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SECONDARY VALUES FOR TRICHLOROETHYLENE (CAS No. 79-01-6)

A search was conducted for information on the chemical properties and toxicity of trichloroethylene to fish and aquatic life using the ECOTOX (toxicity to fish and aquatic life), CHEMFATE (environmental fate), and CHEMFINDER (molecular structure, etc.) databases. This search yielded useful information on trichloroethylene's properties and toxicity. Water quality criteria for the protection of human health have already been established for this chemical and may be found in Chapter NR 105 of the Wisconsin Administrative Code.

Fish and Aquatic Life Secondary Values

To derive an acute toxicity criterion for aquatic life, acute toxicity test results are required for at least one species in each of eight different families. Specific requirements and the data available to meet these requirements are found in Table 1. Following a search for information on the toxicity of trichloroethylene to fish and other aquatic life, it was determined that data are available to meet four out of the eight requirements. Because data are available for a Daphnid species, it is possible to calculate a secondary acute value for trichloroethylene.

The Milwaukee River is designated as a warm water sportfish water body; therefore, the secondary acute value will be calculated using species that would be contained in a database for warm water sportfish designated water bodies. (Trichloroethylene is not a bioaccumulative chemical of concern (BCC); therefore, it will not be necessary to automatically apply cold water values.)

Warm Water Sportfish

To calculate a secondary acute value (SAV), the lowest genus mean acute value (GMAV) in the database is divided by the secondary acute factor (SAF; an adjustment factor corresponding to the number of satisfied requirements).

SAF for four out of eight requirements met = 7.0
Lowest GMAV = 21,900 µg/L (*Pimephales*)

SAV = GMAV/SAF
= 21,900 µg/L / 7.0
= 3,128.57 µg/L

No chronic data are currently available for trichloroethylene that meet acceptability requirements. Therefore, a secondary chronic value (SCV) may be calculated using default ratios only.

SACR (secondary acute-chronic ratio) = Geometric mean of three species mean acute-chronic ratios (SMACRs).

SACR = geometric mean of 18, 18, and 18 = 18

SCV = SAV/SACR
= 3,128.57 µg/L / 18
= 173.81 µg/L

So, for warm water sportfish designated waters, the secondary acute value is 3,129 µg/L and the secondary chronic value is 174 µg/L for trichloroethylene. These values would apply to coldwater, warmwater forage, and limited forage as well.

Table 1. Requirements for calculation of an acute toxicity criterion for protection of aquatic life for trichloroethylene, and corresponding acute toxicity data.

Species Name	Common Name	Duration/ Endpoint	Value µg/L	Reference #[a]	Source
1. At least one salmonid fish in the family Salmonidae, in the class Osteichthyes.					
2. At least one non-salmonid fish from another family in the class Osteichthyes, preferably a commercially or recreationally important warmwater species.					
Lepomis macrochirus	**bluegill**	**96-h/LC50**	**45,000**	**4**	**AQUIRE**
3. At least one planktonic crustacean (e.g., cladoceran, copepod).					
Daphnia magna	**water flea**	**48-h/LC50**	**18,000**	**2**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/LC50**	**100,000**	**3**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/LC50**	**94,000**	**3**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/LC50**	**41,000**	**3**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/LC50**	**43,000**	**3**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/LC50**	**55,000**	**3**	**AQUIRE**
Daphnia magna	**water flea**	**48-h/LC50**	**56,000**	**3**	**AQUIRE**
Species Mean Acute Value (SMAV) = 51,171.61					
Daphnia pulex	**water flea**	**48-h/LC50**	**51,000**	**3**	**AQUIRE**
Daphnia pulex	**water flea**	**48-h/LC50**	**39,000**	**3**	**AQUIRE**
SMAV = 44,598.21					
Genus Mean Acute Value (GMAV; *Daphnia*) = 47,771.98					
4. At least one benthic crustacean (e.g., ostracod, isopod, amphipod, crayfish).					
5. At least one insect (e.g., mayfly, dragonfly, damselfly, stonefly, caddisfly, mosquito, midge).					
Chironomus thummi	**midge**	**48-h/LC50**	**64,000**	**1**	**AQUIRE**

6. At least one fish or amphibian from a family in the phylum Chordata not already represented in one of the other subdivisions.

Pimephales promelas	**fathead minnow**	**96-h/EC50**	**21,900**	**5**	**AQUIRE**
Xenopus laevis	**clawed toad**	**96-h/EC50**	**36,000**	**6**	**AQUIRE**

7. At least one organism from a family in a phylum other than Arthropoda or Chordata (e.g., Rotifera, Annelida, Mollusca).

8. At least one organism from a family in any order of insect or any other phylum not already represented in subdivisions 1 through 7.

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[1]Slooff, W. 1983. Benthic macroinvertebrates and water quality assessment: Some toxicological considerations. Aquatic Toxicology 4:73-82.

[2]LeBlanc, G.A. 1980. Acute toxicity of priority pollutants to water flea (Daphnia magna). Bulletin of environmental contamination and toxicology 24(5):684-691.

[3]Canton, J.H. and D.M.M. Adema. 1978. Reproducibility of short-term and reproduction toxicity experiments with *Daphnia magna* and comparison of the sensitivity of *Daphnia magna* with… Hydrobiologia 59(2):135-140.

[4]Buccafusco, R.J., S.J. Ells and G.A. LeBlanc. 1981. Acute toxicity of priority pollutants to bluegill (*Lepomis macrochirus*). Bulletin of Environmental Contamination and Toxicology 26(4):446-452.

[5]Alexander, H.C., W.M. McCarty and E.A. Bartlett. 1978. Toxicity of perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, and methylene chloride to fathead minnows. Bulletin of Environmental Contamination and Toxicology 20(3):344-352.

[6]Fort, D.J., E.L. Stover, J.R. Rayburn, M. Hull, and J.A. Bantle. 1993. Evaluation of the developmental toxicity of trichloroethylene and detoxification metabolites using *Xenopus*. Terat. Carcinog. Mutagen. 13(1):35-45.