be divided by 2 to obtain a value that is more comparable to a CMC derived using the 1985 Guidelines.
- H** No criterion for protection of human health from consumption of aquatic organisms excluding water was presented in the 1980 criteria document or in the 1986 *Quality Criteria for Water*. Nevertheless, sufficient information was presented in the 1980 document to allow the calculation of a criterion, even though the results of such a calculation were not shown in the document.
- I** This criterion for asbestos is the Maximum Contaminant Level (MCL) developed under the Safe Drinking Water Act (SDWA).
- J** This fish tissue residue criterion for methylmercury is based on a total fish consumption rate of 0.0175 kg/day.
- K** This recommended criterion is based on a 304(a) aquatic life criterion that was issued in the 1995 *Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water* (EPA-820-B-96-001, September 1996). This value was derived using the GLI Guidelines (60FR15393-15399, March 23, 1995; 40CFR132 Appendix A); the difference between the 1985 Guidelines and the GLI Guidelines are explained on page iv of the 1995 *Updates*. None of the decisions concerning the derivation of this criterion were affected by any considerations that are specific to the Great Lakes.



- L The CMC = $1/[(f1/CMC1) + (f2/CMC2)]$ 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.
- M EPA is currently reassessing the criteria for arsenic.
- N This criterion applies to total pbbs, (e.g., the sum of all congener or all isomer or homolog or Aroclor analyses.)
- O The derivation of the CCC for this pollutant (Endrin) did not consider exposure through the diet, which is probably important for aquatic life occupying upper trophic levels.
- P Although a new RfD is available in IRIS, the surface water criteria will not be revised until the National Primary Drinking Water Regulations: Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) is completed, since public comment on the relative source contribution (RSC) for chloroform is anticipated.
- Q This recommended water quality criterion is expressed as µg free cyanide (as CN)/L.
- R This value for selenium was announced (61FR58444-58449, November 14, 1996) as a proposed GLL 303(c) aquatic life criterion. EPA is currently working on this criterion and so this value might change substantially in the near future.
- S This recommended water quality criterion for selenium refers to the inorganic form only.
- T This recommended water quality criterion for selenium is expressed in terms of total recoverable metal in the water column. It is scientifically acceptable to use the conversion factor (0.996 - CMC or 0.922 - CCC) that was used in the GLL to convert this to a value that is expressed in terms of dissolved metal.
- U The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.
- V This value was derived from data for heptachlor and the criteria document provides insufficient data to estimate the relative toxicities of heptachlor and heptachlor epoxide.
- W Although EPA has not published a completed criteria document for butylbenzyl phthalate it is EPA's understanding that sufficient data exist to allow calculation of aquatic criteria. It is anticipated that industry intends to publish in the peer reviewed literature draft aquatic life criteria generated in accordance with EPA Guidelines. EPA will review such criteria for possible issuance as national WQC.
- X There is a full set of aquatic life toxicity data that show that DEHP is not toxic to aquatic organisms at or below its solubility limit.
- Y This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha-endosulfan and beta-endosulfan.
- Z A more stringent MCL has been issued by EPA. Refer to drinking water regulations (40 CFR 141) or Safe Drinking Water Hotline (1-800-426-4791) for values.
- aa This criterion is based on a 304(a) aquatic life criterion issued in 1980 or 1986, and was issued in one of the following documents: Aldrin/Dieldrin (EPA 440/5-80-019), Chlordane (EPA 440/5-80-027), DDT (EPA 440/5-80-038), Endrin (EPA 440/5-80-047), Heptachlor (EPA 440/5-80-052), Polychlorinated biphenyls (EPA 440/5-80-068), Toxaphene (EPA 440/5-86-006). This CCC is currently based on the Final Residue Value (FRV) procedure. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60FR15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria. Therefore, the Agency anticipates that future revisions of this CCC will not be based on the FRV procedure.
- bb This water quality criterion is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (*Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, PB85-227049, January 1985) and was issued in one of the following criteria documents: Arsenic (EPA 440/5-84-033), Cadmium (EPA 882-R-01-001), Chromium (EPA 440/5-84-029), Copper (EPA 440/5-84-031), Cyanide (EPA 440/5-84-028), Lead (EPA 440/5-84-027), Nickel (EPA 440/5-86-004), Pentachlorophenol (EPA 440/5-86-009), Toxaphene, (EPA 440/5-86-006), Zinc (EPA 440/5-87-003).



