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March 17, 2010

Traci Iott
Connecticut Department of Environmental Protection
Bureau of Water Protection and Land Reuse, Planning & Standards Division
79 Elm Street
Hartford, CT, 06106–5127

RE: EPOC Comments on Proposed Amendments to Connecticut Water Quality Standards

Dear Ms. Iott:

We appreciate the opportunity to comment on the proposed amendments to Connecticut's Water Quality Standards, and for the approximately 30-day extension of the public comment period from February 16, 2010 to March 17, 2010. Attached are the comments we have received to date from our membership, and from Exponent, a highly qualified human health and environmental risk assessment firm that we retained a little over a month ago to assist us in reviewing the technical supporting information associated with the proposed amendments. Given the very limited timeframe allowed by the Connecticut Department of Environmental Protection (DEP) for our review, we were forced to focus the detailed review on a small number of commonly-occurring substances for which the proposed standards appeared to be significant potential drivers of environmental remediation. While our detailed comments are attached, we wish to especially highlight in this cover letter the three issues we have identified that are of critical importance to our membership, namely (i) use of the amended water quality standards as, or in derivation of, remediation standards under the Remediation Standard Regulations (RSRs); (ii) promulgation of water quality standards that are inconsistent with federal standards and/or overly conservative; and (iii) limitation of the dilution factor (DF) that can be used for discharges to surface water to 100.

We have been provided very little time to review and comment on the substantive technical basis for these extensive revisions. DEP provided its "Technical Supporting Information for Proposed Revisions to the Connecticut Water Quality Standards: Ambient Water Quality Criteria" on February 3, 2010, leaving us only 30 business days to read, understand, evaluate and comment on the proposed amendments with availability of the technical supporting document. With the proposed amendments involving revision and/or addition of literally hundreds of numeric water quality standards, and the technical supporting information involving over 300 pages detailing the rationale for the proposed amendments, we have not had sufficient time to conduct a comprehensive review of the proposed amendments.

Use of Proposed Amended Water Quality Standards in DEP Remediation Programs

First and foremost, it appears that DEP is planning to use the amended water quality standards (once adopted) not only under its water discharge permitting program, but also under its remedial programs that address mitigation of releases to the environment (e.g., where remediation is required to be completed to attain compliance with the RSRs found in R.C.S.A. Sections 133k-1 through 133k-3). The vast majority of the proposed amendments involve revised standards that are significantly more stringent than currently in effect and proposed standards for additional compounds that are so stringent as to be significant drivers of environmental action or mitigation. Any requirement(s) that would promote or require use of these revised water quality standards under RSR-guided remedial programs are of primary concern to us as such a requirement(s) would be extremely detrimental to the success of environmental remediation programs in Connecticut. Applying these proposed amendments to RSR-guided remedial projects would not only make it much more difficult and costly to meet these standards (which in and of itself would result in fewer remediation projects being initiated, much less completed), but in many cases would significantly diminish or eliminate the value of costly environmental remediation work already undertaken. Notably, at many project sites, expended remediation costs have been on the order of hundreds of thousands to several million dollars, spent to meet the existing remediation standards, many of which would become obsolete upon adoption of the proposed amendments. In addition, it is certainly not clear that the proposed amendments to the water quality standards are sufficiently founded in sound science, and necessary to be protective of public health and the environment. Therefore, we request that any application of revised water quality standards to the RSR remediation programs be done only after such proposed standards have been fully vetted with the public and regulated community, with due consideration given to potential environmental, social and economic impacts and following the applicable procedural requirements of Connecticut General Statutes (CGS) Chapter 54. Furthermore, to the extent adopted, revised standards should be phased in so as not to invalidate the actions at remediation sites that are well advanced through the transfer act or another remedial program.

In particular, we note that the language in Paragraphs 4 and 10 of the proposed amendments both appear to broaden DEP's intended scope of coverage to ensure that groundwater plume discharges to surface waters regulated under the RSRs will be affected by these amendments. In Paragraph 10, DEP has proposed to add a reference to Section 22a-133(k) of the CGS, which is the statutory section authorizing the Commissioner to promulgate cleanup regulations (i.e., the RSRs). This reference is added to the section establishing zones of influence when authorizing discharges to surface waters, making it clear that DEP proposes to use the amended water quality standards to authorize (or not authorize) discharge of groundwater plumes to surface water under the RSRs. In this same paragraph, DEP has proposed replacement of the word "permitting" with "authorizing" under the first sentence, which also would serve to extend the scope of coverage beyond solely those discharges being addressed by DEP permitting programs. Similarly, in Paragraph 4, DEP proposes to eliminate the existing statutory references and replace "point and

non-point source discharges, dredging activity, and the discharge of dredged or fill materials" with "discharges and activities", also serving to significantly broaden the scope of coverage to RSR-guided remediation projects.

The Water Quality Standards can affect remediation in three primary ways:

1) Under the existing RSRs, the water quality standards in existence as of 1996 were used to develop surface-water protection criteria (SWPC) designed to protect surface water from significant adverse impacts associated with groundwater plume discharges to such water bodies. The SWPC are generally 10-times higher than the water quality standards.

2) Also under the RSRs, development of alternative or site-specific SWPC (e.g., which factor in site-specific dilution factors associated with the receiving water body) use the most recent water quality standards as input values in the formula provided.

3) Additionally under the RSRs, the aquatic life criteria contained in the most recent water quality standards are used directly as SWPC for groundwater plumes discharging to a wetland or intermittent stream, or in other cases where the plume occupies more than 0.5% of the upstream drainage basin of the stream to which such plume discharges. Of note, this section of the RSRs (22a-133k-3(b)(2)) specifically references the "Water Quality Standards effective May 15, 1992", with no provision for consideration of amendments to those standards.

Using the amendments to the Water Quality Standards to significantly revise remediation standards in the RSRs (including the numeric standards incorporated or referenced therein), including standards applicable to remediation work already done or underway, is in our opinion inappropriate and inconsistent with the statutory requirements applicable to promulgation of state environmental cleanup regulations under CGS 22a-133k. Using this process avoids many of the procedural requirements applicable to revising the RSRs (which are required to be done in accordance with the provisions of Chapter 54, the Uniform Administrative Procedure Act), thereby eliminating the public's opportunity for meaningful review and comment and ability to institute legal challenges when appropriate.

With thousands of Connecticut Property Transfer Act sites, and numerous other Brownfields sites, RCRA corrective action sites, Dry Cleaning establishments and voluntary remediation sites currently in the process of completing site-wide investigations and remediation, there have already been significant monies expended to complete investigation and remediation of these sites by methods specifically designed to meet the existing remediation standards under the RSRs. Additionally, many business deals have been made or are in progress that have used or are using the existing remediation standards to evaluate potential environmental liabilities and allocate those liabilities amongst various parties. More stringent remediation standards will have wide-reaching adverse impacts on the successful completion of remediation at these sites, and

will also significantly increase the cost of real estate and other business transactions in Connecticut.

More stringent remediation standards would in most cases require the responsible party to first go back and complete additional investigations (e.g., to delineate the extent of contamination exceeding the new standards), and then re-evaluate both the scope and type of remediation needed in release areas exhibiting exceedances of the new standards. In many cases, any significant decreases in the remedial standards will cause more extensive remediation work or a different remediation method to be required. At many sites where there are a number of release areas such a change could require going back and revisiting the release areas that have already been remediated. In all of these cases, the end result would be to significantly drive up the costs of investigation, remediation and monitoring, along with the timeframe to complete such work, and diminishing or eliminating the value of the significant remediation work already completed or underway. Further, it is likely that sites with low concentrations of constituents in groundwater that only slightly exceed SWPC but meet other RSR criteria will never be remediated to SWPC (especially when groundwater discharges to wetlands) since remediation of trace levels of contamination is generally economically unfeasible and/or technically impracticable.

Proposed Amended Water Quality Standards Inconsistent with Federal Standards and/or Overly Conservative

We understand that CGS 22a-426 mandates that amendment of these types of standards shall be consistent with the federal Water Pollution Control Act, and similarly under CGS 22a-6(h), DEP is required to explain and clearly distinguish all such proposed regulations which differ from federal standards when adopting regulations for activities for which the federal government has adopted standards (e.g., such as revisions to the RSRs). As indicated above, it appears that perhaps hundreds of DEP's proposed standards are not consistent with those adopted under the federal program. We have not seen any detailed technical justification for the extensive number of proposed amended standards that will be more stringent than the comparable existing federal standards (see attached table highlighting those proposed standards which will be more stringent than federal standards).

We note that many of the toxicological values used by DEP in development of human health based water quality standards are significantly more stringent than those used by the federal government (e.g., as listed in IRIS). DEP has indicated that it used different toxicological values than the federal government in cases where the federal government had not updated its toxicity constants for a considerable period of time, or where the State believed that additional uncertainty factors were warranted. However, where a detailed review was completed of selected compounds by Exponent (see attached Exponent letter related to human health standards), the proposed modifications of toxicological values by DEP were found to not be scientifically justified.

It is important to note that the toxicological values used by the federal government already incorporate uncertainty factors designed to ensure protection of human health by addressing existing areas of scientific uncertainty in a consistent and robust fashion based on the weight of evidence available. However, the proposed Connecticut toxicological values for about half of the substances have been revised to be more stringent by applying additional uncertainty factors (atop those already used by the federal government). Use of this process by DEP has resulted in toxicological values well below those that can be justified on the basis of peer-reviewed toxicological literature, with uncertainty factors being applied in a duplicative (overly conservative) manner. Further, it appears as though DEP has based many of its toxicological values on the dataset that resulted in the highest estimate of risk, rather than on the preponderance of the evidence and the more scientifically defensible dataset(s) with the least uncertainty. Because DEP presented limited support or justification for the changes, this cannot be discerned in all cases.

Additionally, in development of proposed aquatic life criteria, DEP has derived such standards for a relatively large number of compounds using a limited amount of toxicity data (i.e., Tier II or GLI based standards). The Tier II derivations in some cases were based on data for only two aquatic species, and in other cases such Tier II criteria appear to involve calculation errors (see attached Exponent letter on aquatic life criteria). In development of Tier II standards where available toxicity data are insufficient to support development of National Recommended Water Quality Criteria (NRWQC), the magnitude of one uncertainty factor applied increases significantly according to the number of species for which data are missing, and a second uncertainty factor is applied when chronic data are unavailable. Consequently, in many cases, the uncertainty factors are large and the resultant proposed water quality standards are both highly conservative and not supported by a reasonable base of scientific study. Due to the significant uncertainty for constituents with only Tier II toxicity data, these DEP-proposed "water quality standards" should be used as screening levels (at best), Corresponding water quality standards should not be developed at this time, rather DEP should wait until adequate data are available to support the development of valid water quality standards.

In summary, for a significant percentage of the proposed criteria developed for the protection of human health (including consumption of organisms only and consumption of water and organisms) and the proposed aquatic life criteria in DEP has chosen to favor conservatism in a variety of ways, particularly in its decision to add additional uncertainty factors (beyond what EPA, for example, has already incorporated) to a larger number of the reference doses. In light of this, the WQS have the characteristics of screening values, rather than regulatory values.

Limitation of Dilution Factor for Discharges to Surface Water

In Paragraph 10 of the proposed amendments to the Water Quality Standards, DEP proposes to add a limitation on the dilution factor that can be used for discharges to surface water (i.e., the

proposed language indicates "and, if established, shall provide a maximum of 100:1 dilution factor for any discharge". This is a very restrictive limitation for many surface water bodies considering the relatively small discharge flow rates associated with typical groundwater plumes and the fact that stream flows are already conservatively limited for dilution purposes under the RSRs to 25% of the 7Q10 flow rate. This additional limitation on the allowable dilution factor has not been scientifically justified, and in our opinion is overly conservative and not justifiable, and should be removed.

Summary

DEP has not, in our opinion, adequately demonstrated that (i) the proposed amendments to the water quality standards are sufficiently founded in sound science, and are needed to be protective of public health and the environment (as noted above), and (ii) that an appropriate balance has been struck between the necessity to protect human health and the environment, and the economic impact of the revised standards.

Furthermore, to the extent adopted, revised standards should be phased in so as not to invalidate the actions at remediation sites that are well advanced through the transfer act or another remedial program.

In closing, we request that you clarify that these proposed amendments (once adopted) will ***not*** be applicable to environmental remediation programs in Connecticut guided by the RSRs (e.g., sites subject to remediation under the Transfer Act, RCRA corrective action program, voluntary remedial programs, etc.) until such time as the water quality standard amendments go through formal rulemaking as required under CGS Section 22a-133k(a) (which incorporates Chapter 54), and DEP has justified any inconsistencies with federal requirements. We further request that DEP adopt the proposed water quality standards as screening levels only, where they have been derived using input values estimated from models (and not validated using actual data for each compound, such as the BCFs and FCMs), using limited toxicity data with high uncertainty factors resulting in highly conservative values, or using input values that are not or may not be reasonable given site-specific conditions or a qualified comprehensive review of the preponderance of evidence presented in existing peer-reviewed toxicological literature (as detailed further in the attached Exponent letters). Lastly, we strongly advise that the proposed limitation on dilution factor be removed due its lack of scientific justification and overly conservative nature.

Sincerely yours,

EPOC
Seth Molofsky, Executive Director

Attachments:

- Exponent letter dated March 17, 2010 to Seth Molofsky, Subject: Proposed Changes to Water Quality Standards for Aquatic Life
- Exponent letter dated March 17, 2010 to Seth Molofsky, Subject: Proposed Changes to Water Quality Standards for Human Health

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March 17, 2010

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Subject: Proposed Changes to Water Quality Standards for Aquatic Life
Project No. 1000534.000

Dear Mr. Molofsky:

Exponent reviewed the Connecticut Department of Environmental Protection's (CT DEP) documents related to the changes to Connecticut water quality standards (CT WQS) as proposed by CT DEP on December 22, 2009. Our review focused on the changes to the criteria for toxic substances for aquatic life. Some of the proposed changes to the CT WQS are based on updates that have been made to national criteria. However, most of the proposed changes are based on new WQS for aquatic life. In comparison to the 2002 CT WQS, new aquatic life criteria are proposed for 12 metals, 50 volatile organic chemicals, 55 semi-volatile organic chemicals, and 15 pesticides. This letter presents the results of our technical review and provides comments on the proposed revisions to the CT WQS for toxic substances. Exponent also compared the proposed CT WQS to the National Recommended Water Quality Criteria (NRWQC) established by the U.S. Environmental Protection Agency (EPA) and to comparable WQS established by three nearby states.

Summary of Proposed Changes to the WQS for Toxic Substances

The proposed changes to the CT WQS are based on 1) updated NRWQC for aquatic life established by EPA, 2) new standards derived by CT DEP or other states for chemicals for which EPA does not provide NRWQC for aquatic life, and 3) a study by Hohreiter and Rigg (2001) for the freshwater criteria for formaldehyde. The new standards developed by CT DEP or other states (U.S. EPA 2008) are based on the Tier II procedures established as part of the Great Lakes Water Quality Initiative (GLI, U.S. EPA 1995).

GLI values are based on the methodology presented in EPA's 1995 *Final Water Quality Guidance for the Great Lakes System* (60 FR 15366). Although titled as guidance, the intended

use of this methodology was to develop values for "consistent, enforceable long-term protection" for fish and shellfish in the Great Lakes. This methodology has been used by several states to develop aquatic life water quality criteria that have been incorporated into state regulation. EPA, through its GLI Clearinghouse, maintains a linked index to state WQS developed by the GLI approach; this index was used by CT DEP to obtain the GLI-based state WQS. Most of the proposed CT WQS are from Ohio (Appendix C of the technical support document [CT DEP 2010]), with fewer values from other states such as New York and Indiana.

The GLI methodology is used to develop standards for chemicals that lack sufficient toxicity data for the development of a Tier I value. These standards are referred to as Tier II values. In the Tier II approach, an uncertainty factor (the secondary acute factor [SAF]) is used to adjust for the missing data, and the magnitude of the SAF increases according to the number of species for which data are missing. Another uncertainty factor is applied to the acute data to derive a chronic value when chronic data are unavailable. While this practice adds both conservatism and uncertainty to the Tier II value, it allows criteria to be developed for a wide array of compounds for which toxicity data are insufficient to support NRWQC.

CT DEP calculated water quality values for a number of chemicals by the GLI Tier II methodology, using data obtained through EPA's Ecotox database and Suter and Tsao (1996). This approach was used if no GLI-based Tier II value was available, or if new toxicity data were identified in the Ecotox database. The CT DEP methodology is the same as that used to generate the GLI values, and should reproduce GLI values when the same input data are used. Finally, CT DEP used a study by Hohreiter and Rigg (2001) for the freshwater criteria for formaldehyde. As discussed below, this study should be reviewed and compared to the criteria used in CT WQS to determine its appropriateness.

