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In reply, please refer to:
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COMMITTEE ON FINANCE

SB 1008, HD1 Relating to Water Quality Standards

Testimony of Chiyome Leinaala Fukino, M.D.
Director of Health

April 06, 2009

2:00 P.M.

Department's Position: The Department supports this bill with amendments.

Fiscal Implications: None for the Department.

Purpose and Justification: This bill revises by statute the water quality standards for bacteria in marine waters and the water quality standards for toxic pollutants in all waters.

Toxic pollutants. The Department agrees with the concept of changing the state water quality standards for most toxic pollutants by tying them to the national criteria currently recommended by the U.S. Environmental Protection Agency (EPA). The Department also agrees with amending state water quality standards for bacteria indicators for recreational water to be consistent with latest EPA standards, with changes to the identification of recreational waters, also explained below.

We recommend that SB 1008, HD1 Section 6(2) be amended and 6(3) be deleted. As written the Water Quality Standards enacted in this bill will otherwise be immediately repealed when they become effective—upon approval by the Environmental Protection Agency. Section 6(2) should read as follows: "Any water quality standard adopted in Section 2 or Section 3 of this Act is repealed upon a same or corresponding standard being adopted, amended, or repealed by rules adopted under chapter 91, Hawaii Revised Statutes, by the department of health, and the rule being approved by the United States Environmental Protection Agency, provided that the remaining standards specified in this Act remain in effect."

Rules and statutes. The Department has been working on amendments to its water quality standards rules, Hawaii Administrative Rules (HAR) chapter 11-54. The first set of amendments is narrower than this bill, and is scheduled for public hearing on April 27, 2009. These amendments, targeted for completion by June 2009, will correct a typographical error in the chlordane standard (human health criteria for fish consumption) and provide conformance to federal standards for bacterial indicators within 300 meters of shore. A second set of amendments to adopt the current EPA recommended human health criteria (fish consumption only) for chlordane and dieldrin is also scheduled to be heard on April 27, 2009. In October 2008, we announced our intention to update the state criteria for all the toxic pollutants to meet 2006 EPA criteria (aquatic life criteria and human health criteria), which might take several additional months. This third set of amendments includes, but is not limited to the same changes as today's bill. We do support excluding for now new standards for certain named metals, certain new "non-priority" toxic pollutants, and insuring that the lack of a 2006 EPA criterion does not impliedly repeal an existing state standard. A rationale document supporting these changes is provided to the Committees as an attachment to this testimony. If there are public concerns about the criteria that would be adopted for specific pollutants, we encourage them to be brought forward as soon as possible during this legislative process.

Indicator bacteria. The Department supports Section 3 of this bill, which proposes essentially the same changes as our stalled 2005 administrative revision package. The most notable changes are to use the national standard geometric mean of 35 colony forming units (CFU) of enterococcus per 100 milliliters (ml) of water, instead of the state geometric mean of 7 CFU per 100 ml., and a depth limit on the marine recreational waters. These changes were developed with the assistance of the Sierra Club and the Surfrider Foundation and were previously supported by these groups. Section 3 of the bill includes a new 33 meter depth limit designation for coastal recreational waters, creates a class of infrequent use recreational waters and sets its shore most boundary 500 meters from shore, and its outer boundary is the 3 mile limit of state waters, and changes bacterial indicator criteria within these coastal recreational waters to match federal regulatory levels. Through the efforts of our departmental Indicator Bacteria Working Group in 2004-2005, we understand that most recreational diving activity occurs within thirty-three meters of the surface, and that most recreational surfing and swimming takes place within five hundred meters of shore.

Given the low degree of scientific confidence in the validity of federal indicator bacteria criteria in general, State of Hawaii participation in nationwide efforts to improve these criteria, and the structure of State and EPA standards for adjacent waters, it is in the best interests of the State, EPA, and the scientific community for Hawaii to maintain consistency with the current national criteria, until new indicators or approaches can be promulgated by EPA as a result of its current development efforts.

Raising the geometric mean standard to 35 CFU per 100 ml will allow the DOH lab to use faster, less costly analytical methods that are not suitable for our current standard of 7 CFU per 100 ml. Because most if not all coastal states use 35 CFU per 100 ml as their coastal waters standard, new analytical methods are under development for counts in the range of 35 CFU per 100 ml, and not for lower counts.

Using a 35 CFU per 100 ml geometric mean standard will also reduce inconsistency. Upstream from the marine waters where our current standard of 7 CFU per 100 ml applies, the inland water standard, per EPA recommendation, is 33 CFU per100 ml. In ocean waters beyond the coastal waters where our current standard of 7 CFU per100 ml applies, the EPA standard of 35 CFU per 100 ml applies. This checkerboard of standards creates a confusing situation that is more difficult to implement.

Public health. The attached rationale document explains why the 2006 EPA criteria for toxic pollutants amply protect Hawaii's health and the environment.

For bacteria, in the nineteen years since the current state criteria were adopted, the Department has not seen any reliable scientific evidence to suggest that public health will be compromised by these proposed changes. The epidemiological research from the 1970s and 1980s on sewage tainted waters that informed the establishment of the EPA standard of 35 CFU/100 ml was extrapolated by DOH in 1990 to establish the current criteria of 7 CFU per 100 ml. It was believed that the standard of 7 CFU corresponds with 10 cases of gastroenteritis per 1000 swimmers who swallow a mouthful of ocean water that is contaminated with treated sewage, compared with 19 such cases under the national standard of 35 CFU per 100 ml. We now know that in Hawaii's waters we can have high indicator counts even in the absence of human sewage, because of enterococcus from soils and animals. A large epidemiological study by California in San Diego showed that the use various indicator bacteria had little power to predict illness in the absence of human sewage. Over twenty years of new scientific knowledge about the limitations of the original epidemiological research and the indicator upon which it relies, lead us to conclude that the difference between 7 and 35 CFU/100 ml is not a significant public health concern.

In practice, we require or post warnings of known sewage spills and do not wait for test results, which now take at least a day. We will continue our current practice used for the 7 CFU per 100 ml standard, for any future chronic exceedances of the proposed 35 CFU per 100 ml standard, and our practice is to investigate to confirm or rule out sewage influences and issue advisories when we determine that the source of enterococcus is likely to be human, or otherwise threatening to public health.

Federal requirements. Under federal law, EPA must approve state water quality standards before they can be implemented by states and EPA to meet federal requirements. EPA requirements appear at 40 C.F.R. Parts 130 and 131. The Department will work with EPA following the passage of this bill to achieve an approval agreement.

Thank you for the opportunity to testify.

RATIONALE FOR THE PROPOSED REVISIONS TO DEPARTMENT OF HEALTH WATER QUALITY STANDARDS

House Bill 834, HD2 and Senate Bill 1008, SD1, in the Twenty-fifth Legislature
Regular Session of 2009

STATE OF HAWAII DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH ADMINISTRATION
HONOLULU, HAWAII

March 18, 2009 Version

Errata Sheet: March 19, 2009
RATIONALE FOR THE PROPOSED REVISIONS TO DEPARTMENT OF HEALTH WATER QUALITY STANDARDS. House Bill 834, HD2 and Senate Bill 1008, SD1, in the Twenty-fifth Legislature Regular Session of 2009. STATE OF HAWAII DEPARTMENT OF HEALTH ENVIRONMENTAL HEALTH ADMINISTRATION, HONOLULU, HAWAII. March 18, 2009 Version.

Page 1. In table labeled CONTENTS (at top of page), in the row for IX. Comparative Table of Existing and Proposed Toxic Pollutant Criteria, in the column for "PAGE," change "19" to "18".

Page 2. Throughout the last paragraph (at bottom of page), change "26" to "36" and "2" to "4".

Page 3. At the top of the page, in the first complete sentence of the continuation of the paragraph from page 2., change "8" to "10"; "one pollutant" to "four pollutants"; "more stringent" to "less stringent"; and "less stringent" to "more stringent".

Page 3. In the first complete paragraph at top of page, change "6" to "8"; "2 more stringent" to "3 more stringent"; and "4" to "5".

Page 7. In the paragraph beginning "The standards …" (middle of page), in the last sentence, change "chlordane and dieldrin" to "toxic".

Page 22. In Part IX.A Comparative Table of Existing and Proposed Toxic Pollutant Criteria (Priority Pollutants), on line 33 for Ethylbenzene, in the column "Organism Only (ug/L)," change the font for the value "2,100" from regular type to bold type.

On the next line (unnumbered) for Ethylbenzene, in the column "Organism Only (ug/L)," change the font for the value "1,070" from bold type to regular type.

On the line (unnumbered) for Tetrachloroethanes (two lines below line 37 for 1,1,2,2-Tetrachloroethane), change the font for "Tetrachloroethanes" from regular type to bold type.

Page 27. In Part IX.A. Comparative Table of Existing and Proposed Toxic Pollutant Criteria (Priority Pollutants), on line 106 for delta-BHC, in the column "Organism Only (ug/L)," delete "0.0123 H".

In the line (unnumbered) for DDT, in all the columns, change the font for each entry from bold type to regular type. Then move the entire line up so it is in between line 108 for 4,4'-DDT and line 109 for 4,4'-DDE.

