

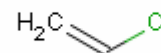


Illinois Environmental Protection Agency
Bureau of Water – Water Quality Standards Section

Lake Michigan Basin Water Quality Standards

VINYL CHLORIDE

CAS: 75-01-4
Water Solubility: 0.11 g/100 mL at 25°C
Log K_{ow}: 1.36



Derived Criteria

Human Health: Where no standard is applicable for a chemical substance within waters of the Lake Michigan Basin, human health numeric values or criteria may be calculated pursuant to 35 IAC 302.540. A Tier I Lake Michigan Basin Human Health Threshold Criterion (LMHHTC) is derived based on disease or functional impairment due to a physiological mechanism for which there is a threshold dose below which no damage occurs (35 IAC 302.585). A Tier I Lake Michigan Basin Human Health Nonthreshold Criterion (LMHHNC) is derived based on disease or functional impairment due to a physiological mechanism for which any dose may cause some risk of damage from cancer or a nonthreshold mechanism (35 IAC 302.590). Values are derived for surface waters classified as public water supplies (drinking), as well as surface waters not used as human drinking water sources (nondrinking).

Tier I Lake Michigan Basin Human Health Criteria			
LMHHTV (µg/L)		LMHHNV (µg/L)	
<u>Drinking</u>	<u>Nondrinking</u>	<u>Drinking</u>	<u>Nondrinking</u>
83	4,860	0.25	14.4

Exposure and Toxicity Data

$$\text{BAF}_{\text{HHTL3}} = 1.417 \text{ l/kg}$$

$$\text{BAF}_{\text{HHTL4}} = 1.710 \text{ l/kg}$$

$$\text{NOAEL} = 0.09 \text{ mg/kg-day (IRIS, 6/20/06)}$$

$$\text{UF} = 30 \text{ (IRIS, 6/20/06)}$$

$$\text{ADE} = 0.003 \text{ mg/kg-day}$$

Carcinogen Assessment: Class A, known human carcinogen (IRIS, 06/20/06)

Cancer slope factor (q_1): 1.4 per mg/kg-day (IRIS, 06/20/06)

$$\text{RAD} = 7.143 \times 10^{-6} \text{ mg/kg-day}$$

Human Health Calculations

Bioaccumulation Factor:

BAF predicted based on Log K_{ow} (Stephan 1993)

$$\text{Log } K_{ow} = 1.36, K_{ow} = 22.91$$

$$\text{Baseline BAF}_{\text{T3}} = (\text{FCM}_{\text{TL3}})(K_{ow}) = (1.0)(22.91) = 22.91$$

$$\text{Baseline BAF}_{\text{T4}} = (\text{FCM}_{\text{TL4}})(K_{ow}) = (1.0)(22.91) = 22.91$$

$$\text{BAF}_{\text{HHTL3}} = [(\text{Baseline BAF}_{\text{T3}})(0.0182)+1] = 1.417$$

$$\text{BAF}_{\text{HHTL4}} = [(\text{Baseline BAF}_{\text{T4}})(0.0310)+1] = 1.710$$

Acceptable Daily Exposure:

$$\text{ADE} = \text{NOAEL} / \text{UF} = 0.09 / 30 = 0.003 \text{ mg/kg-day}$$

Risk Associated Dose:

$$\text{RAD} = 0.00001 / q_1 = 0.00001 / 1.4 = 7.143 \times 10^{-6} \text{ mg/kg-day}$$

REFERENCES

Integrated Risk Information System. USEPA Office of Research and Development, National Center for Environmental Assessment. <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?IRIS>

Stephen, CE. 1993. Derivation of Proposed Human Health and Wildlife Bioaccumulation Factors for the Great Lakes Initiative. Environmental Research Laboratory, Office of Research and Development, U.S. EPA, Duluth, MN.

LMHHTC Calculation

$$\text{LMHHTC} = \frac{\text{ADE} \times \text{BW} \times \text{RSC}}{\text{WC} \times [(\text{FC}_{\text{TL3}} \times \text{BAF}_{\text{HHTL3}}) + (\text{FC}_{\text{TL3}} \times \text{BAF}_{\text{HHTL4}})]}$$

$$\begin{aligned} \text{Drinking water LMHHTC} &= \frac{0.003 \text{ mg/kg-day} \times 70 \text{ kg} \times 0.8}{2.0 \text{ l/day} \times [(0.0036 \text{ kg/day} \times 1.417 \text{ l/kg}) + (0.0114 \text{ kg/day} \times 1.710 \text{ l/kg})]} \\ &= 0.083 \text{ mg/l} = \mathbf{83 \text{ }\mu\text{g/L}} \end{aligned}$$

$$\begin{aligned} \text{Nondrinking water LMHHTC} &= \frac{0.003 \text{ mg/kg-day} \times 70 \text{ kg} \times 0.8}{0.01 \text{ l/day} \times [(0.0036 \text{ kg/day} \times 1.417 \text{ l/kg}) + (0.0114 \text{ kg/day} \times 1.710 \text{ l/kg})]} \\ &= 4.86 \text{ mg/l} = \mathbf{4860 \text{ }\mu\text{g/L}} \end{aligned}$$

LMHHNC Calculation

$$\text{LMHHNC} = \frac{\text{RAD} \times \text{BW}}{\text{WC} \times [(\text{FC}_{\text{TL3}} \times \text{BAF}_{\text{HHTL3}}) + (\text{FC}_{\text{TL3}} \times \text{BAF}_{\text{HHTL4}})]}$$

$$\begin{aligned} \text{Drinking water LMHHNC} &= \frac{7.143 \times 10^{-6} \text{ mg/kg-day} \times 70 \text{ kg}}{2.0 \text{ l/day} \times [(0.0036 \text{ kg/day} \times 1.417 \text{ l/kg}) + (0.0114 \text{ kg/day} \times 1.710 \text{ l/kg})]} \\ &= 0.00025 \text{ mg/l} = \mathbf{0.25 \text{ }\mu\text{g/L}} \end{aligned}$$

$$\begin{aligned} \text{Nondrinking water LMHHNC} &= \frac{7.143 \times 10^{-6} \text{ mg/kg-day} \times 70 \text{ kg}}{0.01 \text{ l/day} \times [(0.0036 \text{ kg/day} \times 1.417 \text{ l/kg}) + (0.0114 \text{ kg/day} \times 1.710 \text{ l/kg})]} \\ &= 0.0144 \text{ mg/l} = \mathbf{14.4 \text{ }\mu\text{g/L}} \end{aligned}$$

Derivation History

Derived June 20, 2006

Contact Information

Brian Koch
Water Quality Standards, Bureau of Water
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, IL 62794-9276