Comparison of Proposed WQS to National Recommended Water Quality Criteria

EPA provides aquatic life NRWQC for priority metals, acrolein, nonlyphenol, MBTE, pentachlorophenol, pesticides, PCBs, and cyanide. While some of the 2009 NRWQC for these chemicals have been adopted by CT DEP in the proposed changes to WQS, others have not. Table 1 highlights the fact that proposed CT WQS are often lower than EPA's 2009 NRWQC. The freshwater criteria for cadmium, trivalent chromium, lead, nickel, silver, and zinc are dependent upon the hardness of the receiving water (such that higher water hardness yields higher criteria values), and differences in criteria for these metals result from differences in the default water hardness value selected (EPA uses 100 mg/L, CT DEP uses 50 mg/L). The basis for selecting a hardness value of 50 mg/L is not provided. Absent evidence that the majority of in-state surface water have hardness around 50 mg/L rather than 100 mg/L, EPA's default value should be used. Moreover, as discussed below, EPA methodology calculates site-specific

criteria on the basis of site-specific water hardness, but CT DEP does not present equations that could be used to calculate site-specific criteria on the basis of water hardness. For the organic chemicals, there is at least a 2-fold difference between proposed CT WQS and NRWQC, which warrants further review of the technical support documentation for the proposed CT WQS.

Table 1. Aquatic life criteria that differ between the proposed CT WQS and the 2009 NRWQC

	Acute		Chronic	
Chemical	Proposed CT WQS	2009 NRWQC	Proposed CT WQS	NRWQC 2009
Freshwater				
Cadmium	1	2	0.15	0.25
Trivalent chromium	323	570	42	74
Lead	30	65	1.2	2.5
Nickel	260	470	29	52
Silver	1	3.2	0.06	--
Zinc	65	120	65	120
Acrolein	0.8	3	0.1	3
Aldrin	0.45	3	0.05	--
Chlordane	1.2	2.4	0.00215	0.043
4,4-DDT	0.55	1.1	0.005	0.001
Endosulfan	0.11	0.22	0.028	0.056
Marine				
Aldrin	0.65	1.3	--	--
Chlordane	0.045	0.09	0.0045	0.004
4,4-DDT	0.065	0.13	0.001	0.001
Endosulfan	0.017	0.034	0.0087	0.0087

In addition, marine CT WQS for endrin, heptachlor, heptachlor epoxide, and lindane are lower than marine NRWQC; however, the CT WQS criteria for these chemicals have not changed from 2002.

Comparison of Proposed WQS to Other Water Quality Criteria

Proposed CT WQS for aquatic life are compared to aquatic life WQS for Massachusetts[1], Rhode Island[2], and New Jersey[3] (see attached Tables 2 through 5). Except for copper, the Massachusetts Department of Environmental Protection (MADEP) adopted EPA's NRWQC. A site-specific freshwater criterion was developed for copper, and has been applied to a number of watersheds throughout Massachusetts. The Rhode Island Department of Environmental Management (RIDEM) adopted most of EPA's NRWQC or developed criteria for chemicals which lack NRWQC. The New Jersey Department of Environmental Protection (NJDEP) adopted several of EPA's NRWQC, but developed many of their own. For instance, NJDEP used EPA's NRWQC equations for cadmium, trivalent chromium, copper, nickel, silver, and zinc but used their own conversion factors.

Review of Seven Proposed WQS

A more detailed review of the WQS for a subset of seven chemicals is presented below. These detailed reviews are intended to highlight issues of concern. Selection of this subset for detailed review does not imply that these or other issues of concern do not relate to other chemicals that were not reviewed.

Cadmium

	Cadmium Freshwater Standards (µg/L)				
	CT DEP	EPA	RIDEM	NJDEP	MADEP
Acute	1.0	2.0	2.0	1.4	2.0
Chronic	0.15	0.25	0.25	0.18	0.25

The proposed cadmium CT WQS (freshwater and marine) for aquatic life are based on EPA's freshwater criteria for cadmium. The freshwater acute and chronic criteria are based on a relationship to water hardness. The freshwater criteria are lower for waters with lower hardness (i.e., soft water) than criteria for waters with higher hardness (i.e., hard water). EPA presents a general freshwater criterion for cadmium based on a default water hardness of 100 mg/L, but site-specific criteria are based on site-specific water hardness measurements. CT DEP used EPA's criteria for cadmium but set the water hardness to 50 mg/L. CT DEP does not present

[1] http://www.mass.gov/dep/service/regulations/314cmr04.pdf

[2] http://www.dem.ri.gov/pubs/regs/regs/water/h20q09a.pdf

[3] http://www.nj.gov/dep/rules/rules/njac7_9b.pdf

equations that could be used to calculate site-specific criteria for cadmium on the basis of water hardness, as do RIDEM, MADEP and NJDEP. CT DEP should allow water-hardness adjustments to the freshwater criteria for cadmium, because water hardness-adjusted criteria more accurately predict the potential for aquatic toxicity.

In 2002, EPA lowered the freshwater aquatic life criteria based on new toxicological data. This change is also reflected in the proposed freshwater CT WQS for cadmium. Other than water-hardness adjustments, we take no issue with how the proposed WQS for cadmium were derived because the toxicity data appear to be the same as those in the NRWQC, the data meet the data requirements for Tier I criteria, and uncertainty factors were not applied.

The proposed CT WQS for cadmium in saltwater are the same as those used by EPA, RIDEM, NJDEP and MADEP for both acute (40 μg/L) and chronic (8.8 μg/L).

Zinc

	Zinc Freshwater Standards (μg/L)				
	CT DEP	EPA	RIDEM	NJDEP	MADEP
Acute	65	120	120	110	120
Chronic	65	120	120	110	120

The basis for the proposed zinc CT WQS (freshwater and marine) is EPA's freshwater criteria for zinc. The freshwater acute and chronic criteria are based on a relationship to water hardness, with lower criteria for soft water and higher criteria for hard water. There appear to be no differences in the toxicity data and the equations used to calculate the proposed freshwater CT WQS for zinc and the EPA aquatic life criteria for zinc. Therefore, the bases for the proposed aquatic life CT WQS for zinc are the same as those for the EPA aquatic life criteria for zinc. However, as with cadmium, the differences between the proposed freshwater CT WQS for zinc and the EPA freshwater criteria for zinc are related to the default water hardness values used to produce the numerical criteria shown in Table 1. CT DEP used a water hardness of 50 mg/L, while EPA used a hardness of 100 mg/L. We take no issue with how the proposed WQS for zinc were derived because the toxicity data met the data requirements for Tier I criteria and uncertainty factors were not applied. However, CT DEP set the water hardness to 50 mg/L when it developed the proposed WQS for zinc. CT DEP does not present equations that could be used to calculate site-specific criteria for zinc on the basis of water hardness, as do RIDEM, MADEP and NJDEP. CT DEP should allow water-hardness adjustments to the freshwater criteria for zinc, because water hardness-adjusted criteria more accurately predict the potential for aquatic toxicity.

The proposed CT WQS standards for zinc in saltwater are the same as those used by EPA, RIDEM, NJDEP, and MADEP for both acute (90 μg/L) and chronic (81 μg/L).

Toluene

	Toluene Freshwater Standards (μg/L)				
	CT DEP	EPA	RIDEM	NJDEP	MADEP
Acute	560	NA	635	NA	NA
Chronic	62	NA	14	NA	NA

CT DEP cites the GLI as the source for their proposed water quality standards for toluene. Ohio EPA used EPA's 1995 *Final Water Quality Guidance for the Great Lakes System* (60 FR 15366) to calculate a Tier II value since the available toxicity data did not meet the required data needs for a Tier I criterion. The Tier II acute value was based on available acute data for toluene in multiple studies on nine species of fish and aquatic invertebrates. The proposed CT WQS are different from the RIDEM WQS, possibly due to differences in toxicity factors or methodologies. We have not reviewed RIDEM WQS in detail. For each genus, the genus mean acute values (GMAVs) were calculated as the geometric mean of acute values in a genus. The lowest GMAV was divided by the SAF, which is based on the number of Tier I data requirements that were met. In the case of toluene, the lowest GMAV was 6,780 μg/L and five families met the Tier I data requirements, which resulted in a SAF of 6.1. The final acute value (FAV) of 1,111 μg/L for toluene was then divided by 2 to derive the Tier II acute value of 560 μg/L (rounded to two significant figures). The Tier II chronic value for toluene (62 μg/L) was calculated by dividing the FAV (1,111 μg/L) by a default secondary acute-to-chronic ratio (SACR) of 18. Available data did not meet the Tier I data requirements for calculating a chemical-specific ACR.

There are no established WQS for toluene for saltwater. In this case, proposed freshwater CT WQS for toluene would be applied to marine water. It is inappropriate to use freshwater criteria for marine water because most species inhabiting freshwater will not be found in marine water. In addition, behavior of some chemicals, particularly metals, is influenced by the physical properties of water, which differ in fresh and marine waters.

Anthracene

	Anthracene Freshwater Standards (µg/L)				
	CT DEP	EPA	RIDEM	NJDEP	MADEP
Acute	0.18	NA	NA	NA	NA
Chronic	0.02	NA	NA	NA	NA

CT DEP has proposed freshwater WQS for anthracene of 0.18 µg/L for acute and 0.02 µg/L for chronic, which were developed by Ohio EPA and presented in the GLI. These WQS were calculated by Ohio EPA using the methods described in the toluene section. There are no WQS for anthracene used by EPA, RIDEM, NJDEP, or MADEP. The Tier II acute value was based on available acute data for anthracene on only two species, one fish and one aquatic invertebrate. While proposed freshwater WQS for anthracene match the Tier II values presented in the GLI, our calculations with the same data resulted in different and slightly higher Tier II values. We verified that the data presented in the GLI matched those in the original research papers. Therefore, there could be an error in the calculations made by Ohio EPA. If GLI data are used, CT DEP should verify those calculations. We determined that the lowest GMAV was 7.8 µg/L and two families met the Tier I data requirements, which resulted in a SAF of 13. The resulting FAV is 0.60 µg/L, which is then divided by 2 to derive a Tier II acute value of 0.30 µg/L (rounded to two significant figures). A Tier II chronic value for anthracene is calculated by dividing the FAV (0.60 µg/L) by a default SACR of 18, which results in a Tier II chronic value of 0.03 µg/L. Available data did not meet the Tier I data requirements for calculating a chemical-specific ACR. Regardless of possible errors in the calculations of the Tier II values for anthracene, calculating WQS for anthracene is highly uncertain because there is limited data on only two aquatic species, which cannot fully represent the variety of aquatic animals in Connecticut waters. In addition, high uncertainty factors were applied to account for the limited data on anthracene. Due to the significant uncertainty for this compound, CT DEP must consider whether a WQS can be developed at this time or whether to wait until adequate data are available to support the development of a valid WQS.

There are no active or proposed anthracene WQS for saltwater.

1,1,1-Trichloroethane

	1,1,1-Trichloroethane Freshwater Standards (µg/L)				
	CT DEP	EPA	RIDEM	NJDEP	MADEP
Acute	690	NA	NA	NA	NA
Chronic	76	NA	NA	NA	NA

CT DEP has proposed freshwater WQS for 1,1,1-trichloroethane of 690 μg/L for acute and 76 μg/L for chronic, which were developed by Ohio EPA and presented in the GLI. These WQS were calculated by Ohio EPA using the methods described in the toluene section. There are no WQS for 1,1,1-trichloroethane used by EPA, RIDEM, NJDEP, or MADEP. The Tier II acute value was based on available acute data for 1,1,1-trichloroethane on only two species, one fish and one aquatic invertebrate. While proposed freshwater WQS for 1,1,1-trichloroethane match the Tier II values presented in the GLI, our calculations with the same data resulted in different and higher Tier II values. We verified that the data presented in the GLI matched those in the original research papers. Therefore, there could be an error in the calculations made by Ohio EPA. If GLI data are used, CT DEP should verify those calculations. We determined that the lowest GMAV was 32,258 μg/L and two families met the Tier I data requirements, which resulted in a SAF of 13. The resulting FAV of 2,481 μg/L for 1,1,1-trichloroethane was then divided by 2 to derive the Tier II acute value of 1,200 μg/L (rounded to two significant figures). The Tier II chronic value for 1,1,1-trichloroethane was calculated by dividing the FAV by a default SACR of 18, which results in a Tier II chronic value of 140 μg/L. Available data did not meet the Tier I data requirements for calculating a chemical-specific ACR. Regardless of possible errors in the calculations of the Tier II values for 1,1,1-trichloroethane, the Tier II values are highly uncertain because there is limited data on only two aquatic species. High uncertainty factors are then applied to these uncertain data. Due to the significant uncertainty for this compound, CT DEP must consider whether a WQS can be developed at this time or whether to wait until adequate data are available to support the development of a valid WQS.

There are no active or proposed 1,1,1-trichloroethane WQS for saltwater.

1,2,4-Trimethylbenzene

	1,2,4-Trimethylbenzene Freshwater Standards (μg/L)				
	CT DEP	EPA	RIDEM	NJDEP	MADEP
Acute	142	NA	NA	NA	NA
Chronic	16	NA	NA	NA	NA

CT DEP cites the use of Tier II procedures for calculating criteria according to 40 CFR 132 *Appendix A: Great Lakes Water Quality Initiative Methodologies for Development of Aquatic Life Criteria and Values*. The Tier II acute value was based on available acute data for 1,2,4-trimethylbenzene on only two species, one fish and one aquatic invertebrate, from two studies. The CT DEP method for calculating this Tier II values seems to follow the methods presented in the GLI, where the lowest GMAV (3,679 μg/L) is divided by the SAF of 13, which corresponds to two of the eight Tier I criteria being met, and is then divided by 2 to calculate the FAV, as per EPA guidance.

Although the GLI and CT DEP methods for calculating a FAV use the same method and are based on the same study (Bobra et al. 1983), the toxicity value is slightly different (GLI used 3,606 µg/L; CT DEP used 3,679 µg/L) and the Tier II values are slightly different: CT DEP criteria are 142 µg/L and 16 µg/L for acute and chronic, respectively, while the GLI criteria are 140 µg/L and 15 µg/L for acute and chronic, respectively. Tier II values for 1,2,4-trimethylbenzene are highly uncertain because they use limited data (two studies on two species) and uncertainty factors. Due to the significant uncertainty for this compound, CT DEP must consider whether a WQS can be developed at this time or whether to wait until adequate data are available to support the development of a valid WQS.

There are no established WQS for 1,2,4-trimethylbenzene for saltwater.

Chlordane

	Chlordane Freshwater Standards (µg/L)				
	CT DEP	EPA	RIDEM	NJDEP	MADEP
Acute	1.2	2.4	2.4	2.4	2.4
Chronic	0.00215	0.0043	0.0043	0.0043	0.0043

The freshwater WQS for chlordane proposed by CT DEP are 1.2 µg/L for acute and 0.00215 µg/L for chronic. These WQS are consistently one-half of the WQS of 2.4 µg/L and 0.0043 µg/L used by EPA, RIDEM, NJDEP, and MADEP for acute and chronic, respectively.

	Chlordane Saltwater Standards (µg/L)				
	CT DEP	EPA	RIDEM	NJDEP	MADEP
Acute	0.045	0.09	0.09	0.09	0.09
Chronic	0.0045	0.004	0.004	0.004	0.004

The saltwater WQS for chlordane proposed by CT DEP are 0.045 µg/L for acute and 0.0045 µg/L for chronic. The saltwater acute standard is one-half the WQS of 0.09 µg/L used by EPA, RIDEM, NJDEP, and MADEP. The saltwater chronic standard proposed by CT DEP (0.0045 µg/L) is slightly higher than the standard used by EPA, RIDEM, NJDEP, and MADEP (0.004 µg/L).

CT DEP cites the use of the EPA WQS for chlordane, but gives no explanation for the proposed WQS that are one-half these EPA standards. CT DEP must justify its use of one-half of the EPA standard.

Technical Issues with Proposed WQS

- The use of freshwater criteria in the absence of marine criteria is inappropriate. The criteria should be based on toxicity information specific to the species inhabiting those waters. Most species inhabiting freshwater will not be found in marine water. In addition, behavior of some chemicals is influenced by the physical properties of water. For example, certain metals are less toxic in marine water than in freshwater because higher concentrations of salts in marine water reduce the availability of metals to aquatic life. It is important to have separate criteria for freshwater and marine water for these reasons.