Page 31, In Part IX.B. Comparative Table of Existing and Proposed Toxic Pollutant Criteria (Non-Priority Pollutants), on line 19 for Hexachlorocyclo-hexane-Technical, in the column "CAS Number," change "319868" to "608731.

RATIONALE FOR THE PROPOSED REVISIONS TO DEPARTMENT OF HEALTH WATER QUALITY STANDARDS (March 18, 2009 Version)

CONTENTS

Part I. Executive Summary

This document explains three groups of proposed revisions to the State Water Quality Standards currently under deliberation for enactment by the State of Hawaii Legislature. First, the proposed revisions to numeric standards for toxic pollutants incorporate over 20 years of new, nationwide scientific research to update standards that have been in effect since 1990 and that are based on outdated U.S. Environmental Protection Agency (EPA) recommendations. Second, the proposed designation of coastal recreational waters formalizes the delineation of marine recreational waters in order to facilitate EPA and State implementation of the federal water quality standards required by the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000 (see 40 CFR 131.41), and of the State's specific criteria for marine recreational waters. Third, the proposed revisions to specific criteria for marine recreational waters provide consistency with the current federal criteria and their usage. This consistency is warranted for five major reasons:

1. the low degree of confidence in the scientific validity of EPA's indicator bacteria criteria (which is the basis for the State criteria);
2. a lack of evidence that implementation of the federal criteria would be any less protective of public health than implementation of the existing State criteria (based on nineteen years of data and experience);
3. the importance of State of Hawaii participation in nationwide efforts to improve these criteria and associated sampling technology;

4. the excessive burden experienced statewide in implementing the existing State criteria (particularly with regard to the Decision Rule recently adopted by the Department to meet BEACH Act requirements); and
5. the impracticality of implementing the existing State criteria given that the waters where they apply are surrounded by inland and marine waters governed by criteria that are five times greater.

Part II. Existing and Proposed Toxic Pollutant Criteria

In order to facilitate reference to and comparison with EPA National Recommended Criteria tables, the existing and proposed numeric standards for toxic pollutants are divided into two groups (priority and non-priority, see Part III.A. below) and five categories. Four of these categories involve aquatic life toxicity standards and the other category contains human-health related fish consumption standards. EPA and DOH have not developed criteria in all five categories for each and every toxic pollutant. The aquatic standards include acute and chronic toxicity values to protect freshwater and saltwater organisms (see Part III.C. below). Acute toxicity causes rapid adverse impacts to aquatic life, such as fish kills. Chronic toxicity occurs over longer periods and generally causes more subtle adverse impacts, such as reduced growth or reproduction. Both acute and chronic impacts to aquatic life must be prevented to ensure the propagation of fish, shellfish, and wildlife. The fish consumption standards are calculated to provide protection to public health from the consumption of contaminated aquatic organisms (see Part III.B. below).

The table in Part IX below compares the proposed toxic pollutant criteria, as recommended by EPA (Office of Water, Office of Science and Technology, 2006), with the existing toxic pollutant criteria in Hawaii Administrative Rules Title 11, Chapter 54 (HAR §11-54). The proposed criteria do not include:

1. EPA-recommended criteria for Arsenic, Cadmium, Chromium III, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Silver, and Zinc, because Hawaii- specific research supported the current State standards for these metals, and thus should be revisited before any changes are proposed;
2. Criteria for which current State water quality standards apply but for which there is no corresponding federal criterion, so that the lack of a federal criterion does not impliedly repeal our current standard; and
3. EPA-recommended criteria for non-priority pollutants that are not addressed by the existing criteria.

The effects of the proposed changes include the addition of 26 new priority toxic pollutants to the water quality standards, the addition of new aquatic life and human health criteria for toxic pollutants in the existing standards, and increases (less stringent standard) and decreases (more stringent standard) in the aquatic life and human health criteria in the existing standards. Specifically, these proposed changes include the adoption of human health criteria for all 26 new pollutants and aquatic life criteria for 2 of these 26 pollutants. For priority toxic pollutants that are listed in the existing water quality standards, there are approximately 57 proposed changes to the human health criteria, including new human health criteria for 11 pollutants, 15 proposed criteria that are more stringent than the existing criteria, and 31 proposed criteria that are less stringent than the existing criteria. There are about 8 proposed changes to the aquatic life criteria for these pollutants, including a new saltwater chronic toxicity criterion for one pollutant, more stringent freshwater chronic toxicity criteria for 3 pollutants, and less stringent freshwater acute toxicity criteria for 4 pollutants.

The proposed changes also affect numeric criteria for 8 non-priority toxic pollutants that are listed in the existing water quality standards. This includes human health criteria for 6 pollutants (2 more stringent, 4 less stringent than existing criteria) and aquatic life criteria for 2 pollutants, including a more stringent criterion for one of the pollutants and various changes for the other (1 more stringent, 1 less stringent, and 2 new criteria).

Part III. Rationale for Proposed Revisions to Toxic Pollutant Criteria

DOH believes that the updated, federally-recommended toxic pollutant criteria proposed by these revisions provide substantial and sufficient ecosystem and public health protection, and are developed with nationwide resources and expertise that cannot be matched at the state level. In order to understand the scientific and policy basis for the federal recommendations, we reviewed existing literature and decisions concerning priority and non-priority toxic pollutants, human health criteria for toxic pollutants (numeric standards for fish consumption), and aquatic life criteria for acute and chronic toxicity.

A. Priority and Non-Priority Pollutants

This terminology appears to be a vestige of historic federal decisions that were largely based on the production, use, environmental presence, and test methods that existed circa 1976-1981 (see http://www.epa.gov/waterscience/methods/pollutants-background.htm) rather than on any explicit or implicit rating of pollutant toxicity or regulatory necessity. However, in order to follow EPA naming conventions, and maintain consistency with the format of the EPA National Recommended Criteria tables, the proposed revisions retain this distinction.

Many of the non-priority toxic pollutants listed in the EPA National Recommended Criteria tables are not listed in the existing State water quality standards, and the proposed revisions do not add them to State standards. However, these pollutants include chemicals that were not yet invented, produced, or used at the time the existing State standards (and the EPA recommendations used to derive them) were established, as well as emerging contaminants whose negative environmental effects were only recently discovered. Although named "non-priority" by EPA convention, reviewing and potentially adopting criteria for these kinds of pollutants are a priority for future review and revision of the water quality standards.

B. Human Health Criteria

EPA calculates human health criteria (numeric standards for fish consumption) using data from three fields of scientific research – human toxicology, aquatic organism bioaccumulation, and human consumption of fish and shellfish – in the context of public health policy decisions about acceptable risk. The existing fish consumption criteria are based on EPA's 1980 methodology for the development of water quality criteria to protect human health (Federal Register Vol. 45, No. 231); EPA's 1986 recommend criteria (Office of Water Regulations and Standards, 1986), based on earlier criteria documents (Criteria and Standards Division, 1980); and DOH's adoption of the 1986 EPA recommendations (Environmental Planning Office, 1989). The proposed revisions to these criteria are based on EPA revisions to the 1980 methodology (Federal Register Vol. 65, No. 214; Office of Science and Technology, 2000a & 2000b); significant scientific advances in cancer risk assessments and exposure assessments (U.S. Environmental Protection Agency, 1997; National Center for Environmental Assessment; Office of Science and technology, 2000d; Science Applications International Corporation, 2002); and resulting EPA recommendations and actions (Office of Science and Technology, 2002 & 2006; Federal Register Vol. 65, No. 97). The following discussion draws directly and heavily from EPA documentation and synthesis of these methodological revisions, scientific advances, and new recommendations.

Human Toxicology - If human or animal studies on a contaminant indicated that it induced a statistically significant carcinogenic response, the 1980 Ambient Water Quality Criteria (AWQC) National Guidelines treated the contaminant as a carcinogen and derived a low-dose cancer potency factor from available animal data using the linearized multistage model (LMS). The LMS, which uses a linear, nonthreshold assumption for low-dose risk, was used by EPA as a science policy choice in protecting public health, and represented a plausible upper limit for low-dose risk. The cancer potency factor (also known as slope factor) is used in risk assessment to estimate a lifetime probability of an individual developing cancer as a result of exposure to a particular level of a potential carcinogen. It quantitatively expresses the relationship between dose and response in terms of the estimated upper-bound incremental lifetime risk per mg/kg average daily dose. In other words, it is the cancer risk (proportion affected) per unit of dose, expressed in milligrams of substance per kilogram of body weight per day. National policy and prevailing opinion in the expert community establish that the human health criteria for carcinogens should be derived assuming lifetime exposure of a 70 kg adult male over a 70-year time period.