- cc When the concentration of dissolved organic carbon is elevated, copper is substantially less toxic and use of Water-Effect Ratios might be appropriate.
- dd The selenium criteria document (EPA 440/5-87-006, September 1987) provides that if selenium is as toxic to saltwater fishes in the field as it is to freshwater fishes in the field, the status of the fish community should be monitored whenever the concentration of selenium exceeds $5.0 \mu\text{g/L}$ in salt water because the saltwater CCC does not take into account uptake via the food chain.
- ee This recommended water quality criterion was derived on page 43 of the mercury criteria document (EPA 440/5-84-026, January 1985). The saltwater CCC of $0.025 \mu\text{g/L}$ given on page 23 of the criteria document is based on the Final Residue Value procedure in the 1985 Guidelines. Since the publication of the Great Lakes Aquatic Life Criteria Guidelines in 1995 (60FR15393-15399, March 23, 1995), the Agency no longer uses the Final Residue Value procedure for deriving CCCs for new or revised 304(a) aquatic life criteria.
- ff This recommended water quality criterion was derived in *Ambient Water Quality Criteria Salthwater Copper Addendum* (Draft, April 14, 1995) and was promulgated in the Interim final National Toxics Rule (60FR22228-22237, May 4, 1995).
- gg EPA is actively working on this criterion and so this recommended water quality criterion may change substantially in the near future.
- hh This recommended water quality criterion was derived from data for inorganic mercury (II), but is applied here to total mercury. If a substantial portion of the mercury in the water column is methylmercury, this criterion will probably be under protective. In addition, even though inorganic mercury is converted to methylmercury and methylmercury bioaccumulates to a great extent, this criterion does not account for uptake via the food chain because sufficient data were not available when the criterion was derived.
- ii This criterion applies to DDT and its metabolites (i.e., the total concentration of DDT and its metabolites should not exceed this value).



NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR NON PRIORITY POLLUTANTS

Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of Water + Organism		FR Cite/Source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Organism (µg/L)	Only (µg/L)	
1 Alkalinity	--		20000 F					Gold Book
2 Aluminum pH 6.5 - 9.0	7429905	750 G/L	87 G/L					53FR33178
3 Ammonia	7664417	FRESHWATER CRITERIA ARE pH, Temperature and Life-stage DEPENDENT -- SEE DOCUMENT D SALTWATER CRITERIA ARE pH AND TEMPERATURE DEPENDENT						EPA823-R-99-014
4 Aesthetic Qualities	--	NARRATIVE STATEMENT -- SEE DOCUMENT						EPA440/5-88-004
5 Bacteria	--	FOR PRIMARY RECREATION AND SHELLFISH USES -- SEE DOCUMENT						Gold Book
6 Barium	7440393					1,000 A		Gold Book
7 Boron	--	NARRATIVE STATEMENT -- SEE DOCUMENT						Gold Book
8 Chloride	16887006	860,000 G	230,000 G					53FR19028
9 Chlorine	7782505	19	11	13	7.5	C		Gold Book
10 Chlorophenoxy Herbicide (2,4,5,-TP)	93721					10 A		Gold Book
11 Chlorophenoxy Herbicide (2,4-D)	94757					100 AC		Gold Book
12 Chloropyrifos	2921882	0.083 G	0.041 G	0.011 G	0.0056 G			Gold Book
13 Color	--	NARRATIVE STATEMENT -- SEE DOCUMENT F						Gold Book
14 Deneaton	8065483		0.1 F		0.1 F			Gold Book
15 Ether, Bis(Chloromethyl)	542881					0.00010 E.H	0.00029 E.H	65FR66443



Non Priority Pollutant	CAS Number	Freshwater		Saltwater		Human Health For Consumption of Water + Organism (µg/L) Only (µg/L)		FR Cite/Source
		CMC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	Water + Organism (µg/L)	Organism Only (µg/L)	
16 Gases, Total Dissolved	--							Gold Book
17 Guthion	86500		0.01 F		0.01 F			Gold Book
18 Hardness	--							Gold Book
19 Hexachlorocyclo-hexane-Technical	319868					0.0123	0.0414	Gold Book
20 Iron	7439896		1,000 F			300 A		Gold Book
21 Malathion	121755		0.1 F		0.1 F			Gold Book
22 Manganese	7439965					50 A.O	100 A	Gold Book
23 Methoxychlor	72435		0.03 F		0.03 F	100 A.C		Gold Book
24 Mirex	2385855		0.001 F		0.001 F			Gold Book
25 Nitrates	14797538					10,000 A		Gold Book
26 Nitrosamines	--					0.0008	1.24	Gold Book
27 Dinitrophenols	25550587					69	5300	65FR66443
28 Nitrosodibutylamine,N	924163					0.0063 A.H	0.22 A.H	65FR66443
29 Nitrosodiethylamine,N	55185					0.0008 A.H	1.24 A.H	Gold Book
30 Nitrosopyrrolidine,N	930552					0.016 H	34 H	65FR66443
31 Oil and Grease	--							Gold Book