- Tier II numerical criteria are based on toxicity data for fewer species than are NRWQC. To account for the smaller data sets used to develop Tier II criteria, uncertainty factors are applied to the toxicity data when deriving the criteria, and the smaller the data set available, the larger the uncertainty factor. The uncertainty factors can be large and result in numerical criteria that are highly conservative. Due to the significant uncertainties associated with these Tier II criteria, CT DEP must consider whether WQS can be developed at this time or whether to wait until adequate data are available to support the development of a valid WQS.

- The number of significant figures for some criteria is more than two. Criteria should be expressed as two significant figures to be consistent with NRWQC (U.S. EPA 1985) and GLI Tier II values (U.S. EPA 1995).

- CT DEP bases the derivation of the defaultWQC for several metals on a hardness value of 50 mg/L rather than EPA's default hardness of 100 mg/L. The basis for selecting a default hardness value of 50 mg/L is not provided. Absent evidence that the majority of in-state surface water have hardness of around 50 mg/L rather than 100 mg/L, EPA's default value should be used. CT DEP should also allow the use of water-hardness adjustments to the freshwater criteria for cadmium, zinc and other metals (e.g., chromium, lead, nickel, and silver) based on EPA's water hardness-dependent criteria because water hardness-adjusted criteria more accurately predict the potential for aquatic toxicity.

- To the extent GLI data is used, CT DEP should verify the data and calculations used in the GLI for the Tier II values.

If you have any questions or comments regarding the information in this letter, please contact us by phone (978-461-4600) or e-mail (mcardle@exponent.com; sdriscoll@exponent.com) at your convenience.

Sincerely,

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Table 2. Comparison of freshwater acute aquatic life water quality standards (µg/L)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Toxic Metals, Cyanides								
7429-90-5	Aluminum (Total)	a		750	EPA	750	750	750	
7664-41-7	Ammonia	b						see note	see note
7440-36-0	Antimony			900	GLI			450	
7440-38-2	Arsenic	c	340	340	EPA	340	340	340	340
1332-21-4	Asbestos								
7440-39-3	Barium			2,000	GLI				
7440-41-7	Beryllium			30.6	GLI			7.5	
7440-42-8	Boron			8,500	GLI				
7440-43-9	Cadmium	c	2.02	1	EPA	2.0	2.0	2.0	1.4
16887-00-6	Chloride			860,000	EPA	860,000	860,000	860,000	860,000
7782-50-5	Chlorine		19	19	EPA	19	19	19	
18540-29-9	Chromium, hexavalent	c	16	16	EPA	16	16	16	15
16065-83-1	Chromium, trivalent	c	323	323	EPA	570	570	570	500
7440-48-4	Cobalt			220	GLI				
7440-50-8	Copper	c	14.3	14.3	CTDEP	BLM	BLM	13	13
7440-50-8	Copper (site specific)	d	25.7	25.7	CTDEP		25.7		
57-12-5	Cyanide		22	22	EPA	22	22	22	22
7439-89-6	Iron								
7439-92-1	Lead	c	30	30	EPA	65	65	65	38
7439-93-2	Lithium								
7439-96-5	Manganese								
7487-94-7	Mercury - inorganic	c	1.4	1.4	EPA	1.4	1.4	1.4	1.4
7440-02-0	Nickel	c	260.5	260	EPA	470	470	470	370
7782-49-2	Selenium (Total)		20	20	EPA			20	20
7440-22-4	Silver	c	1.02	1	EPA	3.2	3.2	3.5	3.2
7440-28-0	Thallium			79	GLI			46	
7440-31-5	Tin			1,600	GLI				
7440-61-1	Uranium								
7440-62-2	Vanadium			150	GLI				
7440-66-6	Zinc	c	65	65	EPA	120	120	120	110
	Volatile Substances								
67-64-1	Acetone			15,000	GLI				
75-05-8	Acetonitrile			73,705	CTDEP Tier 2				
107-02-8	Acrolein			0.8	CTDEP Tier 2	3	3	2.9	
107-13-1	Acrylonitrile			369	CTDEP Tier 2			378	
71-43-2	Benzene			700	GLI			265	
74-83-9	Bromomethane			0.04	CTDEP Tier 2				
78-93-3	2-Butanone			123,077	CTDEP Tier 2				
104-51-8	n-Butylbenzene								
135-98-8	sec-Butylbenzene								
98-06-6	t-Butylbenzene								
75-15-0	Carbon disulfide			130	GLI				
56-23-5	Carbon tetrachloride			2,200	GLI			1,365	
108-90-7	Chlorobenzene			420	GLI			795	
75-00-3	Chloroethane								
110-75-8	2-Chloroethylvinyl ether (mixed)								
67-66-3	Chloroform			1,300	GLI			1,445	
74-87-3	Chloromethane								
91-58-7	2-Chloronapthalene			79	CTDEP Tier 2				
95-49-8	2-Chlorotoluene								
106-43-4	4-Chlorotoluene			64	CTDEP Tier 2				
110-82-7	Cyclohexane			2,480	CTDEP Tier 2				
132-64-9	Dibenzofuran			36	GLI				
95-50-1	1,2-Dichlorobenzene			130	GLI			79	
541-73-1	1,3-Dichlorobenzene			79	GLI			390	
106-46-7	1,4-Dichlorobenzene			57	GLI			56	
75-27-4	Dichlorobromomethane								
110-57-6	1,4-Dichlorobutene								
75-71-8	Dichlorodifluoromethane								
75-34-3	1,1-Dichloroethane			3,700	GLI			5,900	
107-06-2	1,2-Dichloroethane			9,600	GLI				
540-59-0	1,2-Dichloroethylene (1,2 Dichloroethene)			8,800	GLI				
75-35-4	1,1-Dichloroethylene (1,1 Dichloroethene)			1,900	GLI			580	
156-59-2	cis-1,2-Dichloroethylene (cis-1,2-Dichloroethene)			5,500	GLI				
156-60-5	trans-1,2-Dichloroethylene (trans-1,2-Dichloroethene)			5,000	GLI				
78-87-5	1,2-Dichloropropane			847	CTDEP Tier 2			2,625	
542-75-6	1,3-Dichloropropene			15	GLI				

Table 2. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Volatile Substances (cont.)								
141-78-6	Ethyl acetate			14,375	CTDEP Tier 2				
100-41-4	Ethylbenzene			550	GLI			1,600	
106-93-4	Ethylene dibromide								
110-54-3	n-Hexane								
98-82-8	Isopropylbenzene			193	CTDEP Tier 2				
99-87-6	4-Isopropyltoluene			148	CTDEP Tier 2				
108-10-1	Methyl isobutyl ketone								
80-62-6	Methyl methacrylate								
1634-04-4	Methyl tert butyl ether			151,000	EPA				
75-09-2	Methylene chloride			11,000	GLI			9,650	
91-57-6	2-Methylnaphthalene			42	GLI				
98-95-3	Nitrobenzene			1,989	CTDEP Tier 2			1,350	
88-75-5	2-Nitrophenol			650	GLI				
100-02-7	4-Nitrophenol								
103-65-1	n-Propylbenzene								
110-86-1	Pyridine			236	CTDEP Tier 2				
100-42-5	Styrene			214	CTDEP Tier 2				
630-20-6	1,1,1,2-Tetrachloroethane			770	GLI			980	
79-34-5	1,1,2,2-Tetrachloroethane			1,155	CTDEP Tier 2			466	
127-18-4	Tetrachloroethylene			430	GLI			240	
109-99-9	Tetrahydrofuran			74,000	GLI				
108-88-3	Toluene			560	GLI			635	
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane								
71-55-6	1,2,4-Trichlorobenzene				GLI			75	
79-00-5	1,1,1-Trichloroethane			690	GLI				
120-82-1	1,1,2-Trichloroethane			3,300	GLI			900	
79-01-6	Trichloroethylene			2,000	GLI			1,950	
75-69-4	Trichlorofluoromethane								
95-63-6	1,2,4-Trimethylbenzene			142	CTDEP Tier 2				
108-67-8	1,3,5-Trimethylbenzene			237	CTDEP Tier 2				
108-05-4	Vinyl acetate								
75-01-4	Vinyl chloride			8,400	GLI				
133-02-07	Xylenes			240	GLI			133	
	Semivolatile Subtances								
83-32-9	Acenaphthene			19	GLI			85	
208-96-8	Acenaphthylene			120	GLI				
62-53-3	Aniline			11.4	CTDEP Tier 2				
120-12-7	Anthracene			0.18	GLI				
92-87-5	Benzidine			38	CTDEP Tier 2				
56-55-3	Benzo(a)anthracene			42	GLI				
50-32-8	Benzo(a)pyrene			0.54	GLI				
205-99-2	Benzo(b)fluoranthene			23	GLI				
191-24-2	Benzo(g,h,i)perylene								
207-08-9	Benzo(k)fluoranthene								
65-85-0	Benzoic Acid								
111-91-1	Bis(2-chloroethoxy)methane			7,077	CTDEP Tier 2				
111-44-4	Bis(2-chloroethyl)ether			9,231	CTDEP Tier 2				
108-60-1	Bis(2-chloroisopropyl)ether								
117-81-7	Bis(2-ethyl hexyl)phthalate			5	CTDEP Tier 2			555	
75-25-2	Bromoform			1,115	CTDEP Tier 2			1,465	
101-55-3	4-Bromophenyl-phenylether							18	
85-68-7	Butyl benzyl phthalate			130	GLI			85	
86-74-8	Carbazole			48	CTDEP Tier 2				
106-47-8	4-Chloroaniline			9	CTDEP Tier 2				
124-48-1	Chlorodibromomethane								
95-57-8	2-Chlorophenol			290	GLI			129	
59-50-7	3-methyl-4 Chlorophenol			66	CTDEP Tier 2				
7005-72-3	4-Chlorophenyl-phenylether								
218-01-9	Chrysene			42	GLI				
108-39-4	m-Cresol			560	GLI				
53-70-3	Dibenzo(a,h)anthracene								
96-12-8	1,2-Dibromo-3-chloropropane								
91-94-1	3,3-Dichlorobenzidene			40	CTDEP Tier 2				
120-83-2	2,4-Dichlorophenol			110	GLI			101	
34077-87-7	Dichlorotrifluoroethane								
84-66-2	Diethyl phthalate			980	GLI			2,605	
131-11-3	Dimethyl phthalate			2,788	CTDEP Tier 2			1,650	

Table 2. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Semivolatile Subtances (cont.)								
105-67-9	2,4-Dimethylphenol			140	GLI			106	
84-74-2	Di-n-butyl phthalate			34	CTDEP Tier 2				
51-28-5	2,4-Dinitrophenol			199	CTDEP Tier 2			31	
534-52-1	2-methyl-4,6-Dinitrophenol			6.4	CTDEP Tier 2				
121-14-2	2,4-Dinitrotoluene			394	CTDEP Tier 2			1,550	
606-20-2	2,6-Dinitrotoluene			730	GLI				
117-84-0	Di-n-octyl phthalate								
123-91-1	1,4-Dioxane								
122-66-7	1,2-Diphenylhydrazine			10	CTDEP Tier 2			14	
64-17-5	Ethanol			20,491	CTDEP Tier 2				
107-21-1	Ethylene glycol			1,300,000	GLI				
206-44-0	Fluoranthene			3.7	GLI			199	
86-73-7	Fluorene			110	GLI				
50-00-0	Formaldehyde			4,554	Hohreiter and Rigg				
118-74-1	Hexachlorobenzene			0.34	CTDEP Tier 2				
87-68-3	Hexachlorobutadiene								
67-72-1	Hexachloroethane							49	
193-39-5	Indeno(1,2,3-cd)pyrene								
78-59-1	Isophorone			7,500	GLI			5,850	
67-63-0	Isopropanol								
67-56-1	Methanol			3,000	GLI				
95-48-7	2-Methylphenol			600	GLI				
106-44-5	4-Methylphenol			499	CTDEP Tier 2				
91-20-3	Naphthalene			170	GLI			115	
88-74-4	2-Nitroaniline			188	CTDEP Tier 2				
99-09-2	3-Nitroaniline			61	CTDEP Tier 2				
100-01-6	4-Nitroaniline			1,063	CTDEP Tier 2				
62-75-9	n-Nitrosodimethylamine								
621-64-7	n-Nitrosodi-n-propylamine								
86-30-6	n-Nitrosodiphenylamine			220	GLI			293	
84852-15-3	Nonylphenol			28	EPA				
82-68-8	Pentachloronitrobenzene			22	CTDEP Tier 2				
87-86-5	Pentachlorophenol	e	19	19	EPA	19	19	0.05	8.7
85-01-8	Phenanthrene			31	GLI				
108-95-2	Phenol			4,700	GLI			251	
57-55-6	Propylene glycol			640	GLI				
129-00-0	Pyrene			42	GLI				
127-09-3	Sodium acetate								
75-65-0	Tert-butyl alcohol			211,692	CTDEP Tier 2				
95-94-3	1,2,4,5-Tetrachlorobenzene			18	CTDEP Tier 2				
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin								
95-95-4	2,4,5-Trichlorophenol			25	CTDEP Tier 2			23	
88-06-2	2,4,6-Trichlorophenol			30	CTDEP Tier 2			16	
	Pesticides and PCBs								
15972-60-8	Alachlor			294	CTDEP Tier 2				
116-06-3	Aldicarb			11.4	CTDEP Tier 2				
309-00-2	Aldrin		1.5	0.45	CTDEP Tier 2	3	3	3	3
1912-24-9	Atrazine			14.5	CTDEP Tier 2				
12789-03-6	Chlordane		1.2	1.2	EPA	2.4	2.4	2.4	2.4
2921-88-2	Chlorpyrifos			0.083	EPA	0.083	0.083		0.083
94-75-7	2-4 Dichlorophenoxyacetic acid (2,4-D)			47	EPA				
72-54-8	4,4-DDD								
72-55-9	4,4-DDE								
50-29-3	4,4-DDT (Total)		0.55	0.55	EPA	1.1	1.1	1.1	1.1
333-41-5	Diazinon			0.17	EPA	0.17	0.17		
1918-00-9	Dicamba			1619	CTDEP Tier 2				
120-36-5	Dichloroprop			105	CTDEP Tier 2				
60-57-1	Dieldrin		0.24	0.24	EPA	0.24	0.24	0.24	0.24
115-29-7	Endosulfan[#]		0.11	0.11	EPA	0.22	0.22	0.22	0.22
1031-07-8	Endosulfan sulfate								
72-20-8	Endrin		0.086	0.086	EPA	0.086	0.086	0.086	0.086
7421-93-4	Endrin aldehyde			0.086	EPA				
53494-70-5	Endrin ketone			0.086	EPA				
76-44-8	Heptachlor		0.26	0.26	EPA	0.52	0.52	0.52	0.52
1024-57-3	Heptachlor epoxide		0.26	0.26	EPA	0.52	0.52	0.52	0.52
319-84-6	Hexachlorocyclohexane,alpha								
319-85-7	Hexachlorocyclohexane,beta								

Table 2. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Pesticides and PCBs (cont.)								
319-86-8	Hexachlorocyclohexane,delta								
77-47-4	Hexachlorocyclopentadiene			2.8	CTDEP Tier 2			0.35	
58-89-9	Lindane		0.95	0.95	EPA	0.95	0.95	0.95	0.95
72-43-5	Methoxychlor								
122-34-9	Simazine			5	CTDEP Tier 2				
8001-35-2	Toxaphene		0.73	0.73	EPA	0.73	0.73	0.73	0.73
1336-36-3	PCBs								
	Radionuclides								
12587-46-1	Alpha Particles								
12587-47-2	Beta Particles								

Notes: Blank cells indicate criteria not established.

* U.S. EPA 2009 National Recommended Water Quality Criteria (www.epa.gov/ost/criteria/wqctable)

MA DEP WQS: http://www.mass.gov/dep/service/regulations/314cmr04.pdf

RI DEM WQS: http://www.dem.ri.gov/pubs/regs/regs/water/h20q09a.pdf

NJ DEP WQS: http://www.nj.gov/dep/rules/rules/njac7_9b.pdf

BLM - U.S. EPA Biotic Ligand Model used to calculate criteria based upon organic content of receiving water

[a] RI DEM freshwater criteria for aluminum are for waters in which the pH is between 6.5 and 9.

[b] RIDEM ammonia criteria is based on the pH and temperature of the water body, and organism life stage. NJDEP Ammonia criteria based on pH and temperature of water body, season, and water body classification as defined in NJAC 7:9-1.14.

[c] CT WQS is presented as dissolved criteria using the EPA recommended equations and conversion factors at a hardness of 50; EPA and other states use equations for criteria and are shown here based on a hardness of 100 mg/L.
RIDEM, CT WQS and MA DEP use EPA recommended conversion factors, but NJDEP use their own conversion factors.

[d] Site-specific criteria for dissolved copper applicable to portions of impaired waterways.

