Fact Sheet Date: **March 12, 1998**

NEW YORK STATE
-AQUATIC FACT SHEET-

Ambient Water Quality Values for Protection of Aquatic Life

SUBSTANCE: Mercury, dissolved **CAS REGISTRY NUMBER:** Not Applicable

TYPE:	**BASIS:**	**FRESHWATER AMBIENT WATER QUALITY VALUE (ug/L):**
Chronic	Propagation	0.77
Acute	Survival	1.4

INTRODUCTION

These values apply to the water column and are derived to protect aquatic life from the effects of waterborne contaminants. Values for the protection of propagation of aquatic life are referred to as Aquatic (Chronic) or A(C) values. Values for the protection of survival of aquatic life are referred to as Aquatic (Acute) or A(A) values.

SUMMARY OF INFORMATION AND DERIVATION OF VALUE

U.S. EPA (1995a,b) has derived acute and chronic aquatic life criteria for dissolved mercury (II) for the Great Lakes Water Quality Initiative (GLI). The Department has reviewed these criteria and determined that they are based on appropriate data and derived according to the scientific procedures in current and proposed 6 NYCRR Part 702. They are thus determined to be appropriate ambient water quality values for protection of aquatic life for New York State.

The attachment to this fact sheet provides U.S. EPA's derivation of the values expressed as total metal. Conversion to the dissolved form is made using the factor of 0.85 presented in U.S. EPA (1995a). U.S. EPA's Criterion Continuous Concentration (CCC) and Criterion Maximum Concentration (CMC) are equivalent to New York's Aquatic (Chronic) and Aquatic (Acute) values respectively.

U.S. EPA’s criteria are expressed as mercury II, dissolved. There is, however, no practical analytical method to quantify mercury II. In addition there is no practical way to evaluate the transformation of various species of dissolved mercury in ambient waters. Because the measurement of mercury in ambient waters and the specification of effluent limitations will include other species, it is reasonable to specify the ambient standard to include all species of dissolved mercury. The potential over conservativeness of this approach should be minimal because the toxicity of methylmercury is greater than mercury II (U.S. EPA, 1985).

REFERENCES

U.S. EPA (Environmental Protection Agency). 1985. Ambient Water Quality Criteria for Mercury - 1984. EPA 440/5-84-026. January 1985.

U.S. EPA (Environmental Protection Agency). 1995a. Final Water Quality Guidance for the Great Lakes System. 60 Federal Register: 15366 - 15425. March 23, 1995.

U.S. EPA (Environmental Protection Agency) 1995b. Great Lakes Water Quality Initiative Criteria Documents for the Protection of Aquatic Life in Ambient Water. EPA-820-B-95-004. March 1995.

New York State Department of Environmental Conservation
Division of Water
SJS
January 28, 1997

ATTACHMENT

GREAT LAKES WATER QUALITY INITIATIVE

Tier 1 Aquatic Life Criterion for Mercury(II)

The new acceptable acute data for mercury(II) are given in Table J1; no new chronic data were used. These new data were used with those given in Tables 1 and 2 of the criteria document for mercury(II) (U.S. EPA 1985) to obtain the values given in Table J2.

Criterion Maximum Concentration (CMC)

The Final Acute Value (FAV) was calculated using the four lowest Genus Mean Acute Values given in Table J2, resulting in a FAV of 3.388 ug/L. This value did not need to be lowered to protect a commercially or recreationally important species of the Great Lakes System. The CMC was calculated by dividing the FAV by 2, resulting in a CMC of 1.694 ug/L as total recoverable mercury(II).

Criterion Continuous Concentration (CCC)

Insufficient chronic toxicity data were available to calculate a Final Chronic Value (FCV) using the eight-family procedure. Sufficient chronic data were available to calculate a FCV by dividing the FAV by the Final Acute-Chronic Ratio (FACR). ACRs were given for two freshwater species and one saltwater species in U.S. EPA (1985). The ACR obtained with the more resistant fathead minnow was much higher than the other two. The ACR obtained with the saltwater mysid was 3.095 and was similar to the Species Mean Acute-Chronic Ratio of 4.498 for Daphnia magna. The FACR was calculated as the geometric mean of the two SMACRs and was 3.731. The FCV = FAV/FACR = (3.388 ug/L)/(3.731) = 0.9081 ug/L. This value did not need to be lowered to protect a commercially or recreationally important species of the Great Lakes System. The CCC was 0.9081 ug/L as total recoverable mercury(II).

The Criterion

The procedures described in the GLI Tier 1 methodology indicate that, except possibly where a locally important species is very sensitive, aquatic organisms should not be affected unacceptably if the four-day average concentration of mercury(II) does not exceed 0.9081 ug/L more than once every three years on the average and if the one-hour average concentration does not exceed 1.694 ug/L more than once every three years on the average.

Table J1. New Acute Values for Mercury(II)

Species	Method*	Acute Value (ug/L)	Reference
Cladoceran, Ceriodaphnia reticulata	S,U	2.9	Elnabarawy et al. 1986
Cladoceran, Daphnia magna,	S,U	9.6	Elnabarawy et al. 1986
Cladoceran, Daphnia pulex	S,U	3.8	Elnabarawy et al. 1986
Amphipod, Crangonyx pseudogracilis	S,U	1.0**	Martin and Holdich 1986
Midge, Chironomus riparius	S,M	750	Rossaro et al. 1986
Mosquitofish, Gambusia affinis	S,U	230	Paulose 1988
Walking catfish, Clarias batrachus	S,U	375	Kirubagaran and Joy 1988
Fathead minnow, Pimephales promelas	FT,M	172	Spehar and Fiandt 1986
Guppy, Poecilia reticulata	R,U	26	Khangarot and Ray 1987

* S = static, R = renewal, FT = flow-through, U = unmeasured, M = measured.
** Not used in the derivation of the criterion because the corresponding 48-hr LC50 is 470 ug/L, which is an unusually large decrease in the LC50 from 48 to 96 hours.