Non Priority Pollutant	CAS Number	Freshwater			Saltwater			Human Health For Consumption of Water + Organism (µg/L) Only (µg/L)		FR Cite/Source
		CMC (µg/L)	CCC (µg/L)	CCC (µg/L)	CMC (µg/L)	CCC (µg/L)	CCC (µg/L)	Water + Organism (µg/L)	Organism (µg/L)	
32 Oxygen, Dissolved Freshwater	7782447									Gold Book EPA-823-R-00-012
33 Parathion	56382	0.065 J	0.013 J							Gold Book
34 Pentachlorobenzene	608935						1.4 E	1.5 E		65FR66443
35 pH	--		6.5 - 9 F			6.5 - 8.5 FK	5 - 9			Gold Book
36 Phosphorus Elemental	7723140					0.1 FK				Gold Book
37 Nutrients	--									P
38 Solids Dissolved and Salinity	--							250,000 A		Gold Book
39 Solids Suspended and Turbidity	--									Gold Book
40 Sulfide-Hydrogen Sulfide	7783064			2.0 F				2.0 F		Gold Book
41 Tanning Substances	--									Gold Book
42 Temperature	--									Gold Book
43 Tetrachlorobenzene,1,2,4,5-	95943							0.97 E	1.1 E	65FR66443
44 Tributyltin (TBT)	--	0.46 Q	0.063 Q	0.37 Q	0.010 Q					EPA 823-F-00-008
45 Trichlorophenol,2,4,5-	95954							1,800 BE	3,600 BE	65FR66443



Footnotes:

- A This human health criterion is the same as originally published in the Red Book which predates the 1980 methodology and did not utilize the fish ingestion BCF approach. This same criterion value is now published in the Gold Book.
- B The organoleptic effect criterion is more stringent than the value presented in the non priority pollutants table.
- C A more stringent Maximum Contaminant Level (MCL) has been issued by EPA under the Safe Drinking Water Act. Refer to drinking water regulations 40CFR141 or Safe Drinking Water Hotline (1-800-426-4791) for values.
- D According to the procedures described in the *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, except possibly where a very sensitive species is important at a site, freshwater aquatic life should be protected if both conditions specified in Appendix C to the Preamble- Calculation of Freshwater Ammonia Criterion are satisfied.
- E This criterion has been revised to reflect EPA's $q1^*$ or RFD, as contained in the Integrated Risk Information System (IRIS) as of May 17, 2002. The fish tissue bioconcentration factor (BCF) used to derive the original criterion was retained in each case.
- F The derivation of this value is presented in the Red Book (EPA 440/9-76-023, July, 1976).
- G This value is based on a 304(a) aquatic life criterion that was derived using the 1985 *Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, PB85-227049, January 1985) and was issued in one of the following criteria documents: Aluminum (EPA 440/5-86-008); Chloride (EPA 440/5-88-001); Chloropyrifos (EPA 440/5-86-005).
- H This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5} , move the decimal point in the recommended criterion one place to the right).
- I This value for aluminum is expressed in terms of total recoverable metal in the water column.
- J This value is based on a 304(a) aquatic life criterion that was issued in the 1995 *Updates: Water Quality Criteria Documents for the Protection of Aquatic Life in Ambient Water* (EPA-820-B-96-001). This value was derived using the GII Guidelines (60FR15393-15399, March 23, 1995; 40CFR132 Appendix A); the differences between the 1985 Guidelines and the GII Guidelines are explained on page iv of the 1995 Updates. No decision concerning this criterion was affected by any considerations that are specific to the Great Lakes.
- K According to page 181 of the Red Book:
For open ocean waters where the depth is substantially greater than the euphotic zone, the pH should not be changed more than 0.2 units from the naturally occurring variation or any case outside the range of 6.5 to 8.5. For shallow, highly productive coastal and estuarine areas where naturally occurring pH variations approach the lethal limits of some species, changes in pH should be avoided but in any case should not exceed the limits established for fresh water, i.e., 6.5-9.0.
- L There are three major reasons why the use of Water-Effect Ratios might be appropriate. (1) The value of 87 $\mu\text{g/l}$ is based on a toxicity test with the striped bass in water with $\text{pH}=6.5-6.6$ and hardness <10 mg/L. Data in "Aluminum Water-Effect Ratio for the 3M Plant Effluent Discharge, Middleway, West Virginia" (May 1994) indicate that aluminum is substantially less toxic at higher pH and hardness, but the effects of pH and hardness are not well quantified at this time. (2) In tests with the brook trout at low pH and hardness, effects increased with increasing concentrations of total aluminum even though the concentration of dissolved aluminum was constant, indicating that total recoverable is a more appropriate measurement than dissolved, at least when particulate aluminum is primarily aluminum hydroxide particles. In surface waters, however, the total recoverable procedure might measure aluminum associated with clay particles, which might be less toxic than aluminum associated with aluminum hydroxide. (3) EPA is aware of field data indicating that many high quality waters in the U.S. contain more than 87 μg aluminum/L, when either total recoverable or dissolved is measured.
- M U.S. EPA. 1973. Water Quality Criteria 1972. EPA-R3-73-033. National Technical Information Service, Springfield, VA.; U.S. EPA. 1977. Temperature Criteria for Freshwater Fish: Protocol and Procedures. EPA-600/3-77-061. National Technical Information Service, Springfield, VA.