[e] Value presented is calculated using the conversion factors at a pH of 7.

Table 3. Comparison of freshwater chronic aquatic life water quality standards (µg/L)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Toxic Metals, Cyanides								
7429-90-5	Aluminum (Total)	a		87	EPA	87	87	87	
7664-41-7	Ammonia	b		calculated	EPA			see note	see note
7440-36-0	Antimony			190	GLI			10	
7440-38-2	Arsenic	c	150	150	EPA	150	150	150	150
1332-21-4	Asbestos								
7440-39-3	Barium			220	GLI				
7440-41-7	Beryllium			3.6	GLI			0.17	
7440-42-8	Boron			950	GLI				
7440-43-9	Cadmium	c	1.35	0.15	EPA	0.25	0.25	0.25	0.18
16887-00-6	Chloride			230,000	EPA	230,000	230,000	230,000	230,000
7782-50-5	Chlorine		11	11	EPA	11	11	11	
18540-29-9	Chromium, hexavalent	c	11	11	EPA	11	11	11	10
16065-83-1	Chromium, trivalent	c	42	42	EPA	74	74	74	24
7440-48-4	Cobalt			24	GLI				
7440-50-8	Copper	c	4.8	4.8	CTDEP	BLM	BLM	9.0	8.5
7440-50-8	Copper (site specific)	d	18.1	18.1	CTDEP		18.1		
57-12-5	Cyanide		5.2	5.2	EPA	5.2	5.2	5.2	5.2
7439-89-6	Iron			1,000	EPA	1,000	1,000	1,000	
7439-92-1	Lead	c,f	1.2	1.2	EPA	2.5	2.5	2.5	5.4
7439-93-2	Lithium								
7439-96-5	Manganese								
7487-94-7	Mercury - inorganic	c	0.77	0.77	EPA	0.77	0.77	0.77	0.77
7440-02-0	Nickel	c	28.9	29	EPA	52	52	52	44
7782-49-2	Selenium (Total)		5	5	EPA	5	5	5	5
7440-22-4	Silver			0.06	GLI				
7440-28-0	Thallium			17	GLI			1	
7440-31-5	Tin			180	GLI				
7440-61-1	Uranium								
7440-62-2	Vanadium			44	GLI				
7440-66-6	Zinc	c	65	65	EPA	120	120	120	110
	Volatile Substances								
67-64-1	Acetone			1,700	GLI				
75-05-8	Acetonitrile			8,189	CTDEP Tier 2				
107-02-8	Acrolein			0.1	CTDEP Tier 2	3	3	0.06	
107-13-1	Acrylonitrile			41	CTDEP Tier 2			8.4	
71-43-2	Benzene			160	GLI			5.9	
74-83-9	Bromomethane			0.005	CTDEP Tier 2				
78-93-3	2-Butanone			13,752	CTDEP Tier 2				
104-51-8	n-Butylbenzene								
135-98-8	sec-Butylbenzene								
98-06-6	t-Butylbenzene								
75-15-0	Carbon disulfide			15	GLI				
56-23-5	Carbon tetrachloride			240	GLI			30	
108-90-7	Chlorobenzene			47	GLI			18	
75-00-3	Chloroethane								
110-75-8	2-Chloroethylvinyl ether (mixed)								
67-66-3	Chloroform			140	GLI			32	
74-87-3	Chloromethane								
91-58-7	2-Chloronapthalene			9	CTDEP Tier 2				
95-49-8	2-Chlorotoluene								
106-43-4	4-Chlorotoluene			7	CTDEP Tier 2				
110-82-7	Cyclohexane			276	CTDEP Tier 2				
132-64-9	Dibenzofuran			4	GLI				
95-50-1	1,2-Dichlorobenzene			23	GLI			1.8	
541-73-1	1,3-Dichlorobenzene			22	GLI			8.7	
106-46-7	1,4-Dichlorobenzene			9.4	GLI			1.2	
75-27-4	Dichlorobromomethane								
110-57-6	1,4-Dichlorobutene								
75-71-8	Dichlorodifluoromethane								
75-34-3	1,1-Dichloroethane			410	GLI			131	
107-06-2	1,2-Dichloroethane			2,000	GLI				
540-59-0	1,2-Dichloroethylene (1,2 Dichloroethene)			970	GLI				
75-35-4	1,1-Dichloroethylene (1,1 Dichloroethene)			210	GLI			13	
156-59-2	cis-1,2-Dichloroethylene (cis-1,2-Dichloroethene)			620	GLI				
156-60-5	trans-1,2-Dichloroethylene (trans-1,2-Dichloroethene)			560	GLI				
78-87-5	1,2-Dichloropropane			94	CTDEP Tier 2			58	
542-75-6	1,3-Dichloropropene			1.7	GLI				

Table 3. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Volatile Substances (cont.)								
141-78-6	Ethyl acetate			1,597	CTDEP Tier 2				
100-41-4	Ethylbenzene			61	GLI			36	
106-93-4	Ethylene dibromide								
110-54-3	n-Hexane								
98-82-8	Isopropylbenzene			21	CTDEP Tier 2				
99-87-6	4-Isopropyltoluene			16.5	CTDEP Tier 2				
108-10-1	Methyl isobutyl ketone								
80-62-6	Methyl methacrylate								
1634-04-4	Methyl tert butyl ether			51,000	EPA				
75-09-2	Methylene chloride			1,900	GLI			214	
91-57-6	2-Methylnaphthalene			4.7	GLI				
98-95-3	Nitrobenzene			221	CTDEP Tier 2			30	
88-75-5	2-Nitrophenol			73	GLI				
100-02-7	4-Nitrophenol								
103-65-1	n-Propylbenzene								
110-86-1	Pyridine			26	CTDEP Tier 2				
100-42-5	Styrene			24	CTDEP Tier 2				
630-20-6	1,1,1,2-Tetrachloroethane			85	GLI			22	
79-34-5	1,1,2,2-Tetrachloroethane			655	CTDEP Tier 2			10	
127-18-4	Tetrachloroethylene			53	GLI			5.3	
109-99-9	Tetrahydrofuran			11,000	GLI				
108-88-3	Toluene			62	GLI			14	
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane								
71-55-6	1,2,4-Trichlorobenzene			5	GLI			1.7	
79-00-5	1,1,1-Trichloroethane			76	GLI				
120-82-1	1,1,2-Trichloroethane			740	GLI			20	
79-01-6	Trichloroethylene			220	GLI			43	
75-69-4	Trichlorofluoromethane								
95-63-6	1,2,4-Trimethylbenzene			16	CTDEP Tier 2				
108-67-8	1,3,5-Trimethylbenzene			26	CTDEP Tier 2				
108-05-4	Vinyl acetate								
75-01-4	Vinyl chloride			930	GLI				
133-02-07	Xylenes			27	GLI			3	
	Semivolatile Subtances								
83-32-9	Acenaphthene			15	GLI			1.9	
208-96-8	Acenaphthylene			13	GLI				
62-53-3	Aniline			1.3	CTDEP Tier 2				
120-12-7	Anthracene			0.02	GLI				
92-87-5	Benzidine			4	CTDEP Tier 2				
56-55-3	Benzo(a)anthracene			4.7	GLI				
50-32-8	Benzo(a)pyrene			0.06	GLI				
205-99-2	Benzo(b)fluoranthene			2.6	GLI				
191-24-2	Benzo(g,h,i)perylene								
207-08-9	Benzo(k)fluoranthene								
65-85-0	Benzoic Acid								
111-91-1	Bis(2-chloroethoxy)methane			786	CTDEP Tier 2				
111-44-4	Bis(2-chloroethyl)ether			1,026	CTDEP Tier 2				
108-60-1	Bis(2-chloroisopropyl)ether								
117-81-7	Bis(2-ethyl hexyl)phthalate			1	CTDEP Tier 2			12	
75-25-2	Bromoform			124	CTDEP Tier 2			33	
101-55-3	4-Bromophenyl-phenylether							0.4	
85-68-7	Butyl benzyl phthalate			23	GLI			1.9	
86-74-8	Carbazole			5.3	CTDEP Tier 2				
106-47-8	4-Chloroaniline			1	CTDEP Tier 2				
124-48-1	Chlorodibromomethane								
95-57-8	2-Chlorophenol			32	GLI			2.9	
59-50-7	3-methyl-4 Chlorophenol			7	CTDEP Tier 2				
7005-72-3	4-Chlorophenyl-phenylether								
218-01-9	Chrysene			4.7	GLI				
108-39-4	m-Cresol			62	GLI				
53-70-3	Dibenzo(a,h)anthracene								
96-12-8	1,2-Dibromo-3-chloropropane								
91-94-1	3,3-Dichlorobenzidene			4.5	CTDEP Tier 2				
120-83-2	2,4-Dichlorophenol			11	GLI			2.2	
34077-87-7	Dichlorotrifluoroethane								
84-66-2	Diethyl phthalate			220	GLI			58	
131-11-3	Dimethyl phthalate			310	CTDEP Tier 2			37	

Table 3. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Semivolatile Subtances (cont.)								
105-67-9	2,4-Dimethylphenol			15	GLI			2.4	
84-74-2	Di-n-butyl phthalate			4	CTDEP Tier 2				
51-28-5	2,4-Dinitrophenol			22	CTDEP Tier 2			0.69	
534-52-1	2-methyl-4,6-Dinitrophenol			0.7	CTDEP Tier 2				
121-14-2	2,4-Dinitrotoluene			44	CTDEP Tier 2			34	
606-20-2	2,6-Dinitrotoluene			81	GLI				
117-84-0	Di-n-octyl phthalate								
123-91-1	1,4-Dioxane								
122-66-7	1,2-Diphenylhydrazine			1	CTDEP Tier 2			0.31	
64-17-5	Ethanol			2,277	CTDEP Tier 2				
107-21-1	Ethylene glycol			140,000	GLI				
206-44-0	Fluoranthene			0.8	GLI			4.4	
86-73-7	Fluorene			19	GLI				
50-00-0	Formaldehyde			1,178	Hohreiter and Rigg				
118-74-1	Hexachlorobenzene			0.04	CTDEP Tier 2				
87-68-3	Hexachlorobutadiene								
67-72-1	Hexachloroethane							1.1	
193-39-5	Indeno(1,2,3-cd)pyrene								
78-59-1	Isophorone			920	GLI			130	
67-63-0	Isopropanol								
67-56-1	Methanol			330	GLI				
95-48-7	2-Methylphenol			67	GLI				
106-44-5	4-Methylphenol			55.5	CTDEP Tier 2				
91-20-3	Naphthalene			21	GLI			2.6	
88-74-4	2-Nitroaniline			21	CTDEP Tier 2				
99-09-2	3-Nitroaniline			7	CTDEP Tier 2				
100-01-6	4-Nitroaniline			118	CTDEP Tier 2				
62-75-9	n-Nitrosodimethylamine								
621-64-7	n-Nitrosodi-n-propylamine								
86-30-6	n-Nitrosodiphenylamine			25	GLI			6.5	
84852-15-3	Nonylphenol			6.6	EPA				
82-68-8	Pentachloronitrobenzene			2.5	CTDEP Tier 2				
87-86-5	Pentachlorophenol	e	15	15	EPA	15	15	0.04	6.7
85-01-8	Phenanthrene			2.3	GLI				
108-95-2	Phenol			160	GLI			5.6	
57-55-6	Propylene glycol			71	GLI				
129-00-0	Pyrene			4.6	GLI				
127-09-3	Sodium acetate								
75-65-0	Tert-butyl alcohol			23,521	CTDEP Tier 2				
95-94-3	1,2,4,5-Tetrachlorobenzene			2	CTDEP Tier 2				
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin								
95-95-4	2,4,5-Trichlorophenol			2.8	CTDEP Tier 2			0.51	
88-06-2	2,4,6-Trichlorophenol			3.3	CTDEP Tier 2			0.36	
	Pesticides and PCBs								
15972-60-8	Alachlor			33	CTDEP Tier 2				
116-06-3	Aldicarb			1.3	CTDEP Tier 2				
309-00-2	Aldrin			0.05	CTDEP Tier 2				
1912-24-9	Atrazine			1.6	CTDEP Tier 2				
12789-03-6	Chlordane		0.0043	0.00215	EPA	0.0043	0.0043	0.0043	0.0043
2921-88-2	Chlorpyrifos			0.041	EPA	0.041	0.041		0.041
94-75-7	2-4 Dichlorophenoxyacetic acid (2,4-D)			5	EPA				
72-54-8	4,4-DDD								
72-55-9	4,4-DDE								
50-29-3	4,4-DDT (Total)		0.001	0.005	EPA	0.001	0.001	0.001	0.001
333-41-5	Diazinon			0.17	EPA	0.17	0.17		
1918-00-9	Dicamba			180	CTDEP Tier 2				
120-36-5	Dichloroprop			12	CTDEP Tier 2				
60-57-1	Dieldrin		0.056	0.056	EPA	0.056	0.056	0.056	0.056
115-29-7	Endosulfan[#]		0.056	0.028	EPA	0.056	0.056	0.056	0.056
1031-07-8	Endosulfan sulfate								
72-20-8	Endrin		0.036	0.036	EPA	0.036	0.036	0.036	0.036
7421-93-4	Endrin aldehyde			0.036	EPA				
53494-70-5	Endrin ketone			0.036	EPA				
76-44-8	Heptachlor		0.0038	0.0019	EPA	0.0038	0.0038	0.0038	0.0038
1024-57-3	Heptachlor epoxide		0.0038	0.0019	EPA	0.0038	0.0038	0.0038	0.0038
319-84-6	Hexachlorocyclohexane,alpha								
319-85-7	Hexachlorocyclohexane,beta								

Table 3. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Pesticides and PCBs (cont.)								
319-86-8	Hexachlorocyclohexane,delta								
77-47-4	Hexachlorocyclopentadiene			0.3	CTDEP Tier 2			0.008	
58-89-9	Lindane			0.057	GLI				
72-43-5	Methoxychlor			0.03	EPA	0.03	0.03		0.03
122-34-9	Simazine			1	CTDEP Tier 2				
8001-35-2	Toxaphene		0.0002	0.002	EPA	0.002	0.002	0.0002	0.0002
1336-36-3	PCBs		0.014	0.014	EPA	0.014	0.014	0.014	
	Radionuclides								
12587-46-1	Alpha Particles								
12587-47-2	Beta Particles								

Notes: Blank cells indicate criteria not established.

* U.S. EPA 2009 National Recommended Water Quality Criteria (www.epa.gov/ost/criteria/wqctable)

MA DEP WQS: http://www.mass.gov/dep/service/regulations/314cmr04.pdf

RI DEM WQS: http://www.dem.ri.gov/pubs/regs/regs/water/h20q09a.pdf

NJ DEP WQS: http://www.nj.gov/dep/rules/rules/njac7_9b.pdf

BLM - U.S. EPA Biotic Ligand Model used to calculate criteria based upon organic content of receiving water

[a] RI DEM freshwater criteria for aluminum are for waters in which the pH is between 6.5 and 9.

[b] RIDEM ammonia criteria is based on the pH and temperature of the water body, and organism life stage. NJDEP ammonia criteria based on pH and temperature of water body, season, and water body classification as defined in NJAC 7:9-1.14.

[c] CT WQS is presented as dissolved criteria using the EPA recommended equations and conversion factors at a hardness of 50; EPA and other states use equations for criteria and are shown here based on a hardness of 100 mg/L.
RIDEM, CT WQS and MA DEP use EPA recommended conversion factors, but NJDEP use their own conversion factors.

[d] Site-specific criteria for dissolved copper applicable to portions of impaired waterways.

[e] Value presented is calculated using the conversion factors at a pH of 7.

[f] NJDEP uses a WER alue presented is calculated using the conversion factors at a pH of 7.