Since 1980, EPA risk assessment practices have evolved significantly in all of the major areas for AWQC development: that is, cancer and noncancer risk assessments, exposure assessments, and bioaccumulation. When the 1980 AWQC National Guidelines were developed, EPA had not yet developed formal cancer or noncancer risk assessment guidelines. Since then, EPA has published several cancer risk assessment guidelines (most recently in Risk Assessment Forum, 2005; see Background at http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=116283). In 1986, EPA made available to the public the Integrated Risk Information System (IRIS). IRIS is a database that contains risk information on the cancer and noncancer effects of chemicals. The IRIS assessments are peer reviewed and represent EPA consensus positions across the Agency's program and regional offices. In particular, there have been advances in the use of mode of action (MOA) information to support both the identification of potential human carcinogens and the selection of procedures to characterize risk at low, environmentally relevant exposure levels. For example, the Proposed Guidelines for Carcinogen Risk Assessment (Office of Research and Development, 1996) presented revised procedures to quantify cancer risk at low doses, replacing the default use of the LMS model. Thus, given new cancer potency information from IRIS, different cancer potency factors were used to calculate the existing and proposed fish consumption criteria, for example as shown in Table 2 (below) for chlordane and dieldrin (Environmental Health Administration, 2009).

Aquatic Organism Bioaccumulation - Given long-term exposure, the concentration of a pollutant accumulated in an organism may be orders of magnitude higher than the ambient water column concentration. To calculate human health criteria, scientists determine the bioconcentration factor of a toxic pollutant – the concentration rate to which a pollutant will accumulate in aquatic organisms, relative to the concentration of the pollutant in water. Some bioconcentration factors, such as those used to calculate the existing and proposed chlordane and dieldrin criteria (shown below in Table 2), have not changed since 1980. In cases where bioconcentration factors have changed for specific pollutants, these changes are assumed to represent the best available science, and are applied and reflected in the proposed fish consumption criteria.

Human consumption of fish and shellfish - Once both the cancer potency factor and bioconcentration factor are known for a pollutant, a water column concentration can be calculated which will ensure that the pollutant cannot bioaccumulate in aquatic organisms to a level that will cause a selected lifetime cancer risk level to be exceeded (**see Equation for Deriving Human Health Criteria Based on Carcinogenic Effects** below). This calculation is based upon the average amount of fish and shellfish a person is likely to consume. The daily consumption figures used to calculate the existing and proposed fish consumption criteria for all toxic pollutants are shown below in Table 2.

Due to the lack of adequate current fish consumption data for Hawaii, we use the updated national default fish consumption rate (used to calculate the 2002 and 2006 EPA National Recommended Criteria) to calculate the proposed State criteria. This rate (17.5 grams/person/day) approximates the 90^{th} percentile of freshwater/estuarine finfish and shellfish consumption estimates obtained for adult humans by the national survey (Office of Science and Technology, 2002; Science Applications International Corporation, 2002), and therefore represents the estimated average amount consumed by all but 10% of the population. A summary of these national survey results for finfish and shellfish from various habitats is shown below in Table 3. Note that selecting results for fish species from different habitats, and for consumption estimates from different statistical distributions (Statistic), would drive the calculated water quality criteria lower for higher fish consumption, and higher for lower fish consumption (see **Equation for Deriving Human Health Criteria Based on Carcinogenic Effects** below).

Acceptable Risk – EPA policy states that both 10^{-6} and 10^{-5} risk levels are acceptable for the general population and that highly exposed populations should not exceed a 10^{-4} risk level (Office of Science and Technology, 2000a). The existing and proposed State of Hawaii criteria are set at the one in one million lifetime excess cancer risk level (10^{-6}). Human health criteria for carcinogens are based on chosen risk levels that inherently reflect, in part, the exposure parameters used to derive those values. Therefore, changing the exposure parameters also changes the risk. Specifically, the incremental cancer risk levels are relative, meaning that any given criterion associated with a particular cancer risk level is also associated with specific exposure parameter assumptions (e.g., intake rates, body weights). When these exposure parameter values change, so does the relative risk.

For example, for criteria derived on the basis of a cancer risk level of 10^{-6}, individuals consuming up to 10 times the assumed rate would not exceed a 10^{-5} risk level. Similarly, individuals consuming up to 100 times the assumed rate would not exceed a 10^{-4} risk level. Thus, for criteria (like our proposed criteria) based on EPA's default fish intake rate (17.5 grams/person/day) and a risk level of 10^{-6}, individuals consuming fish and shellfish at up to 10 times the average rate would not exceed a 10^{-5} risk level. Those consuming a pound of fish and shellfish per day (454 grams/person/day) would potentially experience between a 10^{-5} and a 10^{-4} risk level (closer to a 10^{-5} risk level), and those consuming fish and shellfish at 100 times the average rate (almost 4 pounds per day) would still not exceed a 10^{-4} risk level. This provides for a 100-fold safety factor in the proposed standards. In other words, we have an adequate margin of safety in using the Federal numbers even for subsistence eaters because of the stringent cancer risk level.

Equation for Deriving Human Health Criteria Based on Carcinogenic Effects
(adapted from Federal Register Vol. 45, No. 231 & Office of Water, 1994).

$$C = \frac{(WT \times P)}{q_1^*(DFC \times BCF)}$$

where:

- C = water quality criteria (mg/l)
- WT = weight of an average human adult (70 kg)
- P = lifetime risk level (10^{-6})
- q_1^* = cancer potency factor $(mg/kg/day)^{-1}$
- DFC = daily fish consumption (kg fish/day)
- BCF = bioconcentration factor (mg toxicant/kg fish divided by mg toxicant/l water)

Table 2. Cancer Potency Factor (q_1^*), Bioconcentration Factor (BCF), and Daily Fish Consumption (DFC) used to calculate existing and proposed toxic pollutant criteria (fish consumption) for chlordane and dieldrin

Criterion	q_1^* (oral slope factor) $(mg/kg/day)^{-1}$	BCF[1]	DFC[2] kg/day
Existing Chlordane Criterion	1.6075[3]	4,1 00	.0199
Proposed Chlordane Criterion	0.35[4]	4,1 00	.0175
Existing Dieldrin Criterion	30.37[3]	4,670	.0199
Proposed Dieldrin Criterion	16[4]	4,670	.0175

[1]Based on the mean of two steady-state BCF values, normalized to 1% lipids, and adjusted to 3% lipids (the weighted average lipids % for consumed fish and shellfish), yielding the weighted average bioconcentration factor for the pollutant and the edible portion of all freshwater and estuarine aquatic organisms (Criteria and Standards Division, 1980).
[2]Existing criteria are based on an assumption that the Hawaii general population consumes 19.9 grams fish/day, which is 3.1 times the 1986 national freshwater/estuarine DFC of 6.5 grams fish /day (Environmental Planning Office, 1989; Office of Water Regulations and Standards, 1986, based on Stanford Research Institute International, 1980). Proposed criteria are based on the updated national default freshwater/estuarine DFC of 17.5 grams fish/day (Office of Science and Technology, 2002, based on Science Applications International Corporation, 2002). Note that this value is within 12 to 14% of the Hawaii DFC used to calculate the existing criteria, and that this Hawaii DFC is the same as the 2002 national mean DFC for fish species from all habitats (see Table 3 below).
[3]Criteria and Standards Division, 1980.

[4]National Center for Environmental Assessment. Values in EPA Integrated Risk Information System (IRIS) confirmed by EPA Toxicologist William A. Frez, Ph.D. on March 05, 2009 via IRIS hotline at (202) 566-1676 and reply e-mail.

Table 3. Summary of Uncooked Daily Fish Consumption (DFC) Estimates, U.S. Population – Finfish and Shellfish, Individuals of Age 18 or Older (adapted from Office of Science and Technology, 2002)

Statistic	Estimated DFC (grams/person/day) for fish species from different habitats		
	Freshwater/Estuarine	Marine	All
Mean	7.50	12.41	**19.91**[2]
90^{th} %	**17.37**[1]	48.92	74.79
99^{th} %	143.35	150.77	215.70

[1]Approximates 17.5 grams/person/day national default rate
[2]Equivalent to the DFC used to develop existing State criteria

Conclusions - DOH believes that the proposed human health criteria standards (numeric standards for fish consumption) are inherently and sufficiently conservative for several reasons, beginning with the selected one in a million lifetime risk level (10^{-6}), which is equal to or more conservative than those routinely used in other DOH human health risk assessments. For example, target excess cancer risks used to develop the soil and groundwater Environmental Action Levels (EALs) range from 10^{-6} to 10^{-4}, depending on the contaminant and taking into considerations such factors as naturally occurring levels, dietary exposure, and uncertainty in toxicity factors (Hazard Evaluation and Emergency Response Office, 2008). The State of Hawaii drinking water Maximum Contaminant Level (MCL) for chlordane of 0.002 mg/l (Department of Health, 2005) equates to a selected cancer risk of 10^{-5}, and State fish consumption advisories are issued on the basis of 10^{-5} risk levels suggested by EPA guidance (Office of Science and Technology, 2000c).

The standards are also conservative because of the assumptions used in estimating the fish consumption factor. These estimates assume that all fish and shellfish consumed are from national/State waters, thus avoiding consideration of the potentially high levels of toxic pollutants in the locally consumed global supply. For example, the research used to establish the fish consumption factor used in the existing Hawaii standards (Hudgins, 1980) estimated that over an eight-year period (from 1970 to 1977), local commercial landings accounted for just 32% of the total Hawaii supply of commercial fish and shellfish (ranging annually from 21% to 46%). Also, of this locally caught seafood, it is likely that much of it is landed in waters that are relatively unaffected by sources of chlordane and dieldrin pollution.