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Tribal Water Quality Standards
Version: 1.0
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- N U.S. EPA, 1986. Ambient Water Quality Criteria for Dissolved Oxygen. EPA 440/5-86-003. National Technical Information Service, Springfield, VA.
- O This criterion for manganese is not based on toxic effects, but rather is intended to minimize objectionable qualities such as laundry stains and objectionable tastes in beverages.
- P Lakes and Reservoirs in Nutrient Ecoregion: II EPA 822-B-00-007, III EPA 822-B-01-008, IV EPA 822-B-01-009, V EPA 822-B-01-010, VI EPA 822-B-00-008, VII EPA 822-B-00-009, VIII EPA 822-B-01-015, IX EPA 822-B-00-011, X EPA 822-B-00-012, XI EPA 822-B-00-013, XII EPA 822-B-00-014, XIII EPA 822-B-01-011, Rivers and Streams in Nutrient Ecoregion: I EPA 822-B-01-012, II EPA 822-B-00-015, III EPA 822-B-00-016, IV EPA 822-B-01-013, V EPA 822-B-01-014, VI EPA 822-B-00-017, VII EPA 822-B-00-018, VIII EPA 822-B-01-015, IX EPA 822-B-00-019, X EPA 822-B-01-016, XI EPA 822-B-00-020, XII EPA 822-B-00-021, XIV EPA 822-B-00-022; and Wetlands in Nutrient Ecoregion XIII EPA 822-B-00-023.
- Q EPA announced the availability of a draft updated tributyltin (TBT) document on August 7, 1997 (62FR42554). The Agency has reevaluated this document and anticipates releasing an updated document for public comment in the near future.



NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR ORGANOLEPTIC EFFECTS

Pollutant	CAS Number	Organoleptic Effect Criteria		FR Cite/Source
		(ug/L)		
1 Acenaphthene	83329	20		Gold Book
2 Monochlorobenzene	108907	20		Gold Book
3 3-Chlorophenol	--	0.1		Gold Book
4 4-Chlorophenol	106489	0.1		Gold Book
5 2,3-Dichlorophenol	--	0.04		Gold Book
6 2,5-Dichlorophenol	--	0.5		Gold Book
7 2,6-Dichlorophenol	--	0.2		Gold Book
8 3,4-Dichlorophenol	--	0.3		Gold Book
9 2,4,5-Trichlorophenol	95954	1		Gold Book
10 2,4,6-Trichlorophenol	88062	2		Gold Book
11 2,3,4,6-Tetrachlorophenol	--	1		Gold Book
12 2-Methyl-4-Chlorophenol	--	1,800		Gold Book
13 3-Methyl-4-Chlorophenol	59507	3,000		Gold Book
14 3-Methyl-6-Chlorophenol	--	20		Gold Book
15 2-Chlorophenol	95578	0.1		Gold Book
16 Copper	7440508	1,000		Gold Book
17 2,4-Dichlorophenol	120832	0.3		Gold Book
18 2,4-Dimethylphenol	105679	400		Gold Book
19 Hexachlorocyclopentadiene	77474	1		Gold Book
20 Nitrobenzene	98953	30		Gold Book



Pollutant	CAS Number	Organoleptic Effect Criteria (µg/L)	FR Cite/Source
21 Pentachlorophenol	87865	30	Gold Book
22 Phenol	108952	300	Gold Book
23 Zinc	7440666	5,000	45 FR79341

General Notes:

1. These criteria are based on organoleptic (taste and odor) effects. Because of variations in chemical nomenclature systems, this listing of pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423. Also listed are the Chemical Abstracts Service (CAS) registry numbers, which provide a unique identification for each chemical.