Table 4. Comparison of marine acute aquatic life water quality standards (µg/L)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Toxic Metals, Cyanides								
7429-90-5	Aluminum (Total)								
7664-41-7	Ammonia	b	233	233	EPA			see note	see note
7440-36-0	Antimony								
7440-38-2	Arsenic	c	69	69	EPA	69	69	69	69
1332-21-4	Asbestos								
7440-39-3	Barium								
7440-41-7	Beryllium								
7440-42-8	Boron								
7440-43-9	Cadmium	c	42	40	EPA	40	40	40	40
16887-00-6	Chloride								
7782-50-5	Chlorine		13	13	EPA	13	13	13	
18540-29-9	Chromium, hexavalent	c	1,100	1,100	EPA	1,100	1,100	1,100	1,100
16065-83-1	Chromium, trivalent								
7440-48-4	Cobalt								
7440-50-8	Copper	c	4.8	4.8	CTDEP	4.8	4.8	4.8	4.8
7440-50-8	Copper (site specific)	d							7.9
57-12-5	Cyanide		1	1	EPA	1	1	1	1
7439-89-6	Iron								
7439-92-1	Lead	c	210	210	EPA	210	210	210	210
7439-93-2	Lithium								
7439-96-5	Manganese								
7487-94-7	Mercury - inorganic	c	1.8	1.8	EPA	1.8	1.8	1.8	1.8
7440-02-0	Nickel	c	74	74	EPA	74	74	74	64
7782-49-2	Selenium (Total)	c	290	290	EPA	290	290	290	290
7440-22-4	Silver	c	1.96	1.9	EPA	1.9	1.9	1.9	1.9
7440-28-0	Thallium								
7440-31-5	Tin								
7440-61-1	Uranium								
7440-62-2	Vanadium								
7440-66-6	Zinc	c	90	90	EPA	90	90	90	90
	Volatile Substances								
67-64-1	Acetone								
75-05-8	Acetonitrile								
107-02-8	Acrolein								
107-13-1	Acrylonitrile								
71-43-2	Benzene								
74-83-9	Bromomethane								
78-93-3	2-Butanone								
104-51-8	n-Butylbenzene								
135-98-8	sec-Butylbenzene								
98-06-6	t-Butylbenzene								
75-15-0	Carbon disulfide								
56-23-5	Carbon tetrachloride								
108-90-7	Chlorobenzene								
75-00-3	Chloroethane								
110-75-8	2-Chloroethylvinyl ether (mixed)								
67-66-3	Chloroform								
74-87-3	Chloromethane								
91-58-7	2-Chloronapthalene								
95-49-8	2-Chlorotoluene								
106-43-4	4-Chlorotoluene								
110-82-7	Cyclohexane								
132-64-9	Dibenzofuran								
95-50-1	1,2-Dichlorobenzene								
541-73-1	1,3-Dichlorobenzene								
106-46-7	1,4-Dichlorobenzene								
75-27-4	Dichlorobromomethane								
110-57-6	1,4-Dichlorobutene								
75-71-8	Dichlorodifluoromethane								
75-34-3	1,1-Dichloroethane								
107-06-2	1,2-Dichloroethane								
540-59-0	1,2-Dichloroethylene (1,2 Dichloroethene)								
75-35-4	1,1-Dichloroethylene (1,1 Dichloroethene)								
156-59-2	cis-1,2-Dichloroethylene (cis-1,2-Dichloroethene)								
156-60-5	trans-1,2-Dichloroethylene (trans-1,2-Dichloroethene)								
78-87-5	1,2-Dichloropropane								

Table 4. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Volatile Substances (cont.)								
542-75-6	1,3-Dichloropropene								
141-78-6	Ethyl acetate								
100-41-4	Ethylbenzene								
106-93-4	Ethylene dibromide								
110-54-3	n-Hexane								
98-82-8	Isopropylbenzene								
99-87-6	4-Isopropyltoluene								
108-10-1	Methyl isobutyl ketone								
80-62-6	Methyl methacrylate								
1634-04-4	Methyl tert butyl ether								
75-09-2	Methylene chloride								
91-57-6	2-Methylnaphthalene								
98-95-3	Nitrobenzene								
88-75-5	2-Nitrophenol								
100-02-7	4-Nitrophenol								
103-65-1	n-Propylbenzene								
110-86-1	Pyridine								
100-42-5	Styrene								
630-20-6	1,1,1,2-Tetrachloroethane								
79-34-5	1,1,2,2-Tetrachloroethane								
127-18-4	Tetrachloroethylene								
109-99-9	Tetrahydrofuran								
108-88-3	Toluene								
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane								
71-55-6	1,2,4-Trichlorobenzene								
79-00-5	1,1,1-Trichloroethane								
120-82-1	1,1,2-Trichloroethane								
79-01-6	Trichloroethylene								
75-69-4	Trichlorofluoromethane								
95-63-6	1,2,4-Trimethylbenzene								
108-67-8	1,3,5-Trimethylbenzene								
108-05-4	Vinyl acetate								
75-01-4	Vinyl chloride								
133-02-07	Xylenes								
	Semivolatile Subtances								
83-32-9	Acenaphthene								
208-96-8	Acenaphthylene								
62-53-3	Aniline								
120-12-7	Anthracene								
92-87-5	Benzidine								
56-55-3	Benzo(a)anthracene								
50-32-8	Benzo(a)pyrene								
205-99-2	Benzo(b)fluoranthene								
191-24-2	Benzo(g,h,i)perylene								
207-08-9	Benzo(k)fluoranthene								
65-85-0	Benzoic Acid								
111-91-1	Bis(2-chloroethoxy)methane								
111-44-4	Bis(2-chloroethyl)ether								
108-60-1	Bis(2-chloroisopropyl)ether								
117-81-7	Bis(2-ethyl hexyl)phthalate								
75-25-2	Bromoform								
101-55-3	4-Bromophenyl-phenylether								
85-68-7	Butyl benzyl phthalate								
86-74-8	Carbazole								
106-47-8	4-Chloroaniline								
124-48-1	Chlorodibromomethane								
95-57-8	2-Chlorophenol								
59-50-7	3-methyl-4 Chlorophenol								
7005-72-3	4-Chlorophenyl-phenylether								
218-01-9	Chrysene								
108-39-4	m-Cresol								
53-70-3	Dibenzo(a,h)anthracene								
96-12-8	1,2-Dibromo-3-chloropropane								
91-94-1	3,3-Dichlorobenzidene								
120-83-2	2,4-Dichlorophenol								
34077-87-7	Dichlorotrifluoroethane								

Table 4. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Semivolatile Subtances (cont.)								
84-66-2	Diethyl phthalate								
131-11-3	Dimethyl phthalate								
105-67-9	2,4-Dimethylphenol								
84-74-2	Di-n-butyl phthalate								
51-28-5	2,4-Dinitrophenol								
534-52-1	2-methyl-4,6-Dinitrophenol							13	
121-14-2	2,4-Dinitrotoluene								
606-20-2	2,6-Dinitrotoluene								
117-84-0	Di-n-octyl phthalate								
123-91-1	1,4-Dioxane								
122-66-7	1,2-Diphenylhydrazine								
64-17-5	Ethanol								
107-21-1	Ethylene glycol								
206-44-0	Fluoranthene								
86-73-7	Fluorene								
50-00-0	Formaldehyde								
118-74-1	Hexachlorobenzene								
87-68-3	Hexachlorobutadiene								
67-72-1	Hexachloroethane								
193-39-5	Indeno(1,2,3-cd)pyrene								
78-59-1	Isophorone								
67-63-0	Isopropanol								
67-56-1	Methanol								
95-48-7	2-Methylphenol								
106-44-5	4-Methylphenol								
91-20-3	Naphthalene								
88-74-4	2-Nitroaniline								
99-09-2	3-Nitroaniline								
100-01-6	4-Nitroaniline								
62-75-9	n-Nitrosodimethylamine								
621-64-7	n-Nitrosodi-n-propylamine								
86-30-6	n-Nitrosodiphenylamine								
84852-15-3	Nonylphenol			7	EPA				
82-68-8	Pentachloronitrobenzene								
87-86-5	Pentachlorophenol		13	13	EPA	13	13		13
85-01-8	Phenanthrene								
108-95-2	Phenol								
57-55-6	Propylene glycol								
129-00-0	Pyrene								
127-09-3	Sodium acetate								
75-65-0	Tert-butyl alcohol								
95-94-3	1,2,4,5-Tetrachlorobenzene								
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin								
95-95-4	2,4,5-Trichlorophenol								
88-06-2	2,4,6-Trichlorophenol								
	Pesticides and PCBs								
15972-60-8	Alachlor								
116-06-3	Aldicarb								
309-00-2	Aldrin		0.65	0.65	CTDEP Tier 2	1.3	1.3	1.3	1.3
1912-24-9	Atrazine								
12789-03-6	Chlordane		0.045	0.045	EPA	0.09	0.09	0.09	0.09
2921-88-2	Chlorpyrifos			0.011	EPA				0.011
94-75-7	2-4 Dichlorophenoxyacetic acid (2,4-D)								
72-54-8	4,4-DDD								
72-55-9	4,4-DDE								
50-29-3	4,4-DDT (Total)		0.065	0.065	EPA	0.13	0.13	0.13	0.13
333-41-5	Diazinon			0.82	EPA	0.82	0.82		
1918-00-9	Dicamba								
120-36-5	Dichloroprop								
60-57-1	Dieldrin		0.355			0.71	0.71	0.71	0.71
115-29-7	Endosulfan[#]		0.017	0.017	EPA	0.034	0.034	0.034	0.034
1031-07-8	Endosulfan sulfate								
72-20-8	Endrin		0.0185	0.0185	EPA	0.037	0.037	0.037	0.037
7421-93-4	Endrin aldehyde								
53494-70-5	Endrin ketone								
76-44-8	Heptachlor		0.0265	0.0265	EPA	0.053	0.053	0.053	0.053

Table 4. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Pesticides and PCBs (cont.)								
1024-57-3	Heptachlor epoxide		0.0265	0.0265	EPA	0.053	0.053	0.053	0.053
319-84-6	Hexachlorocyclohexane,alpha								
319-85-7	Hexachlorocyclohexane,beta								
319-86-8	Hexachlorocyclohexane,delta								
77-47-4	Hexachlorocyclopentadiene								
58-89-9	Lindane		0.08	0.08	EPA	0.16	0.16	0.16	0.16
72-43-5	Methoxychlor								
122-34-9	Simazine								
8001-35-2	Toxaphene		0.21	0.21	EPA	0.21	0.21	0.21	0.21
1336-36-3	PCBs								0.014
	Radionuclides								
12587-46-1	Alpha Particles								
12587-47-2	Beta Particles								

Notes: Blank cells indicate criteria not established.

* U.S. EPA 2009 National Recommended Water Quality Criteria (www.epa.gov/ost/criteria/wqctable)

MA DEP WQS: http://www.mass.gov/dep/service/regulations/314cmr04.pdf

RI DEM WQS: http://www.dem.ri.gov/pubs/regs/regs/water/h20q09a.pdf

NJ DEP WQS: http://www.nj.gov/dep/rules/rules/njac7_9b.pdf

[a] RI DEM freshwater criteria for aluminum are for waters in which the pH is between 6.5 and 9.

[b] RIDEM ammonia criteria is based on the pH and temperature of the water body, and organism life stage. NJDEP ammonia criteria based on pH and temperature of water body, season, and water body classification as defined in NJAC 7:9-1.14.

[c] CT WQS, RIDEM WQS and MADEP WQS are presented as dissolved criteria using the U.S. EPA recommended conversion factors.

NJ DEP WQS are presented as dissolved criteria using their own conversion factors.

[d] Site-specific criteria for dissolved copper applicable to portions of impaired waterways.

Table 5. Comparison of marine chronic aquatic life water quality standards (µg/L)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Toxic Metals, Cyanides								
7429-90-5	Aluminum (Total)								
7664-41-7	Ammonia	b	35	35	EPA			see note	see note
7440-36-0	Antimony								
7440-38-2	Arsenic	c	36	36	EPA	36	36	36	36
1332-21-4	Asbestos								
7440-39-3	Barium								
7440-41-7	Beryllium								
7440-42-8	Boron								
7440-43-9	Cadmium	c	9.3	8.8	EPA	8.8	8.8	8.8	8.8
16887-00-6	Chloride								
7782-50-5	Chlorine		7.5	7.5	EPA	7.5	7.5	7.5	
18540-29-9	Chromium, hexavalent	c	50	50	EPA	50	50	50	50
16065-83-1	Chromium, trivalent								
7440-48-4	Cobalt								
7440-50-8	Copper	c	3.1	3.1	CTDEP	3.1	3.1	3.1	3.1
7440-50-8	Copper (site specific)	d							5.6
57-12-5	Cyanide		1	1	EPA	1	1		1
7439-89-6	Iron				EPA				
7439-92-1	Lead	c	8.1	8.1	EPA	8.1	8.1	8.1	24
7439-93-2	Lithium								
7439-96-5	Manganese								
7487-94-7	Mercury - inorganic	c	0.94	0.94	EPA	0.94	0.94	0.94	0.94
7440-02-0	Nickel	c	8.2	8.2	EPA	8.2	8.2	8.2	22
7782-49-2	Selenium (Total)	c	71	71	EPA	71	71	71	71
7440-22-4	Silver								
7440-28-0	Thallium								
7440-31-5	Tin								
7440-61-1	Uranium								
7440-62-2	Vanadium								
7440-66-6	Zinc	c	81	81	EPA	81	81	81	81
	Volatile Substances								
67-64-1	Acetone								
75-05-8	Acetonitrile								
107-02-8	Acrolein								
107-13-1	Acrylonitrile								
71-43-2	Benzene								
74-83-9	Bromomethane								
78-93-3	2-Butanone								
104-51-8	n-Butylbenzene								
135-98-8	sec-Butylbenzene								
98-06-6	t-Butylbenzene								
75-15-0	Carbon disulfide								
56-23-5	Carbon tetrachloride								
108-90-7	Chlorobenzene								
75-00-3	Chloroethane								
110-75-8	2-Chloroethylvinyl ether (mixed)								
67-66-3	Chloroform								
74-87-3	Chloromethane								
91-58-7	2-Chloronapthalene								
95-49-8	2-Chlorotoluene								
106-43-4	4-Chlorotoluene								
110-82-7	Cyclohexane								
132-64-9	Dibenzofuran								
95-50-1	1,2-Dichlorobenzene								
541-73-1	1,3-Dichlorobenzene								
106-46-7	1,4-Dichlorobenzene								
75-27-4	Dichlorobromomethane								
110-57-6	1,4-Dichlorobutene								
75-71-8	Dichlorodifluoromethane								
75-34-3	1,1-Dichloroethane								
107-06-2	1,2-Dichloroethane								
540-59-0	1,2-Dichloroethylene (1,2 Dichloroethene)								
75-35-4	1,1-Dichloroethylene (1,1 Dichloroethene)								
156-59-2	cis-1,2-Dichloroethylene (cis-1,2-Dichloroethene)								
156-60-5	trans-1,2-Dichloroethylene (trans-1,2-Dichloroethene)								
78-87-5	1,2-Dichloropropane								

Table 5. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Volatile Substances (cont.)								
542-75-6	1,3-Dichloropropene								
141-78-6	Ethyl acetate								
100-41-4	Ethylbenzene								
106-93-4	Ethylene dibromide								
110-54-3	n-Hexane								
98-82-8	Isopropylbenzene								
99-87-6	4-Isopropyltoluene								
108-10-1	Methyl isobutyl ketone								
80-62-6	Methyl methacrylate								
1634-04-4	Methyl tert butyl ether								
75-09-2	Methylene chloride								
91-57-6	2-Methylnaphthalene								
98-95-3	Nitrobenzene								
88-75-5	2-Nitrophenol								
100-02-7	4-Nitrophenol								
103-65-1	n-Propylbenzene								
110-86-1	Pyridine								
100-42-5	Styrene								
630-20-6	1,1,1,2-Tetrachloroethane								
79-34-5	1,1,2,2-Tetrachloroethane								
127-18-4	Tetrachloroethylene								
109-99-9	Tetrahydrofuran								
108-88-3	Toluene								
76-13-1	1,1,2-Trichloro-1,2,2-trifluoroethane								
71-55-6	1,2,4-Trichlorobenzene								
79-00-5	1,1,1-Trichloroethane								
120-82-1	1,1,2-Trichloroethane								
79-01-6	Trichloroethylene								
75-69-4	Trichlorofluoromethane								
95-63-6	1,2,4-Trimethylbenzene								
108-67-8	1,3,5-Trimethylbenzene								
108-05-4	Vinyl acetate								
75-01-4	Vinyl chloride								
133-02-07	Xylenes								
	Semivolatile Subtances								
83-32-9	Acenaphthene								
208-96-8	Acenaphthylene								
62-53-3	Aniline								
120-12-7	Anthracene								
92-87-5	Benzidine								
56-55-3	Benzo(a)anthracene								
50-32-8	Benzo(a)pyrene								
205-99-2	Benzo(b)fluoranthene								
191-24-2	Benzo(g,h,i)perylene								
207-08-9	Benzo(k)fluoranthene								
65-85-0	Benzoic Acid								
111-91-1	Bis(2-chloroethoxy)methane								
111-44-4	Bis(2-chloroethyl)ether								
108-60-1	Bis(2-chloroisopropyl)ether								
117-81-7	Bis(2-ethyl hexyl)phthalate								
75-25-2	Bromoform								
101-55-3	4-Bromophenyl-phenylether								
85-68-7	Butyl benzyl phthalate								
86-74-8	Carbazole								
106-47-8	4-Chloroaniline								
124-48-1	Chlorodibromomethane								
95-57-8	2-Chlorophenol								
59-50-7	3-methyl-4 Chlorophenol								
7005-72-3	4-Chlorophenyl-phenylether								
218-01-9	Chrysene								
108-39-4	m-Cresol								
53-70-3	Dibenzo(a,h)anthracene								
96-12-8	1,2-Dibromo-3-chloropropane								
91-94-1	3,3-Dichlorobenzidene								
120-83-2	2,4-Dichlorophenol								
34077-87-7	Dichlorotrifluoroethane								