Of the three other factors used to derive a fish consumption standard – cancer potency factor, bioconcentration factor, and consumption rate – the consumption rate is by far the most accurate, even if it is an average value. Bioconcentration factors have wide inter- and intraspecies variability. To account for these and other areas of uncertainty, numerous order-of-magnitude safety factors are used in deriving the final values. Adjustments to the fish consumption factor - even the three-fold increase in the old national figure used in the existing State standards, and the single order-of-magnitude variation in estimated nationwide fish consumption - are minor in comparison (Department of Health, 1989). Also, although cancer risk generally increases as fish consumption increases, there are potentially counterbalancing health benefits to eating more fish (as opposed to other items in the global food supply, which may also have higher levels of toxic pollutants).

The need to establish toxic pollutant criteria for the State of California was an impetus for much of the scientific work that generated the 2002 and 2006 National Recommended Water Quality Criteria, many of which were eventually promulgated by federal regulation as the criteria for the inland surface waters, enclosed bays and estuaries of that state (Federal Register Vol. 65, No. 97). The nationwide resources and expertise for this effort cannot be matched at the state level. Given California's large fisheries, large fish-eating populations, large scientific community, and more heavily polluted waters, we assume that the National Recommended Water Quality Criteria are equally suitable for Hawaii, and they will provide substantial and sufficient public health protection for fish consumption.

C. Aquatic Life Criteria

The existing and proposed criteria for the protection of aquatic life specify pollutant concentrations which, if not exceeded, should protect most, but not necessarily all, aquatic life and its uses (Federal Register/Vol. 45, No. 231). These criteria for preventing acute and chronic toxicity to fresh and saltwater organisms are based upon extensive EPA reviews of aquatic toxicity research (Criteria and Standards Division, 1980; Environmental Protection Agency, 1985; Office of Water Regulations and Standards, 1986; Environmental Planning Office, 1989; Health and Ecological Criteria Division, 1996; National Center for Environmental Assessment). Since 1980, EPA has changed its requirements for the type and extent or research results needed to derive final criteria for a particular pollutant, and now recommends that states invest in species-specific and site-specific research to develop their aquatic life criteria.

The existing criteria were based on large and diverse groups of organisms in order to ensure that the most sensitive organisms in the receiving waters are likely to be protected, but very few Hawaiian species were represented in the national database. However, replicating the level of effort and information reflected in national database, using Hawaii species only, is clearly impossible. There are not a sufficient number of tests available using native and naturalized species to meet the requirements for developing criteria, and even if all the tests were available, it would be time and cost-prohibitive to repeat the national research for all of the toxic pollutants (Environmental Planning Office, 1989).

Although EPA recommendations about the exceedance frequency for aquatic life criteria have also changed, the exiting and proposed Hawaii criteria are based on the original EPA approach. Acute toxicity standards are expressed as maximum concentrations which must never be exceeded (instantaneous values), and chronic toxicity criteria are expressed as average concentrations during any 24-hour period, because the lower pollutant levels which cause chronic impacts (compared to acuter impacts) must be present for a longer time period than the levels which cause acute impacts. DOH believes that other approaches that apply the criteria in the context of longer "recovery periods" for pollution events are less applicable to oceanic systems, less protective of continual cycles of toxic impact, and less practical to implement (Environmental Planning Office, 1989). In some cases, the proposed changes to existing acute toxicity criteria may reflect the development of EPA national recommendations that did not exist when the State standards were adopted in 1990. In such cases, the existing criteria may be based on EPA-published acute Lowest Observed Effect Levels (LOEL, representing the level which is lethal to 50 percent of test organisms) divided by three (to estimate the level of no acute toxicity) (Environmental Planning Office, 1989).

Conclusions - DOH believes that the proposed aquatic life criteria (numeric standards for acute and chronic toxicity) were developed using the best available science and sufficiently protect most aquatic life and its uses. Six of the proposed criteria are more stringent than the existing criteria, three of the proposed criteria establish standards that did not previously exist for the associated pollutants, and only four of the proposed criteria are less stringent than the existing criteria. We assume that the National Recommended Water Quality Criteria are suitable for Hawaii, as they provide for simple, straightforward implementation that makes maximum uses of EPA recommendations, and ensure comprehensive coverage of toxic pollutants with scientifically defensible criteria without the need to conduct a resource-intensive evaluation of the particular segments and pollutants requiring criteria.

Part IV. Existing and Proposed Designation of Coastal Recreation Waters

In order to facilitate EPA and State implementation of the federal water quality standards required by the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000 (http://www.epa.gov/waterscience/beaches/files/beachbill.pdf, and 40 CFR 131.41), and of the State's specific criteria for marine recreational waters, DOH proposes three designations of coastal recreational waters that formalize the delineation of marine recreational waters and the scope of their use and regulation. The existing water quality standards do no explicitly state that recreational uses are to be protected in marine waters, and do not explicitly define or delineate the full extent of marine recreational waters and the types of recreational uses protected therein. DOH proposes to rectify this situation by:

1. excluding from coastal recreational waters the areas where water contact recreational activities are prohibited by state or federal law or regulation;
2. designating only the areas within 33 meters of the surface as coastal recreational waters; and
3. designating areas beyond 500 meters from shore as infrequent use coastal recreation waters.

This would effectively limit the applicability of the specific federal and state water quality criteria for coastal recreational waters and marine recreational waters to areas within 33 meters of the surface where water contact recreational activities are not prohibited by state or federal law or regulation, and provide a basis for relaxing the single sample maximum for bacterial indicator criteria in areas beyond 500 meters from shore.

Part V. Rationale for Designation of Coastal Recreation Waters

A. Prohibited areas

State water quality standards proclaim that the uses to be protected in Class AA marine waters are "... compatible recreation ..." [HAR §11-54-3(c)(1)(B)], while HAR §11-54-3(c)(2) concerning Class A marine waters merely states "It is the objective of class A waters that their use for recreational purposes and aesthetic enjoyment be protected." This has historically been interpreted as designating all state marine waters (from shoreline to three nautical miles from shore) as recreational waters, with no explicit or implicit exclusion of areas where water contact recreational activities are prohibited by state or federal law or regulation. In fact, state or federal law or regulation prohibits water contact recreational activities in various marine waters, such as sea defense areas, pipeline areas, outfall areas, and harbors. Where these activities are prohibited by other jurisdictions, there is currently no implicit or explicit corollary non-recreational use designation in the water quality standards. Thus the proposal to exclude from the designation of coastal recreational waters areas where water contact recreational activities are prohibited by state or federal law or regulation corrects this deficiency and relieves DOH of any potential affirmative duty to protect water quality for recreational use support in these areas.

B. 33m depth

"Marine waters," "compatible recreation," and "recreational purpose" are not included in the definitions listed in HAR §11-54-1, but according to HAR §11-54-2(c)(1) marine waters "are either embayments, open coastal, or oceanic waters." According to HAR §11-54-6(a)(1), (b)(1), and (c)(1), "embayment," "open coastal waters," and "oceanic waters" each means some portion of "marine waters." "Coastal waters" is defined in HAR §11-54-1 as "all waters surrounding the islands of the State from the coast of any island, to a point three miles seaward from the coast ..." (Department of Health, 2004). Class A and Class AA "Water areas to be protected" are listed for embayments and open coastal waters [HAR §11-54-6(a)(2) and (b)(2)], but oceanic waters (defined as "all other marine waters outside of the 183 meter ... depth contour") are all Class A only [HAR §11-54-6(c)(1) and (2)]. Thus all marine waters are coastal waters, and may be Class A, but only marine waters within embayments or open coastal waters can be Class AA.

To complement this confusion, HAR §11-54-8(b) establishes specific bacterial indicator criteria for marine recreational waters only "within 300 meters (one thousand feet) of the shoreline, including natural public bathing or wading areas ..." Given historical rationales for designating all State marine waters (from shoreline to three nautical miles from shore) as recreational waters (see A. Prohibited areas above), this led to an EPA regulatory decision that the federal bacterial indicator criteria established under the BEACH Act of 2000 should be applied to all State marine waters beyond 300 meters from shore, since those waters are "designated for swimming, bathing, surfing, or similar water contact activities" but do "not have in place EPA-approved bacteria criteria that are as protective of human health as EPA's 1986 recommended bacteria criteria" (Federal Register Vol. 69, No. 220).

Existing State water quality standards do not designate a maximum depth for delineating marine recreational waters, however many other states have implicitly or explicitly done so. Although

EPA, in its regulatory decision noted above, partially relied upon DOH statements that "The standard applies at all points in the water column from the surface to the bottom"(Department of Health, 1989), DOH believes that this statement from a previous administration does not properly represent the letter or the intent of State law and current departmental policy. While DOH acknowledges that commercial and extreme/adventurous water contact activities occur in waters deeper than 33 meters, the attendant dangers, limited light, and bottom time restrictions qualify these as non-recreational activities (Environmental Planning Office, 2005) that appear to pose greater risks to the health of divers than would high enterococcus counts.