NATIONAL RECOMMENDED WATER QUALITY CRITERIA

Additional Notes:

1. Criteria Maximum Concentration and Criterion Continuous Concentration

The Criteria Maximum Concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The Criterion Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The CMC and CCC are just two of the six parts of an aquatic life criterion; the other four parts are the acute averaging period, chronic averaging period, acute frequency of allowed exceedence, and chronic frequency of allowed exceedence. Because 304(a) aquatic life criteria are national guidance, they are intended to be protective of the vast majority of the aquatic communities in the United States.

2. Criteria Recommendations for Priority Pollutants, Non Priority Pollutants and Organoleptic Effects

This compilation lists all priority toxic pollutants and some non priority toxic pollutants, and both human health effect and organoleptic effect criteria issued pursuant to CWA §304(a). Blank spaces indicate that EPA has no CWA §304(a) criteria recommendations. For a number of non-priority toxic pollutants not listed, CWA §304(a) "water + organism" human health criteria are not available, but EPA has published MCLs under the SDWA that may be used in establishing water quality standards to protect water supply designated uses. Because of variations in chemical nomenclature systems, this listing of toxic pollutants does not duplicate the listing in Appendix A of 40 CFR Part 423. Also listed are the Chemical Abstracts Service CAS registry numbers, which provide a unique identification for each chemical.

3. Human Health Risk

The human health criteria for the priority and non priority pollutants are based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{-5} , move the decimal point in the recommended criterion one place to the right).

4. Water Quality Criteria published pursuant to Section 304(a) or Section 303(c) of the CWA

Many of the values in the compilation were published in the California Toxics Rule. Although such values were published pursuant to Section 303(c) of the CWA, they represent the Agency's most recent calculation of water quality criteria and are thus the Agency's 304(a) criteria.



5. **Calculation of Dissolved Metals Criteria**
The 304(a) criteria for metals, shown as dissolved metals, are calculated in one of two ways. For freshwater metals criteria that are hardness-dependent, the dissolved metal criteria were calculated using a hardness of 100 mg/l as CaCO₃ for illustrative purposes only. Saltwater and freshwater metals' criteria that are not hardness-dependent are calculated by multiplying the total recoverable criteria before rounding by the appropriate conversion factors. The final dissolved metals' criteria in the table are rounded to two significant figures. Information regarding the calculation of hardness dependent conversion factors are included in the footnotes.
6. **Maximum Contaminant Levels**
The compilation includes footnotes for pollutants with Maximum Contaminant Levels (MCLs) more stringent than the recommended water quality criteria in the compilation. MCLs for these pollutants are not included in the compilation, but can be found in the appropriate drinking water regulations (40 CFR 141.11-16 and 141.60-63), or can be accessed through the Safe Drinking Water Hotline (800-426-4791) or the Internet (<http://www.epa.gov/waterscience/drinking/standards/dwstandards.pdf>).
7. **Organoleptic Effects**
The compilation contains 304(a) criteria for pollutants with toxicity-based criteria as well as non-toxicity based criteria. The basis for the non-toxicity based criteria are organoleptic effects (e.g., taste and odor) which would make water and edible aquatic life unpalatable but not toxic to humans. The table includes criteria for organoleptic effects for 23 pollutants. Pollutants with organoleptic effect criteria more stringent than the criteria based on toxicity (e.g., included in both the priority and non-priority pollutant tables) are footnoted as such.
8. **Gold Book**
The "Gold Book" is Quality Criteria for Water, 1986. EPA 440/5-86-001.
9. **Correction of Chemical Abstract Services Number**
The Chemical Abstract Services number (CAS) for Bis(2-Chlorisopropyl) Ether, has been revised in IRJS and in the table. The correct CAS number for this chemical is 108-60-1. The previous CAS number for this pollutant was 39638-32-9.
10. **Contaminants with Blanks**
EPA has not calculated criteria for contaminants with blanks. However, permit authorities should address these contaminants in NPDES permit actions using the States' existing narrative criteria for toxics.
11. **Specific Chemical Calculations**
 - A. **Selenium**
Aquatic Life
This compilation contains aquatic life criteria for selenium that are the same as those published in the proposed CTR. In the CTR, EPA proposed an acute criterion for selenium based on the criterion proposed for selenium in the Water Quality Guidance for the Great Lakes System (61 FR 58444). The GLI and CTR proposals take into account data showing that selenium's two prevalent oxidation states in water, selenite and selenate, present differing potentials for aquatic toxicity, as well as new data indicating that various forms of selenium are additive. The new approach produces a different selenium acute criterion concentration, or CMC, depending upon the relative proportions of selenite, selenate, and other forms of selenium that are present.
EPA is currently undertaking a reassessment of selenium, and expects the 304(a) criteria for selenium will be revised based on the final reassessment (63FR26186). However, until such time as revised water quality criteria for selenium are published by the Agency, the recommended water quality criteria in this compilation are EPA's current 304(a) criteria.