Table 5. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Semivolatile Subtances (cont.)								
84-66-2	Diethyl phthalate								
131-11-3	Dimethyl phthalate								
105-67-9	2,4-Dimethylphenol								
84-74-2	Di-n-butyl phthalate								
51-28-5	2,4-Dinitrophenol								
534-52-1	2-methyl-4,6-Dinitrophenol							7.9	
121-14-2	2,4-Dinitrotoluene								
606-20-2	2,6-Dinitrotoluene								
117-84-0	Di-n-octyl phthalate								
123-91-1	1,4-Dioxane								
122-66-7	1,2-Diphenylhydrazine								
64-17-5	Ethanol								
107-21-1	Ethylene glycol								
206-44-0	Fluoranthene								
86-73-7	Fluorene								
50-00-0	Formaldehyde								
118-74-1	Hexachlorobenzene								
87-68-3	Hexachlorobutadiene								
67-72-1	Hexachloroethane								
193-39-5	Indeno(1,2,3-cd)pyrene								
78-59-1	Isophorone								
67-63-0	Isopropanol								
67-56-1	Methanol								
95-48-7	2-Methylphenol								
106-44-5	4-Methylphenol								
91-20-3	Naphthalene								
88-74-4	2-Nitroaniline								
99-09-2	3-Nitroaniline								
100-01-6	4-Nitroaniline								
62-75-9	n-Nitrosodimethylamine								
621-64-7	n-Nitrosodi-n-propylamine								
86-30-6	n-Nitrosodiphenylamine								
84852-15-3	Nonylphenol			1.7	EPA				
82-68-8	Pentachloronitrobenzene								
87-86-5	Pentachlorophenol		7.9	7.9	EPA	7.9	7.9		7.9
85-01-8	Phenanthrene								
108-95-2	Phenol								
57-55-6	Propylene glycol								
129-00-0	Pyrene								
127-09-3	Sodium acetate								
75-65-0	Tert-butyl alcohol								
95-94-3	1,2,4,5-Tetrachlorobenzene								
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin								
95-95-4	2,4,5-Trichlorophenol								
88-06-2	2,4,6-Trichlorophenol								
	Pesticides and PCBs								
15972-60-8	Alachlor								
116-06-3	Aldicarb								
309-00-2	Aldrin								
1912-24-9	Atrazine								
12789-03-6	Chlordane		0.004	0.0045	EPA	0.004	0.004	0.004	0.004
2921-88-2	Chlorpyrifos			0.0056	EPA				0.0056
94-75-7	2-4 Dichlorophenoxyacetic acid (2,4-D)								
72-54-8	4,4-DDD								
72-55-9	4,4-DDE								
50-29-3	4,4-DDT (Total)		0.001	0.001	EPA	0.001	0.001	0.001	0.001
333-41-5	Diazinon			0.82	EPA	0.82	0.82		
1918-00-9	Dicamba								
120-36-5	Dichloroprop								
60-57-1	Dieldrin		0.0019			0.0019	0.0019	0.0019	0.0019
115-29-7	Endosulfan[#]		0.0087	0.0087	EPA	0.0087	0.0087	0.0087	0.0087
1031-07-8	Endosulfan sulfate								
72-20-8	Endrin		0.0023	0.0023	EPA	0.0023	0.0023	0.0023	0.0023
7421-93-4	Endrin aldehyde								
53494-70-5	Endrin ketone								
76-44-8	Heptachlor		0.0036	0.0036	EPA	0.0036	0.0036	0.0036	0.0036

Table 5. (cont.)

CAS Number	Chemical	WQS Notes	CTDEP 2002 WQS	CTDEP Proposed WQS	Basis for CTDEP Proposed WQS	U.S. EPA 2009* WQS	MA DEP WQS	RI DEM WQS	NJ DEP WQS
	Pesticides and PCBs (cont.)								
1024-57-3	Heptachlor epoxide		0.0036	0.0036	EPA	0.0036	0.0036	0.0036	0.0036
319-84-6	Hexachlorocyclohexane,alpha								
319-85-7	Hexachlorocyclohexane,beta								
319-86-8	Hexachlorocyclohexane,delta								
77-47-4	Hexachlorocyclopentadiene								
58-89-9	Lindane								
72-43-5	Methoxychlor					0.03	0.03		0.03
122-34-9	Simazine								
8001-35-2	Toxaphene		0.0002	7.5	EPA	0.0002	0.0002	0.0002	0.0002
1336-36-3	PCBs		0.03	0.03	EPA	0.03	0.03	0.03	0.03
	Radionuclides								
12587-46-1	Alpha Particles								
12587-47-2	Beta Particles								

Notes: * U.S. EPA 2009 National Recommended Water Quality Criteria (www.epa.gov/ost/criteria/wqctable)

MA DEP WQS: http://www.mass.gov/dep/service/regulations/314cmr04.pdf

RI DEM WQS: http://www.dem.ri.gov/pubs/regs/regs/water/h20q09a.pdf

NJ DEP WQS: http://www.nj.gov/dep/rules/rules/njac7_9b.pdf

[a] RI DEM freshwater criteria for aluminum are for waters in which the pH is between 6.5 and 9.

[b] RIDEM ammonia criteria is based on the pH and temperature of the water body, and organism life stage. NJDEP ammonia criteria based on pH and temperature of water body, season, and water body classification as defined in NJAC 7:9-1.14.

[c] CT WQS, RIDEM WQS and MADEP WQS are presented as dissolved criteria using the U.S. EPA recommended conversion factors. NJ DEP WQS are presented as dissolved criteria using their own conversion factors.

[d] Site-specific criteria for dissolved copper applicable to portions of impaired waterways.

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March 17, 2010

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Executive Director
Environmental Professionals' Organization of Connecticut, Inc.
P.O. Box 176
Amston, CT 06231-0176

Subject: Proposed changes to water quality standards for human health
Exponent Project No. 1000534.000

Dear Mr. Molofsky:

Exponent reviewed the documents from the Connecticut Department of Environmental Protection (CT DEP) related to proposed changes to the Connecticut Water Quality Standards (WQS) as proposed by the CT DEP on December 22, 2009. This review focuses on the changes to the criteria for toxic substances for human health. This letter presents the results of our technical review and provides comments on the proposed revisions to the WQS for toxic substances. Exponent also compared the proposed WQS to the current WQS and to the National Recommended Water Quality Criteria (NRWQC) established by U.S. Environmental Protection Agency (USEPA).

Summary of Proposed Changes to WQS for Toxic Substances

CT DEP relied upon the USEPA guidance documents, *Methodology for Deriving Ambient Water Quality Criteria for the Protection of Human Health (2000)* and *Water Quality Standards Handbook: Second Edition (updated 2007)*, to revise the human health based water quality criteria.

There are two types of WQS for the protection of human health: 1) consumption of organisms only and 2) consumption of water and organisms. Both WQS include a fish consumption pathway, and the second type of standard also includes ingestion of water at a rate of two liters per day. Other potential pathways such as dermal contact with water are not included in the WQS for the protection of human health.

The proposed changes to WQS for human health are based on 1) the inclusion of a Relative Source Contribution (RSC) factor for non-cancer endpoints, with a default value of 0.2 (see below), 2) an increase in the average fish consumption rate by people from 6.5 grams per day to

20 grams per day, 3) the inclusion of a food chain multiplier for chemicals that biomagnify, and 4) revisions to chemical-specific toxicological values (Reference Doses or RfDs and Cancer Slope Factors or CSFs).

Review of the Three Proposed Generic Changes to the CT WQS

RSC Factor

The proposed RSC factor for non-carcinogenic substances is consistent with current USEPA practice (USEPA 2002). The RSC approach assumes that people may be exposed to a chemical via multiple media, of which the regulated media is one. The proposed default RSC is 0.2 The proposed WQS and the NRWQS for most chemicals, therefore, allow exposures of up to 20% of the RfD from sources related to drinking water and/or fish consumption, with the remaining 80% assumed to come from non-water related exposures. In cases where adequate data exists on relevant sources and exposure pathways (pathways other than oral for water exposures, and exposures to other media, such as food, soil, or air) for a chemical, USEPA (2000) recommends apportioning the RfD to each pathway, based upon that data.

Fish Consumption Rate

The fish consumption rate used in the calculation of the current WQS is 6.5 grams/day, based on 1980 USEPA guidelines for deriving WQS. The proposed CT DEP WQS rate of fish consumption is 20 grams per day, which is the approximate median rate of consumption of fish potentially caught in Connecticut. This value is similar to the value of 17.5, representing the 90th percentile of fish consumption (USEPA 2000), used in the calculation of many of the current NRWQS. It is not clear from the CT DEP technical support document what sources and types of fish the reported fish consumption rates include.

USEPA guidance (USEPA 2000) recommends that states rely on regional fish consumption surveys, focusing on freshwater and estuarine fish, to establish a fish consumption rate used to calculate WQS. The Connecticut survey relied on also indicated 75th, 90th and 95th percentile fish consumption rates of approximately 43, 81 and 110 grams per day, respectively—values substantially (~2, 4- and 5-fold, respectively) greater than the estimated median rate for that state. It is thus not clear how the U.S. EPA (2000) guidance was applied by adopting the median rate of fish consumption of 20 grams per day as the specific basis of the proposed change in the WQS fish consumption rate.

Bioconcentration Factor (BCF) and Food Chain Multiplier (FCM)

CT DEP cites either USEPA 2002 or BCFWIN as the source of the BCF for each chemical. BCFWIN includes two separate models, but CT DEP did not specify which values they used from the BCFWIN program.

Consistent with current USEPA practice (2000), the proposed CT DEP WQS includes a food chain multiplier (FCM) for hydrophobic compounds (log Kow > 4). The FCM models bioaccumulation at trophic levels higher than one, beyond that predicted by chemical-specific bioconcentration factors (BCF). It is the ratio of the bioaccumulation factor specific to a particular trophic level, and the BCF, which is equivalent to the bioaccumulation at a trophic level of one. CT DEP lists the FCMs they have adopted as a function of the octanol-water partitioning coefficient (log Kow), citing USEPA guidance as the source of a model used to calculate them. However, they do not specify which model or guidance document they relied on. The CT DEP FCM values do not match the values for any of the trophic levels listed in USEPA (2000).

Review of Eight Proposed CT WQS

Eight chemicals, hexavalent chromium, inorganic mercury, nickel, tetrachloroethylene, trichloroethylene, vinyl chloride, ethylbenzene and toluene were selected for detailed review. Table 1 presents the WQS values, Table 2 presents the chemical-specific toxicological values, and Table 3 presents the chemical-specific assumptions of the current CT WQS, the proposed WQS, and the 2009 NRWQS for the eight chemicals.

CT DEP reviewed toxicological values for individual chemicals from several sources, including the USEPA Integrated Risk Information System (IRIS) database, California Environmental Protection Agency (CalEPA), the Agency for Toxic Substances and Disease Registry (ATSDR), USEPA Superfund Health Effects Assessment Summary Tables (HEAST) and other USEPA sources. CT DEP did not follow an established hierarchy. Instead they made judgments regarding the most current understanding of the toxicology on a chemical-specific basis. For certain non-cancer toxicity values, CT DEP modified available toxicity values with additional uncertainty factors, resulting in values that are more conservative, in an effort to take into account uncertainties and data gaps, including uncertainties regarding potential carcinogenicity.

Table 1. Comparison of Eight Proposed CT WQS to Current CT WQS and 2009 NRWQS. (Note: -- indicates not applicable/available)

Chemical	Cancer/Non-Cancer	Organisms Only (µ/L)			Water and Organisms (µ/L)		
		Proposed	2002	EPA 2009	Proposed	2002	EPA 2009
Hexavalent Chromium	Cancer	0.28	--	--	0.038	--	--
	Non-Cancer	--	2019	--	--	100	--
Inorganic Mercury	Non-Cancer	0.00029	0.051	--	0.00029	0.05	--
Nickel	Non-Cancer	30	4600	4600	9.5	610	610
Tetrachloroethylene	Cancer	0.21	8.85	3.30	0.05	0.8	0.69
Trichloroethylene	Cancer	3.71	81	30	0.36	2.7	2.5
Vinyl Chloride	Cancer	2	525	2.4	0.023	2	0.025
Ethylbenzene	Non-Cancer	187	19000	2100	51	700*	530
Toluene	Non-Cancer	438	200000	15000	42	1000*	1300

*Higher values than these criteria were obtained through use of water quality critera formulas for ethylbenzene and toluene (3120 and 6765 ug/L, respectively)

EX

Table 2. Comparison of Proposed CT WQS, Current CT WQS, and 2009 NRWQS Toxicological Values for Eight Chemicals. (Note: -- indicates not applicable/available)

Chemical	CSF/RfD	Units	Proposed	2002	EPA 2009
Hexavalent Chromium	CSF	mg/kg-d^{-1}	0.79	--	--
	RfD	mg/kg-d	--	0.003	--
Inorganic Mercury	RfD	mg/kg-d	0.0003	0.0001	--
Nickel	RfD	mg/kg-d	0.002	0.02	0.02
Tetrachloroethylene	CSF	mg/kg-d^{-1}	0.54	0.0398	0.0398
Trichloroethylene	CSF	mg/kg-d^{-1}	0.089	0.0126	0.0126
Vinyl Chloride	CSF	mg/kg-d^{-1}	1.5	0.0174	1.4
Ethylbenzene	RfD	mg/kg-d	0.01	0.1	0.1
Toluene	RfD	mg/kg-d	0.0067	0.2	0.2

Table 3. Comparison of Proposed CT WQS, Current CT WQS, and 2009 NRWQS Assumptions for Eight Chemicals. (Note: -- indicates not applicable/available)

Chemical	BCF (unitless)			FCM (unitless)			FI (g/d)			RSC (unitless)		
	Proposed	2002	EPA 2009	Proposed	2002	EPA 2009	Proposed	2002	EPA 2009	Proposed	2002	EPA 2009
Hexavalent Chromium	16	16	--	--	--	--	20	6.5	--	--	--	--
Inorganic Mercury	7343	7343	--	100	--	--	20	18.7	--	0.2	--	--
Nickel	47	47	47	--	--	--	20	6.5	6.5	0.2	--	--
Tetrachloroethylene	30.6	30.6	30.6	--	--	--	20	6.5	17.5	--	--	--
Trichloroethylene	10.6	10.6	10.6	--	--	--	20	6.5	17.5	--	--	--
Vinyl Chloride	1.17	1.17	1.17	--	--	--	20	6.5	17.5	--	--	--
Ethylbenzene	37.5	37.5	37.5	--	--	--	20	6.5	17.5	0.2	--	0.2
Toluene	10.7	10.7	10.7	--	--	--	20	6.5	17.5	0.2	--	0.2

Hexavalent Chromium [Cr(VI)]

The changes from the current CT WQS include an increase in the fish consumption rate from 6.5 to 20 grams per day and a change in the toxicological value. The proposed criteria are based on a cancer endpoint with a CSF of 0.79 (mg/kg-day)$^{-1}$, while the current criteria are based on a non-cancer endpoint with a RfD of 0.003 mg/kg-day.

The USEPA has not established human health NRWQC for hexavalent chromium. Nor has USEPA adopted an oral CSF for hexavalent chromium. As the basis of the oral CSF, CT DEP

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cites the CalEPA's evaluation in 2002[1] for its Public Health Goal and USEPA's evaluation in 2008 of Cr(VI).

The CalEPA is revising its Public Health Goal (PHG) for Cr(VI) in drinking water. In the 2009 draft document *Public Health Goal for Hexavalent Chromium in Drinking Water*, the CalEPA describes Borneff et al. 1968— the study which was used previously to derive an oral CSF for Cr(VI) in the 2002 evaluation— as being "*unsuitable for deriving a dose-response relationship for hexavalent chromium*" (page 97). Instead, the CalEPA is proposing to use the National Toxicology Program (NTP)'s 2007 rodent study (NTP 2007a,b) as the basis for deriving an oral CSF (CalEPA 2009). Given that CalEPA is not using Borneff et al. 1968 in its development of a PHG for Cr(VI), the CT DEP must consider excluding the use of this earlier study from its consideration.