Given the demonstrated confusion and inconsistency in the existing definition and delineation of the full extent of marine recreational waters (and the types of recreational uses protected therein), the low degree of confidence in the scientific validity of EPA's indicator bacteria criteria (which is the basis for the State criteria, see Part VII below), and the impracticality and expense of implementing marine recreational water quality standards at the extreme depths frequently encountered in Hawaiian waters, DOH believes that it is in the best interest of the State, and particularly of our public health protection efforts, to designate only the areas within 33 meters of the marine water surface as coastal recreational waters. This proposal to facilitate EPA and State implementation of the federal water quality standards required by the BEACH Act of 2000 and of the State's specific criteria for marine recreational waters has been studied by the Department and publicly posted and available since 2005. The Hawaii chapters of the Sierra Club and the Surf Rider Foundation supported these 2005 proposed rule amendments, and the House Committees on Energy & Environmental Protection and Water, Land, & Ocean Resources recently found that the rationale for these amended standards remains valid for the adoption of the proposed revised enterococcus standards (House of Representatives, 2009).

C. Infrequent Use Coastal Recreation Waters

During a previous revision of the water quality standards, DOH agreed "that full and partial body-contact recreational activities, including swimming, skin diving, surfing, kayaking, and windsurfing, frequently occur beyond the 1,000 foot boundary" (Department of Health, 1989). The BEACH Act of 2000 provides guidance for states to establish different water quality criteria for frequent and infrequent recreational use of coastal recreational waters. During a more recent review of the water quality standards, the DOH advisory group recommended that a frequent use area be designated out to 500 meters from the shoreline. By virtue of this designation (which essentially extends the existing frequent use area an additional 200 meters offshore), almost all surf sites in Hawaii would be located within the frequent use areas, as would almost all other recreational water activities near the shoreline. Beyond 500 meters from the shore, activities are more closely related to transient recreation uses not involving frequent full-body submergence, such as deep-sea fishing (trolling), sailing, and canoe paddling. Because most full-body contact recreational activities are located within 500 meters of the shoreline, the use beyond 500 meters can be classed as infrequent (Environmental Planning Office, 2005).

Given the demonstrated confusion and inconsistency in the existing definition and delineation of the full extent of marine recreational waters (and the types of recreational uses protected therein), the low degree of confidence in the scientific validity of EPA's indicator bacteria criteria (which is the basis for the State criteria, see Part VII below), and the impracticality and expense of implementing marine recreational water quality standards for frequent use areas in waters beyond 500 meters from shore, and particularly of our public health protection efforts, to designate marine waters beyond 500 meters as infrequent use coastal recreation waters, and to regulate them accordingly. This proposal to facilitate EPA and State implementation of the federal water quality standards required by the BEACH Act of 2000 and of the State's specific criteria for marine recreational waters has been studied by the Department and publicly posted and available since 2005. The Hawaii chapters of the Sierra Club and the Surf Rider Foundation supported these 2005 proposed rule amendments, and the House Committees on Energy & Environmental Protection and Water, Land, & Ocean Resources recently found that the rationale for these amended standards remains valid for the adoption of the proposed revised enterococcus standards (House of Representatives, 2009).

Part VI. Existing and Proposed Specific Criteria for Marine Recreational Waters

The proposed revisions would supersede HAR §11-54-8(b)(1) and (2) by revising the criteria to maintain consistency with the current national criteria and usage of the criteria in accordance with Beaches Environmental Assessment and Coastal Health Act of 2000, 40 CFR Part 131 (in 69 FR 67218, dated November 16, 2004). In marine recreational waters within 300 meters from shore, the existing geometric mean criterion of 7 colony forming units (CFU) per 100 milliliters (ml) of water will be replaced by the proposed criterion of 35 CFU per 100 ml, which is already in place beyond 300 meters from shore under federal regulation. Similarly, the existing single sample maximum criterion of 100 CFU per 100 ml will be replaced by the proposed criterion of 104 CFU per 100 ml. In marine recreational waters beyond 500 m from shore, the existing single sample maximum criterion of 100 CFU per 100 ml will be replaced by the proposed criterion of 501 CFU per 100 ml, and implemented according to recent EPA guidance (Office of Water, 1006).

Part VII. Rationale for Proposed Revisions to Specific Criteria for Marine Recreational Waters

Given the low degree of confidence in the validity of EPA's indicator bacteria criteria, and State of Hawaii participation in nationwide efforts to improve these criteria, it is in the best interests of the State, EPA, and the scientific community for Hawaii to maintain consistency with the current national criterion and usage of the criterion. The proposed revision will allow for the application of the standard in a manner that is consistent with other States and the EPA, until EPA can promulgate new indicators. It will also allow the DOH lab to use faster, more economical analytical methods that are not suitable for our current standard of 7 CFU per 100 ml. Because most if not all coastal states use 35 CFU per 100 ml as their coastal waters standard, new analytical methods are under development for counts in the range of 35 CFU per 100 ml, and not for lower counts. In the nineteen years since the current state criteria were adopted, the Department has not seen any reliable scientific evidence to suggest that public health will be compromised by these proposed changes. Over twenty years of new scientific knowledge about the limitations of the original epidemiological research and the indicator upon which it relies, lead us to conclude that the difference between 7 and 35 CFU/100 ml is not a significant public health concern.

The enterococcus criterion of 35 CFU per 100 (geometric mean) for marine recreational waters was adopted by Hawaii in 1988, replacing fecal coliform as the health risk indicator organism. This limit was based upon EPA recommendations, and was estimated to correspond to a risk of 19 illnesses per 1000 swimmers who swallow a mouthful of sewage impacted waters (Criteria and Standards Division, 1986). Enterococcus, as an indicator organism, is not the cause of illnesses. Rather, it serves as an indicator for sewage contamination. Sewage contains many other different types of pathogenic organisms, some of which (e.g. viruses) are actually responsible for causing illnesses. After further review of the data, the DOH administration determined that 19 illnesses per 1000 swimmers was too high a risk level, preferring that the risk be reduced to half that amount, or 10 illnesses per 1000 swimmers. This lower risk corresponded to an enterococcus geomean level of 7 CFU per 100 ml. As a result, Hawaii opted in 1990 to lower the State standard from the recommended Federal limit of 35 CFU per 100 ml to a more stringent 7 CFU per 100 ml (Environmental Planning Office, 1989).

At that time, the standard was used solely to assess potential health risks from swimming related activities. If an exceedance occurred, the situation was evaluated to determine if the cause was sewage related. Subsequent actions were taken only when a sewage source was suspected. However, it must be understood that there are other environmental sources of Enterococcus bacteria besides sewage. Furthermore, these bacteria have been shown to survive and replicate in the natural environment. This is important because, for example, during rain events, the non-sewage related enterococcus bacteria are washed into the waterways and are eventually transported out to marine waters. It is common for bacteria levels to increase after rain events. Unlike with sewage, however, this does not mean that the other pathogenic organisms contained in sewage are also present in elevated quantities. It is for this reason that the sources of the elevated enterococcus levels were assessed before corrective actions were taken.

Throughout the U.S. and the global scientific community, there is a low degree of confidence in the validity of EPA's indicator bacteria criteria, especially where most pollution sources are non-point in origin. In the last few years, EPA and the states have extensively examined the adequacy of bacterial indicators for identifying sewage contamination, and there is consensus on the need for better and quicker indicator tests. While studies are underway to identify new testing methods for regulatory purposes, they have not concluded. In practice, the department has moved toward a "tool box approach" to water quality analysis, looking at more than one indicator. This is current best practice.

Using a 35 CFU per 100 ml geometric mean standard will also reduce inconsistency in our regulation and management of water quality and pollutant sources. Upstream from the marine waters where our current standard of 7 CFU per 100 ml applies, the inland water standard, per EPA recommendation, is 33 CFU per100 ml. In ocean waters beyond the coastal waters where our current standard of 7 CFU per100 ml applies, the EPA standard of 35 CFU per 100 ml applies (Federal Register Vol. 69, No. 220). This checkerboard of standards creates a confusing situation that is more difficult to implement.

Adoption of the higher federal standard has not been shown to result in an increased risk of minor illness after recreational use of states' surface waters. Switching to the federal criterion will help us to directly compare recreational water quality in Hawaii to that of other states using the same criterion, until such time as more human-specific sewage indicators are identified and made widely available at a low cost for routine monitoring purposes. The advantages of this proposal are that bacterial counts can be made more accurately at the higher federal criterion of 35 CFU per 100 ml; and that Hawaii's data become comparable to data from other subtropical and tropical areas using the federal criterion. Chronic exceedances of the 35 CFU federal standard at a location will be followed up with sanitary surveys to determine if the source of enterococcus is human, animal, or soil. There is no reliable scientific evidence that this will compromise public health in any way (Environmental Planning Office, 2005).