Table J2. Ranked Genus Mean Acute Values for Mercury(II)

Rank*	Genus Mean Acute Value (ug/L)	Species	Species Mean Acute Value (ug/L)	Species Mean Acute-Chronic Ratio
29	2000	Stonefly, Acroneuria lycorias	2000	-----
28	2000	Mayfly, Ephemerella subvaria	2000	-----
27	2000	Caddisfly, Hydropsyche betteni	2000	-----
26	1200	Caddisfly, (Unidentified)	1200	-----
25	1200	Damselfly, (Unidentified)	1200	-----
24	1000	Worm, Nais sp.	1000	-----
23	1000	Mozambique tilapia Tilapia mossambica	1000	-----
22	406.2	Tubificid worm, Spirosperma ferox	330	-----
		Tubificid worm, Spirosperma nikolskyi	500	-----
21	375	Walking catfish, Clarias batrachus	375	-----
20	370	Snail, Aplexa hypnorum	370	-----
19	257	Coho salmon, Oncorhynchus kisutch	240	-----
		Rainbow trout, Oncorhynchus mykiss	275	-----
18	250	Tubificid worm, Quistadrilus multisetosus	250	-----
17	240	Tubificid worm, Rhyacodrilus montana	240	-----

Table J2. Ranked Genus Mean Acute Values for Mercury(II)

Rank*	Genus Mean Acute Value (ug/L)	Species	Species Mean Acute Value (ug/L)	Species Mean Acute-Chronic Ratio

16	203	Mosquitofish, Gambusia affinis	203	-----
15	180	Tubificid worm, Limnodrilus hoffmeisteri	180	-----
14	163	Fathead minnow, Pimephales promelas	163	> 649.2**
13	160	Bluegill, Lepomis macrochirus	160	-----
12	140	Tubificid worm, Tubifex tubifex	140	-----
11	140	Tubificid worm, Stylodrilus heringianus	140	-----
10	122***	Midge, Chironomus sp.	20	-----
		Midge, Chironomus riparius	750	-----
9	100	Tubificid worm, Varichaeta pacifica	100	-----
8	80	Tubificid worm, Branchiura sowerbyi	80	-----
7	80	Snail, Amnicola sp.	80	-----
6	50	Crayfish, Orconectes limosus	50	-----
5	28	Guppy, Poecilia reticulata	28	-----
4	20	Crayfish, Faxonella clypeatus	20	-----
3	10	Amphipod, Gammarus sp.	10	-----

Table J2. Ranked Genus Mean Acute Values for Mercury(II)

Rank*	Genus Mean Acute Value (ug/L)	Species	Species Mean Acute Value (ug/L)	Species Mean Acute-Chronic Ratio
2	3.3	Cladoceran, Daphnia magna	3.7	4.498
		Cladoceran,	2.9	-----

		Daphnia pulex		
1	2.9	Cladoceran, Ceriodaphnia reticulata	2.9	-----

* Ranked from most resistant to most sensitive based on Genus Mean Acute Value.
** Not used in the calculation of the Final Acute-Chronic Ratio.
*** This GMAV was not set equal to the lowest SMAV because the species was not identified.

FAV = 3.388 ug/L

CMC = FAV/2 = 1.694 ug/L

FACR = 3.731

FCV = FAV/FACR = (3.388 ug/L)/(3.731) = 0.9081 ug/L = CCC

References

Elnabarawy, M.T., A.N. Welter, and R.R. Robideau. 1986. Relative Sensitivity of Three Daphnia Species to Selected Organic and Inorganic Chemicals. Environ. Toxicol. Chem. 5:393-398.

Khangarot, B.S., and P.K. Ray. 1987. Studies on the Acute Toxicity of Copper and Mercury Alone and in Combination to the Common Guppy, Poecilia reticulata (Peters). Arch. Hydrobiol. 110:303-314.

Kirubagaran, R., and K.P. Joy. 1988. Toxic Effects of Three Mercurial Compounds on Survival and Histology of the Kidney of the Catfish Clarias batrachus (L.). Ecotoxicol. Environ. Safety 15:171-179.

Martin, T.R., and D.M. Holdich. 1986. The Acute Lethality of Heavy Metals to Peracarid Crustaceans (with Particular Reference to Fresh-Water Asellids and Gammarids). Water Res. 20:1137-1147.

Paulose, P.V. 1988. Comparative Study of Inorganic and Organic Mercury Poisoning on Selected Freshwater Organisms. J. Environ. Biol. 9:203-206.

Rossaro, B., G.F. Gaggino, and R. Marchetti. 1986. Accumulation of Mercury in Larvae and Adults, Chironomus riparius (Meigen). Bull. Environ. Contam. Toxicol. 37:402-406.

Spehar, R.L., and J.T. Fiandt. 1986. Acute and Chronic Effects of Water Quality Criteria-Based Metal Mixtures on Three Aquatic Species. Environ. Toxicol. Chem. 5:917-931.

U.S. EPA. 1985. Ambient Water Quality Criteria for Mercury - 1984. EPA 440/5-84-026. National Technical Information Service, Springfield, VA.