The NTP 2007 rodent study is being considered by the USEPA and CalEPA for development of an oral CSFs for Cr(VI). However, to date, an oral CSF for Cr(VI) has not yet been promulgated by either the USEPA or the CalEPA.[2] Currently, CalEPA is in the process of reviewing all comments regarding its proposed PHG for Cr(VI) in drinking water. A second comment period, which will be held before finalizing the PHG, has not been scheduled. The USEPA guidance document (USEPA 2008a) cited by CT DEP is a risk assessment conducted by the Office of Prevention, Pesticides, and Toxic Substances (OPPTS) for wood preservatives containing arsenic and/or chromium ("chromate arsenicals"). However, the USEPA has not formerly issued an oral CSF for Cr(VI) on IRIS. A toxicological review of Cr(VI) was last conducted by USEPA in 1998, at which time the Agency concluded that the oral carcinogenicity of Cr(VI) could not be determined based on the available literature.

While the NTP 2007 rodent study is being considered by CalEPA to derive oral CSFs for Cr(VI), CT DEP must recognize that the relevance of this rodent study for evaluating human oral intake and risk of Cr(VI) is questionable for the key reasons described below and may not serve as a valid basis for deriving a water quality standard for the protection of human health.

The NTP 2007 rodent study did not indicate the ingestion of Cr(VI) from drinking water sources may cause tumors in humans. Instead, the study revealed tumors may develop from the oral intake of Cr(VI) at concentrations approximately 300 to 11,000 times greater than the highest concentrations (95th percentile) of Cr(VI) found in U.S. drinking water supplies. Further, the

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[1] CT DEP (2010) did not provide a citation for this CalEPA document. The CalEPA document that is relevant to CT DEP's discussion of CalEPA's evaluation is *Public Health Goal for Chromium in Drinking Water. Office of Environmental Health Hazard Assessment. California Environmental Protection Agency. Pesticide and Environmental Toxicology Section. February 1999.*

[2] The existing California and U.S. Environmental Protection Agency (U.S. EPA) Maximum Contaminant Levels (MCLs) of (total) chromium in drinking water are 50 ppb and 100 ppb (50 µg/L and 100 µg/L), respectively. Neither of these regulatory levels are specific for hexavalent chromium, and neither involves the assumption of potential carcinogenicity of Cr(VI).

study demonstrated that tumor incidences can differ significantly depending on the species due to interspecies variations in tissue sensitivity and reductive metabolism. The study reported that oral mucosa tumors were observed only in rats but not mice, whereas intestinal tumors were observed only in mice but not rats. However, in mice, tissues that were likely exposed to higher levels of Cr(VI) than that of the intestine, such as the forestomach and stomach, did not develop tumors.

The very high concentrations of Cr(VI) required to result in tumor development and the interspecies difference in cancer potency must be recognized by the CT DEP, especially with regard to the human relevance of the rodent data.

Available studies on human oral intake of Cr(VI) have not shown tumor incidences in the small intestines and other organs, such as the oral cavity and the stomach, that could be associated with the Cr(VI) intake. Therefore, the relevance of CSFs derived by the USEPA OPPTS and CalEPA based on tumors in mice small intestines to humans appears very limited, and the CT DEP should not be adopting the USEPA OPPTS and CalEPA's approach. The CalEPA (2009) derived CSF using the NTP mice small intestine data because the agency found the human data (Zhang and Li, 1987) could not support a derivation of CSF, due to several important limitations, including uncertainties regarding individual exposure levels, potential confounding factors such as potential airborne exposures to Cr(VI) and additional contaminants in drinking water, and an uncertain exposure period.

Inorganic Mercury

The changes from the current CT WQS are 1) designation of mercury criteria as applicable to inorganic mercury, 2) an update of the RfD from 0.0001 to 0.0003 mg/kg-day, 3) application of a RSC factor of 0.2, 3) an increase in the fish ingestion rate from 18.7 to 20 grams/day, 4) application of a FCM of 100.

The proposed CT DEP inorganic mercury AWQS for the protection of human health is based on an RfD of 0.0003 mg/kg-day, consistent with the RfDs for elemental mercury and mercuric chloride in IRIS.

The proposed CT DEP WQS are specifically for inorganic mercury. Currently, USEPA has established human health NRWQS for methyl mercury, but not for inorganic mercury. USEPA has also declined to calculate a BCF for methyl mercury. Instead, it has established a criterion for methyl mercury in fish tissue. While methyl mercury is known to bioaccumulate, the BCF and FCM that CT DEP has applied to inorganic mercury is not appropriate. According to the USEPA's Episuite BCFWIN program, the bioconcentration factor for metallic mercury ranges from 1 to 3 and the BCF for mercury chloride ranges from 1 to 100, depending on the calculation method. These values are much lower than the value of 7343 used by CT DEP. In addition, inorganic mercury is not hydrophobic; therefore use of a FCM is not appropriate.

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CT DEP must revise the BCF and FCM to be appropriate for inorganic mercury. It appears that CT DEP is confusing inorganic mercury with organic mercury.

Nickel

The changes from the current CT WQS are 1) addition of an uncertainty factor of 10 to the IRIS RfD, 2) application of a RSC factor of 0.2, 3) an increase in the fish ingestion rate from 6.5 to 20 grams/day.

Nickel exposures occur primarily from water and food ingestion. Based on data for nickel ingestion from food, a chemical-specific RSC could be derived for nickel. CalEPA (2001) performed such an analysis for its Public Health Goal (PHG) for nickel, deriving a RSC of 0.3.

CT DEP justifies their use of an additional uncertainty factor of 10 because of uncertainties regarding dermal hypersensitivity, reproductive toxicity, and oral carcinogenicity.

The IRIS value already includes an uncertainty factor of 3 to account for uncertainties regarding reproductive toxicity. While CT DEP cites evidence that may justify using a factor of 10 rather than a factor of 3, they do not support using both uncertainty factors (3 and 10) simultaneously. Given the lack of evidence for carcinogenicity of nickel via the oral route of exposure, potential carcinogenicity of nickel is not sufficient justification for an additional uncertainty factor. CT DEP must also consider potential dietary requirements for nickel. Nickel is known to be an essential nutrient in animals and is thought to be essential in humans. According to the Institute of Medicine (IM 2001), normal dietary exposure to nickel is approximately 100 µg/day; one study found adult exposures of 200-400 µg/day from the diet. The proposed CT DEP RfD is the equivalent of 140 µg/day for adults.

Tetrachloroethylene (PCE)

The changes from the current CT WQS are 1) an increase in the CSF from 0.0398 to 0.54 $(mg/kg\text{-}d)^{-1}$, and 2) an increase in the fish ingestion rate from 6.5 to 20 grams/day.

The proposed CSF is based on the CalEPA's Public Health Goal (PHG) for PCE, established in 2001. CT DEP did not consider the more recent and extensive draft review conducted by USEPA in 2008, *Toxicological Review of Tetrachloroethylene (Perchlorothylene) (CAS No. 127-18-4) in Support of Summary Information on the Integrated Risk Information System (IRIS)* (USEPA 2008b) or the National Research Council (NRC) review (NRC 2010) of that document. The USEPA derived a range of cancer slope factors for tetrachloroethylene of 0.01 to 0.1 per mg/kg-day, below the CalEPA CSF of 0.54. The NRC criticized the USEPA for failing to critically evaluate the studies they relied on with respect to their methodological strengths and weaknesses. They noted that U.S. EPA based their dose-response evaluation on the dataset that resulted in the highest estimate of risk. In the judgment of some members of the committee, it would be more scientifically defensible to base the dose-response evaluation on the dataset with

the least uncertainty. In light of the recent controversy surrounding the CSF for tetrachloroethylene, CT DEP must provide more extensive justification for their choice of a CSF for tetrachloroethylene.

PCE is a volatile chemical that is metabolized by fish and would not be expected to accumulate in fish. Any tetrachloroethylene that did get into fish tissue would be expected to volatilize upon cooking. Therefore CT DEP should eliminate the fish ingestion pathway for this and other volatile chemicals.

Trichloroethylene (TCE)

The changes from the current CT WQS are 1) an increase in the CSF from 0.0126 to 0.089 (mg/kg-d)-1, and 2) an increase in the fish ingestion rate from 6.5 to 20 grams/day.

CT DEP based the proposed CSF on USEPA's 2001 draft toxicological review of TCE. They selected the midpoint of the range of CSF values developed in the draft document rather than the upper end of the range, due to the draft nature of the document and continuing uncertainties. While CT DEP cites the fact that the 2001 document had undergone two major reviews as supporting its use as the basis for CT WQS for TCE, USEPA's evaluation has continued to undergo revision and continues to raise scientific concerns. In October 2009, USEPA released a revised toxicological review, including revisions to the CSF range. The 2009 review relies on a single case control study of renal cell cancers among screw-cutting industry workers. This study has a number of serious limitations, including potential selection bias, uncertainties in the quantification of exposures, potential confounding due to other workplace exposures, and relatively small sample size. The 2009 document has not yet undergone a formal external review. Given the continuing nature of the controversy surrounding TCE, it is premature to adopt USEPA's draft CSF for TCE.

Trichloroethylene is a volatile chemical that is metabolized by fish and would not be expected to accumulate in fish. Any trichloroethylene that did get into fish tissue, would be expected to volatilize upon cooking. Therefore CT DEP should eliminate the fish ingestion pathway for this and other volatile chemicals.

Vinyl Chloride

The changes from the current CT WQS are 1) an increase in the CSF from 0.0174 to 1.5 $(mg/kg\text{-}d)^{-1}$ and 2) an increase in the fish ingestion rate from 6.5 to 20 grams/day. The change in the CSF is consistent with USEPA's IRIS database, and the proposed CT WQS (0.023 µg/L) is similar to the NRWQS (0.025 µg/L) for vinyl chloride.

Vinyl chloride is a volatile chemical that is metabolized by fish and would not be expected to accumulate in fish. Any vinyl chloride that did get into fish tissue would be expected to

volatilize upon cooking. Therefore CT DEP should eliminate the fish ingestion pathway for this and other volatile chemicals.

Ethylbenzene

The changes from the current CT WQS are 1) the addition of an uncertainty factor of 10 to the RfD, 2) application of a RSC factor of 0.2, and 3) an increase in the fish ingestion rate from 6.5 to 20 grams/day.

CT DEP applied an additional 10 fold uncertainty factor, based on potential carcinogenicity of ethylbenzene. The relevance of this endpoint is highly uncertain, due to ethylbenzene's established lack of genotoxicity and limited evidence of carcinogenicity via the oral route of exposure.

Ethyl benzene is a volatile chemical that is metabolized by fish and would not be expected to accumulate in fish. Any ethyl benzene that did get into fish tissue, would be expected to volatilize upon cooking. Therefore CT DEP should eliminate the fish ingestion pathway for this and other volatile chemicals.

Because ethylbenzene is a volatile chemical, it is not generally found in food or surface soil. Therefore, a chemical-specific RSC greater than 0.2 is justified.

Toluene

The changes from the current CT WQS are 1) a decrease in the RfD from 0.2 to 0.0067 mg/kg-day, 2) application of a RSC factor of 0.2, and 3) an increase in the fish ingestion rate from 6.5 to 20 grams/day.

CT DEP elected to base the RfD for toluene on the Minimum Risk Level (MRL) developed by ATSDR (2000), rather than the IRIS RfD established in 2005. The MRL is based on changes in neurotransmitter levels in rats. It is not known if these changes are persistent, and the changes have not been correlated with behavioral, neuropsychological or neuroanatomical changes. In addition, reproductive studies conducted at higher doses did not find significant effects, further casting doubt on the relevance of the observed neurochemical changes to public health. For these reasons, IRIS did not use this endpoint to develop its RfD, but did include an uncertainty factor of 3 to account for lack of adequate data on endpoints of potential concern, including neurotoxicity.

Toluene is a volatile chemical that is metabolized by fish and would not be expected to accumulate in fish. Any toluene that did get into fish tissue, would be expected to volatilize upon cooking. Therefore CT DEP should eliminate the fish ingestion pathway for this and other volatile chemicals.

Because toluene is a volatile chemical, it is not generally found in food or surface soil. Therefore, a chemical-specific RSC greater than 0.2 is justified.

Summary of Technical Issues with Proposed WQS

- CT DEP must provide additional background and justification for the selection of the fish consumption rate of 20 grams per day.

- CT DEP must provide the sources of the BCF values from the BCFWIN program. In general, experimental values should be favored over modeled values. In addition, BCFs from USEPA 2002 should be updated as appropriate.

- The CT DEP FCM values do not match the values for any of the trophic levels listed in USEPA (2000). CT DEP must provide additional background and justification for its derivation of FCM values.

- Derivation of chemical-specific RSC values may be appropriate for certain chemicals.

- The WQS for inorganic mercury uses an inappropriate BCF / FCM.

- CT DEP must reconsider the selected CSF for hexavalent chromium because it has not been formally adopted by USEPA and the basis of the CSF suffers from a variety of important limitations.

- Relative to nickel, CT DEP must justify their use of an additional uncertainty factor of 10 because of uncertainties regarding dermal hypersensitivity, reproductive toxicity, and oral carcinogenicity.

- In light of the recent controversy surrounding the CSF for PCE, CT DEP must provide more extensive justification for their choice of a CSF for PCE.

- Given the continuing nature of the controversy surrounding TCE, it is premature to adopt USEPA's draft CSF for TCE.

- Relative to the selection of toxicological values, CT DEP did not follow an established hierarchy. Instead they made judgments regarding the most current understanding of the toxicology on a chemical-specific basis. For certain non-cancer toxicity values, CT DEP modified available toxicity values with additional uncertainty factors, resulting in values that are more conservative, in an effort to take into account uncertainties and data gaps, including uncertainties regarding potential carcinogenicity.

- CT DEP should eliminate the fish ingestion pathway for volatile chemicals because such chemicals rarely bioaccumulate and would be lost from fish tissue upon cooking.

- Nearly one-half of the toxicological values have been modified by CT DEP to be more stringent by a factor of 10 or more without adequate justification.

- The factor "RL" that appears in formulae on pages 8 and 9 of the CT DEP proposal for carcinogens is not defined. This appears to refer to "Risk Level," but an acronym for this is not defined anywhere in the CT DEP document.

- CTDEP has chosen to favor conservatism in a variety of ways, particularly in its decision to add additional uncertainty factors to a larger number of the reference doses. In light of this, the WQS have the characteristics of screening values, rather than regulatory values.

If you have any questions or comments regarding the information in this letter, please contact us by phone (978-461-4606) or e-mail (bsouthworth@exponent.com; sdriscoll@exponent.com) sdriscoll@exponent.com) at your convenience.