The proposed revisions to specific criteria for marine recreational waters provide consistency with the current federal criteria and their usage. This consistency is warranted for five major reasons:

1. the low degree of confidence in the scientific validity of EPA's indicator bacteria criteria (which is the basis for the State criteria);
2. a lack of evidence that implementation of the federal criteria would be any less protective of public health than implementation of the existing State criteria (based on nineteen years of data and experience);
3. the importance of State of Hawaii participation in nationwide efforts to improve these criteria and associated sampling technology;
4. the excessive burden experienced statewide in implementing the existing State criteria (particularly with regard to the Decision Rule recently adopted by the Department to meet BEACH Act requirements); and
5. the impracticality of implementing the existing State criteria given that the waters where they apply are surrounded by inland and marine waters governed by criteria that are five times greater.

Given the low degree of scientific confidence in the validity of federal indicator bacteria criteria in general, State of Hawaii participation in nationwide efforts to improve these criteria, and the structure of State and EPA standards for adjacent waters, it is in the best interests of the State, EPA, and the scientific community for Hawaii to maintain consistency with the current national criteria, until new indicators or approaches can be promulgated by EPA as a result of its current development efforts.

This proposal to facilitate EPA and State implementation of the federal water quality standards required by the BEACH Act of 2000 and of the State's specific criteria for marine recreational waters has been studied by the Department and publicly posted and available since 2005. The Hawaii chapters of the Sierra Club and the Surf Rider Foundation supported these 2005 proposed rule amendments, and the House Committees on Energy & Environmental Protection and Water, Land, & Ocean Resources recently found that the rationale for these amended standards remains valid for the adoption of the proposed revised enterococcus standards (House of Representatives, 2009).

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Part IX. Comparative Table of Existing and Proposed Toxic Pollutant Criteria

The attached table follows the structure of the 2006 EPA National Recommended Criteria (Office of Science and Technology, 2006) to display relationships between existing State of Hawaii criteria, proposed State of Hawaii criteria, and National Recommended Criteria for EPA Priority (Part IX.A.) and Non-Priority (Part IX.B.) toxic pollutants. Pollutants are listed in numeric order according to the line numbers shown in the EPA table, with the EPA name and information in one or more rows followed by the DOH name and information from HAR §11-54-4(b)(3) in the next row(s). No relationship with EPA criteria could be found for three of the toxic pollutants in HAR §11-54-4(b)(3), so they are not incorporated in this Part IX. table and no changes to their existing criteria are proposed [Pentachloroethanes, Polynuclear aromatic hydrocarbons, and Tetrachlorophenol (2,3,5,6)].

In the following table, each criterion value (and associated footnote, where applicable) entered in bold type indicates the proposed legislative action. The criteria and information in the unshaded cells are from the EPA National Recommended Criteria, and those in the shaded cells are the existing DOH regulatory criteria and information from HAR §11-54-4(b)(3). Note that unlike HAR §11-54-4(b)(3), the table does not identify carcinogens. Also, in some cases DOH pollutant names for compounds are listed in the plural form. These pollutant names are shown in bold type, and represent complex mixtures of isomers. The criteria associated with these compounds refer to the total allowable concentration of any combination of isomers of the compound, not only to the concentrations of individual isomers. In these cases, both the existing DOH criteria for the complex mixtures and the associated DOH and EPA criteria for the related individual isomers are retained as the proposed regulatory criteria. Reviewing the need for changes to this situation is a priority for future rulemaking.

Part IX.A. - Comparative Table of Existing and Proposed Toxic Pollutant Criteria (Priority Pollutants)

			Freshwater		Saltwater		Human Health for the consumption of	
	Priority Pollutant (EPA 2006) / Toxic Pollutant (DOH 1990)	CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
1	Antimony	7440360					640 B	65FR66443
	Antimony		3000	ns	ns	ns	15000	
2	Arsenic	7440382	340 A,D,K	150 A,D,K	69 A,D,bb	36 A,D,bb	0.14 C,M,S	65FR31682 57FR60848
	Arsenic		360	190	69	36	ns	
3	Beryllium	7440417						65FR31682
	Beryllium		43	ns	ns	ns	0.039	
4	Cadmium	7440439	2.0 D,E,K,bb	0.25 D,E,K,bb	40 D,bb	8.8 D,bb		EPA-822-R-01-001 65FR31682
	Cadmium		3*	3*	43	9.3	ns	
5a	Chromium (III)	16065831	570 D,E,K	74 D,E,K				EPA820/B-96-001 65FR31682
5b	Chromium (VI)	18540299	16 D,K	11 D,K	1,100 D,bb	50 D,bb		65FR31682
	Chromium (VI)		16	11	1100	50	ns	
6	Copper	7440508	13 D,E,K,cc	9.0 D,E,K,cc	4.8 D,cc,ff	3.1 D,cc,ff		65FR31682
	Copper		6*	6*	2.9	2.9	ns	
7	Lead	7439921	65 D,E,bb,gg	2.5 D,E,bb,gg	210 D,bb	8.1 D,bb		65FR31682
	Lead		20*	20*	140	5.6	ns	
8a	Mercury	7439976						62FR42160
	Mercury		2.4	0.55	2.1	0.025	0.047	

			Freshwater		Saltwater		Human Health for the consumption of	
Priority Pollutant (EPA 2006) / **Toxic Pollutant (DOH 1980)**		CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
8b	Methylmercury	22967926	**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	EPA823-R-01-001
9	Nickel	7440020	470 D,E,K	52 D,E,K	74 D,bb	8.2 D,bb	4,600 B	65FR31682
	Nickel		**5***	**5***	**75**	**8.3**	**33**	
10	Selenium	7782492	L,R,T	5.0 T	290 D,bb,dd	71 D,bb,dd	4200	62FR42160 65FR31682 65FR66443
	Selenium		**20**	**5**	**300**	**71**	**ns**	
11	Silver	7440224	3.2 D,E,G		1.9 D,G			65FR31682
	Silver		**1***	**1***	**2.3**	**ns**	**ns**	
12	Thallium	7440280					**0.47**	68FR75510
	Thallium		**470**	**ns**	**710**	**ns**	**16**	
13	Zinc	7440666	120 D,E,K	120 D,E,K	90 D,bb	81 D,bb	26,000 U	65FR31682 65FR66443
	Zinc		**22***	**22***	**95**	**86**	**ns**	
14	Cyanide	57125	**22 K,Q**	**5.2 K,Q**	**1 Q,bb**	**1 Q,bb**	**140 jj** - -	EPA820/B-96-001 57FR60848 68FR75510
	Cyanide		**22**	**5.2**	**1**	**1**	**ns**	
15	Asbestos	1332214						57FR60848
16	2,3,7,8-TCDD (Dioxin)	1746016					**5.1E-9 C**	65FR66443
	Dioxin		**0.003**	**ns**	**ns**	**ns**	**5.00E-09**	

			Freshwater		Saltwater		Human Health for the consumption of	
Priority Pollutant (EPA 2006) **Toxic Pollutant (DOH 1990)**		CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
17	Acrolein	107028					**290**	65FR66443
	Acrolein		**23**	**ns**	**18**	**ns**	**250**	
18	Acrylonitrile	107131					**0.25 B,C**	65FR66443
	Acrylonitrile		**2500**	**ns**	**ns**	**ns**	**0.21**	
19	Benzene	71432					**51 B,C**	IRIS 01/19/00 & 65FR66443
	Benzene		**1800**	**ns**	**1700**	**ns**	**13**	
20	Bromoform	75252					**140 B,C**	65FR66443
21	Carbon Tetrachloride	56235					**1.6 B,C**	65FR66443
	Carbon Tetrachloride		**12000**	**ns**	**16000**	**ns**	**2.3**	
22	Chlorobenzene	108907					1,600 U	68FR75510
23	Chlorodibromomethane	124481					13 B,C	65FR66443
24	Chloroethane	75003						
25	2-Chloroethylvinyl Ether	110758						
26	Chloroform	67663					**470 C,P**	62FR42160
	Chloroform		**9600**	**ns**	**ns**	**ns**	**5.1**	
27	Dichlorobromomethane	75274					**17 B,C**	65FR66443
28	1,1-Dichloroethane	75343						
29	1,2-Dichloroethane	107062					**37 B,C**	65FR66443
	1,2-Dichloroethane		**39000**	**ns**	**38000**	**ns**	**79**	
30	1,1-Dichloroethylene	75354					**7,100**	68FR75510
31	1,2-Dichloropropane	78875					**15 B,C**	65FR66443
	Dichloropropanes		**7700**	**ns**	**3400**	**ns**	**ns**	