Appendices:

Appendix A - Conversion Factors for Dissolved Metals

Metal	Conversion Factor freshwater CMC	Conversion Factor freshwater CCC	Conversion Factor saltwater CMC	Conversion Factor saltwater CCC ¹
Arsenic	1.000	1.000	1.000	1.000
Cadmium	$1.136672 \cdot [(\ln \text{hardness}) / (0.041838)]$	$1.101672 \cdot [(\ln \text{hardness}) / (0.041838)]$	0.994	0.994
Chromium III	0.316	0.860	--	--
Chromium VI	0.982	0.962	0.993	0.993
Copper	0.960	0.960	0.83	0.83
Lead	$1.46203 \cdot [(\ln \text{hardness}) / (0.145712)]$	$1.46203 \cdot [(\ln \text{hardness}) / (0.145712)]$	0.951	0.951
Mercury	0.85	0.85	0.85	0.85
Nickel	0.998	0.997	0.990	0.990
Selenium	--	--	0.998	0.998
Silver	0.85	--	0.85	--
Zinc	0.978	0.986	0.946	0.946



Appendix B - Parameters for Calculating Freshwater Dissolved Metals Criteria That Are Hardness-Dependent

Chemical	Freshwater Conversion Factors (CF)					
	m_A	b_A	m_C	b_C	CMC	CCC
Cadmium	1.0166	-3.924	0.7409	-4.719	$1.136672 \cdot \{ \ln(\text{hardness}) / 0.041838 \}$	$1.101672 \cdot \{ \ln(\text{hardness}) / 0.041838 \}$
Chromium III	0.8190	3.7256	0.8190	0.6848	0.316	0.860
Copper	0.9422	-1.700	0.8545	-1.702	0.960	0.960
Lead	1.273	-1.460	1.273	-4.705	$1.46203 \cdot \{ \ln(\text{hardness}) / 0.145712 \}$	$1.46203 \cdot \{ \ln(\text{hardness}) / 0.145712 \}$
Nickel	0.8460	2.255	0.8460	0.0584	0.998	0.997
Silver	1.72	-6.59	--	--	0.85	--
Zinc	0.8473	0.884	0.8473	0.884	0.978	0.986

Hardness-dependant metals' criteria may be calculated from the following:

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

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



Appendix C - Calculation of Freshwater Ammonia Criterion

1. The one-hour average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on the average, the CMC (acute criterion) calculated using the following equations.

Where salmonid fish are present:

$$CMC = \frac{0.275}{1 + 10^{7.204-pH}} + \frac{39.0}{1 + 10^{0.028 \cdot (pH-7.7)}}$$

Or where salmonid fish are not present:

$$CMC = \frac{0.411}{1 + 10^{7.204-pH}} + \frac{58.4}{1 + 10^{0.028 \cdot (pH-7.7)}}$$

2.A. The thirty-day average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on the average, the CCC (chronic criterion) calculated using the following equations.

When fish early life stages are present:

$$CCC = \left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{0.028 \cdot (pH-7.7)}} \right) \cdot \text{MIN}(2.85, 1.45 \cdot 10^{0.028 \cdot (pH-7.7)})$$

When fish early life stages are absent:

$$CCC = \left(\frac{0.0577}{1 + 10^{7.688-pH}} + \frac{2.487}{1 + 10^{0.028 \cdot (pH-7.7)}} \right) \cdot \text{MIN}(1.45 \cdot 10^{0.028 \cdot (pH-7.7)}, 2.85)$$

2B. In addition, the highest four-day average within the 30-day period should not exceed 2.5 times the CCC.