Sincerely,

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Managing Scientist

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EX

Comparison of 2009 Proposed DEP Water Quality Standards to EPA Water Quality Standards

DEP has Lower Criteria
DEP has Higher Criteria
DEP Revoked Criteria

Compound	Aquatic Life Criteria (µg/L)								Human Health Designation (µg/L)			
	Freshwater				Saltwater				Consumption of:			
	Acute		Chronic		Acute		Chronic		Organisms Only		Water and Organisms	
	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA
Toxic Metals, Cyanides												
Aluminum (Total)	750	750	87	87	----		----		168000		2074	
Ammonia	----		----		233		35		11200		138	
Antimony	900		190		----		----		280	640	2.8	5.6
Arsenic+	340	340	150	150	69	69	36	36	0.05	0.14	0.02	0.018
Asbestos	----		----		----		----		7 million fibers/L	7 million fibers/L	----	
Barium	2000		220		----		----		112000		1383	1000
Beryllium	30.6		3.6		----		----		7		1	
Boron	8500		950		----		----		112000		1383	
Cadmium	1	2	0.15	0.25	40	40	8.8	8.8	11.2		0.14	
Chloride	860000	860000	230000	230000	----		----		----		----	
Chlorine	19	19	11	11	----	13	----	7.5	56000		691	
Chromium, hexavalent	16		11		1100		50		0.28		0.038	
Chromium, trivalent	323	570	42	74	----		----		65625		9052	
Cobalt	220		24		----		----		168		2	
Copper	14.3		4.8		4.8	4.8	3.1	3.1	194		51	1300
Copper (site specific)	25.7		18.1		----		----		194		51	
Cyanide>	22	22	5.2	5.2	1	1	1	1	14000	140	139	140
Iron	----		1000	1000	----		----		----		----	300
Lead	30	65	1.2	2.5	210	210	8.1	8.1	----		15	
Lithium	----		----		----		----		1120		14	
Manganese	----		----		----		----		39200	100	484	50
Mercury - inorganic*	1.4	1.4	0.77	0.77	1.8	1.8	0.94	0.94	0.00029		0.00029	
Nickel	260	470	29	52	74	74	8.2	8.2	30	4600	9.5	610
Selenium (Total)^	20		5	5	290	290	71	71	729	4200	33	170
Silver	1	3.2	0.06		1.9	1.9	----		7000		35	
Thallium	79		17		----		----		0.48	0.47	0.26	0.24
Tin	1600		180		----		----		177		50	
Uranium	----		----		----		----		1680		21	
Vanadium	150		44		----		----		46		6	
Zinc (Total) <	65	120	65	120	90	90	81	81	4468	26000	1429	7400
Volatile Substances												
Acetone	15000		1700		----		----		504000		6222	
Acetonitrile	73705		8189		----		----		2800		35	

Comparison of 2009 Proposed DEP Water Quality Standards to EPA Water Quality Standards

DEP has Lower Criteria
DEP has Higher Criteria
DEP Revoked Criteria

Compound	Aquatic Life Criteria (µg/L)								Human Health Designation (µg/L)			
	Freshwater				Saltwater				Consumption of:			
	Acute		Chronic		Acute		Chronic		Organisms Only		Water and Organisms	
	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA
Acrolein	0.8	3	0.1	3	----		----		0.16	9	0.11	6
Acrylonitrile	369		41		----		----		0.22	0.25	0.049	0.051
Benzene	700		160		----		----		6.73	51	0.33	2.2
Bromomethane	0.04		0.005		----		----		93	1500	3.37	47
2-Butanone	123077		13752		----		----		336000		4148	
n-Butylbenzene	----	---	----		----		----		----		----	
sec-Butylbenzene	----		----		----		----		----		----	
t-Butylbenzene	----		----		----		----		----		----	
Carbon disulfide	130		15		----		----		28544		683	
Carbon tetrachloride	2200		240		----		----		1.44	1.6	0.23	0.23
Chlorobenzene	420		47		----		----		1359	1600	127	130
Chloroethane	----		----		----		----		752		7.37	
2-Chloroethylvinyl ether (mixed)	----		----		----		----		----		----	
Chloroform	1300		140		----		----		187	470	6.75	5.7
Chloromethane	----		----		----		----		199		17.54	
2-Chloronapthalene	79		9		----		----		277	1600	185	1000
2-Chlorotoluene	----		----		----		----		41		10	
4-Chlorotoluene	64		7		----		----		19		8	
Cyclohexane	2480		276		----		----		33922		8810	
Dibenzofuran	36		4		----		----		----		----	
1,2-Dichlorobenzene	130		23		----		----		1133	1300	405	420
1,3-Dichlorobenzene	79		22		----		----		13	960	4.5	320
1,4-Dichlorobenzene	57		9.4		----		----		2.6	190	0.94	63
Dichlorobromomethane	----		----		----		----		15	17	0.54	0.55
1,4-Dichlorobutene	----		----		----		----		----		----	
Dichlorodifluoromethane	----		----		----		----		9642		338	
1,1-Dichloroethane	3700		410		----		----		3723		69	
1,2-Dichloroethane	9600		2000		----		----		32	37	0.38	0.38
1,2-Dichloroethylene (1,2 Dichloroethene)	8800		970		----		----		2564		68	
1,1-Dichloroethylene (1,1 Dichloroethene)	1900		210		----		----		625	7100	33	330

Comparison of 2009 Proposed DEP Water Quality Standards to EPA Water Quality Standards

DEP has Lower Criteria
DEP has Higher Criteria
DEP Revoked Criteria

	Aquatic Life Criteria (µg/L)								Human Health Designation (µg/L)			
	Freshwater				Saltwater				Consumption of:			
	Acute		Chronic		Acute		Chronic		Organisms Only		Water and Organisms	
Compound	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA
cis-1,2-Dichloroethylene (cis-1,2-Dichloroethene)	5500		620		----		----		4430		69	
trans-1,2-Dichloroethylene (trans-1,2-Dichloroethene)	5000		560		----		----		4430	10000	69	140
1,2-Dichloropropane	847		94		----		----		24	15	0.93	0.5
1,3-Dichloropropene	15		1.7		----		----		18	21	0.34	0.34
Ethyl acetate	14375		1597		----		----		504000		6222	
Ethylbenzene	550		61		----		----		187	2100	51	530
Ethylene dibromide	----		----		----		----		0.69		0.017	
n-Hexane	----		----		----		----		177		78	
Isopropylbenzene	193		21		----		----		1351		461	
4-Isopropyltoluene	148		16.5		----		----		169		94	
Methyl isobutyl ketone	----		----		----		----		70000		556	
Methyl methacrylate	----		----		----		----		107692		972	
Methyl tert butyl ether	151000		51000		----		----		5600		69	
Methylene chloride	11000		1900		----		----		519	590	4.63	4.6
2-Methylnaphthalene	42		4.7		----		----		38		16	
Nitrobenzene	1989		221		----		----		121	690	3.4	17
2-Nitrophenol	650		73		----		----		----		----	
4-Nitrophenol	----		----		----		----		----		----	
n-Propylbenzene	----		----		----		----		----		----	
Pyridine	236		26		----		----		168		2	
Styrene	214		24		----		----		951		122	
1,1,1,2-Tetrachloroethane	770		85		----		----		9.48		1.18	
1,1,2,2-Tetrachloroethane	1155		655		----		----		3.5	4.0	0.17	0.17
Tetrachloroethylene	430		53		----		----		0.21	3.3	0.05	0.69
Tetrahydrofuran	74000		11000		----		----		368		4.55	
Toluene	560		62		----		----		438	15000	42	1300
1,1,2-Trichloro-1,2,2-trifluoroethane	----		----		----		----		98315		17303	
1,2,4-Trichlorobenzene			5		----		----		7.75	70	4.31	35
1,1,1-Trichloroethane	690		76		----		----		9500		504	

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	Acute		Chronic		Acute		Chronic		Organisms Only		Water and Organisms	
Compound	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA
1,1,2-Trichloroethane	3300		740		----		----		13.65	16	0.59	0.59
Trichloroethylene	2000		220		----		----		3.71	30	0.36	2.5
Trichlorofluoromethane	----		----		----		----		30045		1963	
1,2,4-Trimethylbenzene	142		16		----		----		712		235	
1,3,5-Trimethylbenzene	237		26		----		----		1010		260	
Vinyl acetate	----		----		----		----		11200		138	
Vinyl chloride	8400		930		----		----		2	2.4	0.023	0.025
Xylenes	240		27		----		----		6554		1154	
Semi-volatile Subtances												
Acenaphthene	19		15		----		----		174	990	123	670
Acenaphthylene	120		13		----		----		1400		323	
Aniline	11.4		1.3		----		----		491		6	
Anthracene	0.18		0.02		----		----		5833	40000	1544	8300
Benzidine	38		4		----		----		0.00017	0.00020	0.000081	0.000086
Benzo(a)anthracene	42		4.7		----		----		0.003	0.018	0.003	0.0038
Benzo(a)pyrene	0.54		0.06		----		----		0.0002	0.018	0.0002	0.0038
Benzo(b)fluoranthene	23		2.6		----		----		0.003	0.018	0.003	0.0038
Benzo(g,h,i)perylene	----		----		----		----		0.016		0.015	
Benzo(k)fluoranthene	----		----		----		----		0.004	0.018	0.004	0.0038
Benzoic Acid	----		----		----		----		2240000		27654	
Bis(2-chloroethoxy)methane	7077		786		----		----		----		----	
Bis(2-chloroethyl)ether	9231		1026		----		----		0.2	0.53	0.013	0.030
Bis(2-chloroisopropyl)ether	----		----		----		----		20	65000	0.49	1400
Bis(2-ethyl hexyl)phthalate	5		1		----		----		0.02	2.2	0.02	1.2
Bromoform	1115		124		----		----		117	140	4.22	4.3
4-Bromophenyl-phenylether	----		----		----		----		----		----	
Butyl benzyl phthalate	130		23		----		----		24	1900	21	1500
Carbazole	48		5.3		----		----		3		1.11	
4-Chloroaniline	9		1		----		----		32		0.64	
Chlorodibromomethane	----		----		----		----		11	13	0.4	0.4
2-Chlorophenol	290		32		----		----		26	150	15	81

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	Acute		Chronic		Acute		Chronic		Organisms Only		Water and Organisms	
Compound	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA
3-methyl-4 Chlorophenol	66		7		----		----		----		----	
4-Chlorophenyl-phenylether	----		----		----		----		----		----	
Chrysene	42		4.7		----		----		0.11	0.018	0.1	0.0038
m-Cresol	560		62		----		----		4684		116	
Dibenzo(a,h)anthracene	----		----		----		----		0.0001	0.018	0.0001	0.0038
1,2-Dibromo-3-chloropropane	----		----		----		----		0.033		0.004	
3,3-Dichlorobenzidene	40		4.5		----		----		0.025	0.028	0.019	0.021
2,4-Dichlorophenol	110		11		----		----		17	290	5	77
Dichlorotrifluoroethane	----		----		----		----		----		----	
Diethyl phthalate	980		220		----		----		767	44000	323	17000
Dimethyl phthalate	2788		310		----		----		1556	1100000	412	270000
2,4-Dimethylphenol	140		15		----		----		149	850	72	380
Di-n-butyl phthalate	34		4		----		----		66	4500	34	2000
2,4-Dinitrophenol	199		22		----		----		93	5300	1.4	69
2-methyl-4,6-Dinitrophenol	6.4		0.7		----		----		51	280	2.7	13
2,4-Dinitrotoluene	394		44		----		----		1.35	3.4	0.05	0.11
2,6-Dinitrotoluene	730		81		----		----		1.35		0.05	
Di-n-octyl phthalate	----		----		----		----		2.8		2.7	
1,4-Dioxane	----		----		----		----		1680		21	
1,2-Diphenylhydrazine	10		1		----		----		0.18	0.2	0.035	0.036
Ethanol	20491		2277		----		----		37520		463	
Ethylene glycol	1300000		140000		----		----		1120000		13827	
Fluoranthene	3.7		0.8		----		----		5.7	140	5.6	130
Fluorene	110		19		----		----		848	5300	211	1100
Formaldehyde	4554		1178		----		----		11200		138	
Hexachlorobenzene	0.34		0.04		----		----		0.0000076	2.9E-04	0.0000076	2.8E-04
Hexachlorobutadiene	----		----		----		----		11	18	0.43	0.44
Hexachloroethane	----		----		----		----		2.6	3.3	1.3	1.4
Indeno(1,2,3-cd)pyrene	----		----		----		----		0.0016	0.018	0.0016	0.0038
Isophorone	7500		920		----		----		841	960	35	35
Isopropanol	----		----		----		----		1848		1027	

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	Acute		Chronic		Acute		Chronic		Organisms Only		Water and Organisms	
Compound	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA
Methanol	3000		330		----		----		84000		1037	
2-Methylphenol	600		67		----		----		840		20	
4-Methylphenol	499		55.5		----		----		854		20	
Naphthalene	170		21		----		----		133		13	
2-Nitroaniline	188		21		----		----		84		1.7	
3-Nitroaniline	61		7		----		----		197		1.7	
4-Nitroaniline	1063		118		----		----		188		1.7	
n-Nitrosodimethylamine	----		----		----		----		8.4	3.0	0.002	0.00069
n-Nitrosodi-n-propylamine	----		----		----		----		0.44	0.51	0.005	0.005
n-Nitrosodiphenylamine	220		25		----		----		5.3	6.0	3	3.3
Nonylphenol	28	28	6.6	28	7	7	1.7	7	----		----	
Pentachloronitrobenzene	22		2.5		----		----		1.8		1.5	
Pentachlorophenol	19	19	15	15	13	13	7.9	7.9	0.83	3	0.22	0.27
Phenanthrene	31		2.3		----		----		972		257	
Phenol	4700		160		----		----		15000	860000	207	10000
Propylene glycol	640		71		----		----		280000		3457	
Pyrene	42		4.6		----		----		350	4000	131	830
Sodium acetate	----		----		----		----		----		----	
Tert-butyl alcohol	211692		23521		----		----		9520		118	
1,2,4,5-Tetrachlorobenzene	18		2		----		----		0.14	1.1	0.13	0.97
2,3,7,8-Tetrachlorodibenzo-p-dioxin	----		----		----		----		5.38E-11		5.38E-11	
2,4,5-Trichlorophenol	25		2.8		----		----		64	3600	33	1800
2,4,6-Trichlorophenol	30		3.3		----		----		0.3	2.4	0.2	1.4
Pesticides and PCB's												
Alachlor	294		33		----		----		1.5		0.45	
Aldicarb	11.4		1.3		----		----		1207		7	
Aldrin	0.45		0.05		0.65		----		4.4E-07	5.0E-05	4.4E-07	4.9E-05
Atrazine	14.5		1.6		----		----		18		0.67	
Chlordane	1.2	2.4	0.00215	0.0043	0.045	0.09	0.0045	0.004	0.0000084	8.1E-04	0.0000084	8.0E-04

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	Acute		Chronic		Acute		Chronic		Organisms Only		Water and Organisms	
Compound	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA
Chlorpyrifos	0.083	0.083	0.041	0.041	0.011	0.011	0.0056	0.0056	----		----	
2-4 Dichlorophenoxyacetic acid (2,4-D)	47		5		----		----		560		6.91	100
4,4-DDD	----		----		----		----		0.000004	0.00031	0.000004	0.00031
4,4-DDE	----		----		----		----		0.000002	0.00022	0.000002	0.00022
4,4-DDT (Total)	0.55	1.1	0.005	0.001	0.065	0.13	0.001	0.001	0.000002	0.00022	0.000002	0.00022
Diazinon	0.17	0.17	0.17	0.17	0.82	0.82	0.82	0.82	----		----	
Dicamba	1619		180		----		----		16800		207	
Dichloroprop	105		12		----		----		2016		25	
Dieldrin	0.24	0.24	0.056	0.056	----	0.71	----	0.0019	0.0000059	5.4E-05	0.0000058	5.2E-05
Endosulfan[#]	0.11	0.22	0.028	0.056	0.017	0.034	0.0087	0.0087	0.52	89	0.38	62
Endosulfan sulfate	----		----		----		----		0.52	89	0.38	62
Endrin	0.086	0.086	0.036	0.036	0.0185	0.037	0.0023	0.0023	0.012	0.06	0.012	0.059
Endrin aldehyde	0.086		0.036		----		----		0.035	0.30	0.035	0.29
Endrin ketone	0.086		0.036		----		----		0.052		0.052	
Heptachlor	0.26	0.52	0.0019	0.0038	0.0265	0.053	0.0036	0.0036	9.3E-07	7.9E-05	9.3E-07	7.9E-05
Heptachlor epoxide	0.26	0.52	0.0019	0.0038	0.0265	0.053	0.0036	0.0036	0.000013	0.000039	0.000013	0.000039
Hexachlorocyclohexane,alpha	----		----		----		----		0.0043	0.0414	0.0024	0.0123
Hexachlorocyclohexane,beta	----		----		----		----		0.015	0.0414	0.0085	0.0123
Hexachlorocyclohexane,delta	----		----		----		----		0.014	0.0414	0.008	0.0123
Hexachlorocyclopentadiene	2.8		0.3		----		----		372	1100	38	40
Lindane	0.95	0.95	0.057		0.08		----		0.024	1.8	0.014	0.98
Methoxychlor	----		0.03	0.03	----		----	0.03	0.17		0.16	100
Simazine	5		1		----		----		194.44		3.44	
Toxaphene	0.73	0.73	0.002	0.0002	0.21	0.21	7.5	0.0002	0.0000052	2.8E-04	0.0000052	2.8E-04
PCB's	----		0.014		----		0.03		5.6E-07	6.4E-05	5.6E-07	6.4E-05
Radionuclides												
Alpha Particles	----		----		----		----		----		15 pCi/L	
Beta Particles	----		----		----		----		----		4 pCi/L	

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	Acute		Chronic		Acute		Chronic		Organisms Only		Water and Organisms	
Compound	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA	DEP Proposed	EPA

Notes:
---- Criteria Not Established
+ 2002 Criteria lists compound as Arsenic (Tri)
> 2002 Criteria lists compound as Cyanide ($HCN + CN^-$)
** 2002 Criteria does not explicitly name compound as organic or inorganic Mercury*
^ 2002 Criteria only lists the freshwater acute and freshwater chronic criteria for Selenium as (total)
< 2002 Criteria does not list Zinc as (total)
 # 2002 Criteria lists endosulfan (alpha) and endosulfan (beta) separately.
The values used are identical between the two listed endosulfan compounds for every category in the 2002 Criteria.

DISCLAIMER: This table is provided without warranty of any kind, either expressed or implied, and you should always

refer to the official DEP proposed regulations at:

http://www.ct.gov/dep/lib/dep/water/water_quality_standards/water_quality_standards_proposed_12_22_09.pdf