	Priority Pollutant (EPA 2006) Toxic Pollutant (DOH 1990)	CAS Number	Freshwater CMC 1 (acute) (µg/L)	Freshwater CCC 1 (chronic) (µg/L)	Saltwater CMC 1 (acute) (µg/L)	Saltwater CCC 1 (chronic) (µg/L)	Human Health for the consumption of Organism Only (µg/L)	FR Cite/ Source
32	1,3-Dichloropropene	542756					21 C	68FR75510
	1,3-Dichloropropene		2000	ns	260	ns	4.6	
33	Ethylbenzene	100414					2,100	68FR75510
	Ethylbenzene		11000	ns	140	ns	1,070	
34	Methyl Bromide	74839					1,500 B	65FR66443
35	Methyl Chloride	74873						65FR31682
36	Methylene Chloride	75092					590 B,C	65FR66443
37	1,1,2,2-Tetrachloroethane	79345					4.0 B,C	65FR66443
	Tetrachloroethane(1,1,2,2)		ns	ns	3000	ns	3.5	
	Tetrachloroethanes		3100	ns	ns	ns	ns	
38	Tetrachloroethylene	127184					3.3 C	65FR66443
	Tetrachloroethylene		1800	ns	3400	145	2.9	
39	Toluene	108883					15,000	68FR75510
	Toluene		5800	ns	2100	ns	140,000	
40	1,2-Trans-Dichloroethylene	156605					10,000	68FR75510
41	1,1,1-Trichloroethane	71556						65FR31682
	Trichloroethane(1,1,1)		6000	ns	10400	ns	340000	
42	1,1,2-Trichloroethane	79005					16 B,C	65FR66443
	Trichloroethane(1,1,2)		6000	ns	ns	ns	14	
43	Trichloroethylene	79016					30 C	65FR66443
	Trichloroethylene		15000	ns	700	ns	26	
44	Vinyl Chloride	75014					2.4 C,kk	68FR75510
	Vinyl Chloride		ns	ns	ns	ns	170	

			Freshwater		Saltwater		Human Health for the consumption of	
	Priority Pollutant (EPA 2006) Toxic Pollutant (DOH 1990)	CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
45	2-Chlorophenol	95578					150 B,U	65FR66443
	Chlorophenol (2)		1400	ns	ns	ns	ns	
46	2,4-Dichlorophenol	120832					290 B,U	65FR66443
	2,4-Dichlorophenol		670	ns	ns	ns	ns	
47	2,4-Dimethylphenol	105679					850 B,U	65FR66443
	Phenol 2,4-dimethyl		700	ns	ns	ns	ns	
48	2-Methyl-4,6-Dinitrophenol	534521					280	65FR66443
	Dinitro-o-cresol (2,4)		ns	ns	ns	ns	250	
49	2,4-Dinitrophenol	51285					5,300 B	65FR66443
50	2-Nitrophenol	88755						
51	4-Nitrophenol	100027						
	Nitrophenols		77	ns	1600	ns	ns	
52	3-Methyl-4-Chlorophenol	59507					U	
53	Pentachlorophenol	87865	19 F,K	15 F,K	13 bb	7.9 bb	3.0 B,C,H	65FR31682 65FR66443
	Pentachlorophenol		20	13	13	ns	ns	
54	Phenol	108952					1,700,000 B,U	65FR66443
	Phenol		3400	ns	170	ns	ns	
55	2,4,6-Trichlorophenol	88062					2.4 B,C,U	65FR66443
	Trichlorophenol(2,4,6)		ns	ns	ns	ns	1.2	
56	Acenaphthene	83329					990 B,U	65FR66443
	Acenaphthene		570	ns	320	ns	ns	
57	Acenaphthylene	208968						

			Freshwater		Saltwater		Human Health for the consumption of	
	Priority Pollutant (EPA 2006) Toxic Pollutant (DOH 1990)	CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
58	Anthracene	120127					40,000 B	65FR66443
59	Benzidine	92875					0.00020 B,C	65FR66443
	Benzidine		800	ns	ns	ns	0.00017	
60	Benzo(a) Anthracene	56553					0.018 B,C	65FR66443
61	Benzo(a) Pyrene	50328					0.018 B,C	65FR66443
62	Benzo(b) Fluoranthene	205992					0.018 B,C	65FR66443
63	Benzo(ghi) Perylene	191242						
64	Benzo(k) Fluoranthene	207089					0.018 B,C	65FR66443
65	Bis(2-Chloroethoxy) Methane	111911						
66	Bis(2-Chloroethyl) Ether	111444					0.53 B,C	65FR66443
	Chloroethers-ethy(bis-2)		ns	ns	ns	ns	0.44	
67	Bis(2-Chloroisopropyl) Ether	108601					65,000 B	65FR66443
	Chloroethers-isoprophyl		ns	ns	ns	ns	1400	
68	Bis(2-Ethylhexyl) PhthalateX	117817					2.2 B,C	65FR66443
	Phthalate esters - di-2-ethylhexyl		ns	ns	ns	ns	16000	
69	4-Bromophenyl Phenyl Ether	101553						
70	Butylbenzyl PhthalateW	85687					1,900 B	65FR66443
71	2-Chloronaphthalene	91587					1,600 B	65FR66443
72	4-Chlorophenyl Phenyl Ether	7005723						
73	Chrysene	218019					0.018 B,C	65FR66443
74	Dibenzo(a,h)Anthracene	53703					0.018 B,C	65FR66443

			Freshwater		Saltwater		Human Health for the consumption of	
	Priority Pollutant (EPA 2006) Toxic Pollutant (DOH 1990)	CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
75	1,2-Dichlorobenzene	95501					1,300	68FR75510
76	1,3-Dichlorobenzene	541731					960	65FR66443
77	1,4-Dichlorobenzene	106467					190	68FR75510
	Dichlorobenzenes		370	ns	660	ns	850	
78	3,3'-Dichlorobenzidine	91941					0.028 B,C	65FR66443
	Dichlorobenzidine		ns	ns	ns	ns	0.007	
79	Diethyl PhthalateW	84662					44,000 B	65FR66443
	Phthalate esters - diethyl		ns	ns	ns	ns	590000	
80	Dimethyl PhthalateW	131113					1,100,000	65FR66443
	Phthalate esters - dimethyl		ns	ns	ns	ns	950000	
81	Di-n-Butyl PhthalateW	84742					4,500 B	65FR66443
	Phthalate esters - dibutyl		ns	ns	ns	ns	50000	
82	2,4-Dinitrotoluene	121142					3.4 C	65FR66443
83	2,6-Dinitrotoluene	606202						
	Dinitrotoluenes		110	ns	200	ns	3	
84	Di-n-Octyl Phthalate	117840						
85	1,2-Diphenylhydrazine	122667					0.20 B,C	65FR66443
	Diphenylhydrazine (1,2)		ns	ns	ns	ns	0.018	
86	Fluoranthene	206440					140 B	65FR66443
	Fluoranthene		1300	ns	13	ns	18	
87	Fluorene	86737					5,300 B	65FR66443
88	Hexachlorobenzene	118741					0.00029 B,C	65FR66443
	Hexachlorobenzene		ns	ns	ns	ns	0.00024	

			Freshwater		Saltwater		Human Health for the consumption of	
	Priority Pollutant (EPA 2006) Toxic Pollutant (DOH 1990)	CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
89	Hexachlorobutadiene	87683					18 B,C	65FR66443
	Hexachlorobutadiene		30	ns	11	ns	16	
90	Hexachlorocyclopentadiene	77474					1,100 U	68FR75510
	Hexachlorocyclopentadiene		2	ns	2	ns	ns	
91	Hexachloroethane	67721					3.3 B,C	65FR66443
	Hexachloroethane		330	ns	310	ns	2.9	
92	Ideno(1,2,3-cd)Pyrene	193395					0.018 B,C	65FR66443
93	Isophorone	78591					960 B,C	65FR66443
	Isophorone		39000	ns	4300	ns	170000	
94	Naphthalene	91203						
	Naphthalene		770	ns	780	ns	ns	
95	Nitrobenzene	98953					690 B,H,U	65FR66443
	Nitrobenzene		9000	ns	2200	ns	ns	
96	N-Nitrosodimethylamine	62759					3.0 B,C	65FR66443
	Nitrosodimethylamine-N		ns	ns	ns	ns	5.3	
97	N-Nitrosodi-n-Propylamine	621647					0.51 B,C	65FR66443
98	N-Nitrosodiphenylamine	86306					6.0 B,C	65FR66443
	Nitrosodiphenylamine-N		ns	ns	ns	ns	5.3	
99	Phenanthrene	85018						
100	Pyrene	129000					4,000 B	65FR66443
101	1,2,4-Trichlorobenzene	120821					70	68FR75510

			Freshwater		Saltwater		Human Health for the consumption of	
	Priority Pollutant (EPA 2006) Toxic Pollutant (DOH 1990)	CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
102	Aldrin	309002	3.0 G		1.3 G		**0.000050 B,C**	65FR31682 65FR66443
	Aldrin		**3**	**ns**	**1.3**	**ns**	**0.000026**	
103	alpha-BHC	319846					**0.0049 B,C**	65FR66443
	Hexachlorocyclohexane alpha		**ns**	**ns**	**ns**	**ns**	**0.01**	
104	beta-BHC	319857					**0.017 B,C**	65FR66443
	Hexachlorocyclohexane beta		**ns**	**ns**	**ns**	**ns**	**0.018**	
105	gamma-BHC (Lindane)	58899	0.95 K		0.16 G		**1.8**	65FR31682 68FR75510
	Lindane		**2**	**0.08**	**0.16**	**ns**	**0.02**	
106	delta-BHC	319868					0.0123 H	
107	Chlordane	57749	2.4 G	**0.0043 G,aa**	0.09 G	**0.004 G,aa**	**0.00081 B,C**	65FR31682 65FR66443
	Chlordane		**2.4**	**0.0043**	**0.09**	**0.004**	0.000016	
108	4,4'-DDT	50293	**1.1 G,ii**	**0.001 G,aa,ii**	**0.13 G,ii**	**0.001 G,aa,ii**	**0.00022 B,C**	65FR31682 65FR66443
109	4,4'-DDE	72559					**0.00022 B,C**	65FR66443
110	4,4'-DDD	72548					**0.00031 B,C**	65FR66443
	DDT		**1.1**	**0.001**	**0.013**	**0.001**	**0.000008**	
	metabolite TDE		**0.03**	**ns**	**1.2**	**ns**	**ns**	

	Priority Pollutant (EPA 2006) / Toxic Pollutant (DOH 1990)	CAS Number	Freshwater CMC 1 (acute) (µg/L)	Freshwater CCC 1 (chronic) (µg/L)	Saltwater CMC 1 (acute) (µg/L)	Saltwater CCC 1 (chronic) (µg/L)	Human Health for the consumption of Organism Only (µg/L)	FR Cite/ Source
111	Dieldrin	60571	0.24 K	0.056 K,O	0.71 G	0.0019 G,aa	0.000054 B,C	65FR31682 65FR66443
	Dieldrin		2.5	0.0019	0.71	0.0019	0.000025	
112	alpha-Endosulfan	959988	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	89 B	65FR31682 65FR66443
							-	
113	beta-Endosulfan	33213659	0.22 G,Y	0.056 G,Y	0.034 G,Y	0.0087 G,Y	89 B	65FR31682 65FR66443
							-	
114	Endosulfan Sulfate	1031078					89 B	65FR66443
	Endosulfan		0.22	0.056	0.034	0.0087	52	
115	Endrin	72208	0.086 K	0.036 K,O	0.037 G	0.0023 G,aa	0.06	65FR31682 68FR75510
	Endrin		0.18	0.0023	0.037	0.0023	ns	
116	Endrin Aldehyde	7421934					0.30 B,H	65FR66443
117	Heptachlor	76448	0.52 G	0.0038 G,aa	0.053 G	0.0036 G,aa	0.000079 B,C	65FR31682 65FR66443
	Heptachlor		0.52	0.0038	0.053	0.0036	0.00009	
118	Heptachlor Epoxide	1024573	0.52 G,V	0.0038 G,V,aa	0.053 G,V	0.0036 G,V,aa	0.000039 B,C	65FR31682 65FR66443
119	Polychlorinated Biphenyls (PCBs)			0.014 N,aa		0.03 N,aa	0.000064 B,C,N	65FR31682 65FR66443
	Polychlorinated biphenyls		2	0.014	10	0.03	0.000079	

			Freshwater		Saltwater		Human Health for the consumption of	
Priority Pollutant (EPA 2006) **Toxic Pollutant (DOH 1990)**		CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
120	Toxaphene	8001352	0.73	0.0002 aa	0.21	0.0002 aa	0.00028 B,C	65FR31682 65FR66443
	Toxaphene		0.73	0.0002	0.21	0.0002	0.00024	

EPA website for links to reference documents http://www.epa.gov/waterscience/criteria/wqctable/

Footnotes

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 (PDF)," (49 pp., 3MB) October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center and 40CFR§131.36(b)(1). Conversion Factors applied in the table can be found in Appendix A to the Preamble- Conversion Factors for Dissolved Metals.

F Freshwater aquatic life values for pentachlorophenol are expressed as a function of pH, and are calculated as follows: CMC = exp(1.005(pH)-4.869); CCC = exp(1.005(pH)-5.134). Values displayed in table correspond to a pH of 7.8.

Footnotes - continued

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 (PDF) (153 pp., 7.3 MB) (EPA 440/5-80-019), Chlordane (PDF) (68 pp., 3.1 MB) (EPA 440/5-80-027), DDT (PDF) (175 pp., 8.3 MB) (EPA 440/5-80-038), Endosulfan (PDF) (155 pp., 7.3 MB) (EPA 440/5-80-046), Endrin (PDF) (103 pp., 4.6 MB) (EPA 440/5-80-047), Heptachlor (PDF) (114 pp., 5.4 MB) (EPA 440/5-80-052), Hexachlorocyclohexane (PDF) (109 pp., 4.8 MB) (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 (PDF) (104 pp., 3.3 MB) . 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.

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.

N This criterion applies to total pcbs, (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 g free cyanide (as CN)/L.

U The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.

Y This value was derived from data for endosulfan and is most appropriately applied to the sum of alpha-endosulfan and beta-endosulfan.

bb This water quality criterion is based on a 304(a) aquatic life criterion that was derived using the 1985 Guidelines (PDF) (104 pp., 3.3 MB) (*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 (PDF) (74 pp., 3.2 MB) (EPA 440/5-84-033), Cadmium (EPA-822-R-01-001), Chromium (EPA 440/5-84-029), Copper (PDF) (150 pp., 6.2 MB) (EPA 440/5-84-031), Cyanide (PDF) (67 pp., 2.7 MB) (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).

Par . - Comparative Table of Existing and Proposed Toxic Pollutant Criter n-Priority Pollutants)

	Non-Priority Pollutant (EPA 2006) **Toxic Pollutant (DOH 1990)**	CAS Number	Freshwater CMC 1 (acute) (µg/L)	Freshwater CCC 1 (chronic) (µg/L)	Saltwater CMC 1 (acute) (µg/L)	Saltwater CCC 1 (chronic) (µg/L)	Human Health for the consumption of Organism Only (µg/L)	FR Cite/ Source
2	Aluminum pH 6.5 – 9.0 **Aluminum**	7429905	750 G,I 750	87 G,I,L 260	 ns	 ns	 ns	53FR33178
9	Chlorine **Chlorine**	7782505	19 19	11 11	13 13	7.5 7.5	 ns	Gold Book
12	Chloropyrifos **Chloropyrifos**	2921882	0.083 G 0.083	0.041 G 0.041	0.011 G 0.011	0.0056 G 0.0056	 ns	Gold Book
14	Demeton **Demeton**	8065483		0.1 F 0.1	 ns	0.1 F 0.1	 ns	Gold Book
15	Ether, Bis(Chloromethyl) **Chloroethers-methyl(bis)**	542881	 ns	 ns	 ns	 ns	0.00029 E,H 0.0006	65FR66443
17	Guthion **Guthion**	86500	 ns	0.01 F 0.01	 ns	0.01 F 0.01	 ns	Gold Book
19	Hexachlorocyclo-hexane-Technical **Hexachlorocyclo-hexane-Technical**	319868	 ns	 ns	 ns	 ns	0.0414 0.014	Gold Book
21	Malathion **Malathion**	121755	 ns	0.1 F 0.1	 ns	0.1 F 0.1	 ns	Gold Book
23	Methoxychlor **Methoxychlor**	72435	 ns	0.03 F 0.03	 ns	0.03 F 0.03	 ns	Gold Book
24	Mirex **Mirex**	2385855	 ns	0.001 F 0.001	 ns	0.001 F 0.001	 ns	Gold Book
26	Nitrosamines **Nitrosamines**	—	 1950	 ns	 ns	 ns	1.24 0.41	Gold Book
29	Nitrosodibutylamine, N **Nitrosodibutylamine, N**	924163	 ns	 ns	 ns	 ns	0.22 A,H 0.19	65FR66443
30	Nitrosodiethylamine, N **Nitrosodiethylamine, N**	55185	 ns	 ns	 ns	 ns	1.24 A,H 0.41	Gold Book
31	Nitrosopyrrolidine, N **Nitrosopyrrolidine, N**	930552	 ns	 ns	 ns	 ns	34 H 30	65FR66443
35	Parathion **Parathion**	56382	0.065 J 0.065	0.013 J 0.013	 ns	 ns	 ns	Gold Book
36	Pentachlorobenzene **Pentachlorobenzene**	608935	 ns	 ns	 ns	 ns	1.5 E 28	65FR66443

Part - Comparative Table of Existing and Proposed Toxic Pollutant Criteri ı-Priority Pollutants)

			Freshwater		Saltwater		Human Health for the consumption of	
	Non-Priority Pollutant (EPA 2006) / Toxic Pollutant (DOH 1990)	CAS Number	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	CMC 1 (acute) (µg/L)	CCC 1 (chronic) (µg/L)	Organism Only (µg/L)	FR Cite/ Source
45	Tetrachlorobenzene,1,2,4,5-	95943					1.1 E	65FR66443
	Tetrachlorobenzene,1,2,4,5-		ns	ns	ns	ns	16	
46	Tributyltin (TBT)	—	0.46 Q	0.072 Q	0.42 Q	0.0074 Q		69FR342
	Tributyltin		ns	0.026	ns	0.01	ns	

EPA website for links to reference documents: http://www.epa.gov/waterscience/criteria/wqctable/

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

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 (*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 GLI Guidelines (60FR15393-15399, March 23, 1995; 40CFR132 Appendix A); the differences between the 1985 Guidelines and the GLI 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.

L There are three major reasons why the use of Water-Effect Ratios might be appropriate.
1. The value of 87 µg/l is based on a toxicity test with the striped bass in water with 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 g aluminum/L, when either total recoverable or dissolved is measured.

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.