NOTE OF EXPLANATION FOR HEALTH (FISH CONSUMPTION) FACT SHEET FOR CADMIUM

The Health (Fish Consumption) Type numerical values for cadmium are supported by the attached "Aquatic" basis Fact Sheet dated May 23, 1985. Although listed as "Aquatic" in that Fact Sheet, the values of 2.7 ug/L are actually based on bioaccumulation and are now designated as the H(FC) Type. The reader should disregard the documentation for the freshwater values in the May 23, 1985 Fact Sheet.

-- NYSDEC 3-98

VALUE(S) ADDED 7-24-85

FACT SHEET REVISED _____

VALUE(S) REMOVED _____

Date: May 23, 1985

Surface Water Quality Standard Documentation

Chemical: Cadmium

C.A.S, No.(s): NA

Basis (Human/Aquatic): Aquatic

Standard by Water Classification:

	ug/l	Notes
Classes AA,AA-s;A;A-s;B;C	*	I
Class D	**	H
Classes SA;SB;SC;I	2.7	M
Class SD	2.7	M

Remarks: * = exp (0.7852[ln(ppm hardness)]-3.490)
** = exp (1.128 [ln(ppm hardness)]-3.828)
-Standards apply to the acid-soluble form.

Summary of Information

1. EPA. 1976. Quality criteria for water. EPA 440/9-76-023. USEPA, Wash., D.C. 256 pp.

criteria:

Freshwater Water

Soft Water	Hard Water	
0.4 ug/l	1.2 ug/l	for cladocerans and salmonid fishes
4.0 ug/l	12.0ug/l	for other, less sensitive, aquatic life.

Marine
5.0 ug/l

-basis for freshwater criteria: chronic studies that demonstrated levels necessary to protect aquatic life.

-basis for marine criterion: to prevent oysters from accumulating cadmium to the level of 13-15 mg/Kg, the human emetic threshold.

2. NYSDEC. 1978. Cadmium In: Rationale Document for Specific Water Quality Standards contained in Table II- Metals (Section 701.6(d), Page 24) of proposed Classifications and Standards of Quality and Purity (6 NYCRR Parts 700, 701, 702, and 704) NYSDEC Exhibit at Proposed Water Quality Standards Hearings.

-recommended standard: 0.4 ug/l in waters of less than 80 mg/l alkalinity and 4 ug/l in waters of 80 mg/l or more alkalinity.

-based on chronic studies that demonstrated levels necessary to protect aquatic life.

3. IJC. 1977. New and revised Great Lakes water quality objectives Vol. II. International Joint Commission, Regional Office, Windosr, Ont. 155 pp.

-criterion: "Concentrations of total cadmium in an unfiltered water sample should not exceed 0.2 micrograms per litre to protect aquatic life."

-based on effects on reproduction of trout and zooplankton.

4. EPA. 1980. Ambient water quality criteria for cadmium. USEPA, Wash., D.C.

-criteria derived following the National Guidelines:

-in freshwater the 24 hr. average should not exceed the concentration given by exp (1.05[ln(hardness ppm)]-8.53) (ug/l) and the concentration give by exp (1.05 [ln(hardness ppm)]-3.73) (ug/l) not be exceeded at any time.

-in saltwater, 4.5 ug/l as a 24 hr. average and 59 ug/l not to be exceeded at any time.

5. EPA. 1985. Ambient aquatic life water quality criteria for cadmium. [proposed final] USEPA, Wash. D.C. 122 pp.

-criteria derived following the revised National Guidelines:

-freshwater: the four-day average in ug/l was given by the expression exp (0.7852[ln(hardness)]-3.490); the one-hour average in ug/l was given by exp(1.128[ln (hardness)]-3.828).

-saltwater: 8.7 ug/l as a four-day average and 40 ug/l as a one-hour average.

-criteria expressed as acid-soluble cadmium, operationally defined as the cadmium that passes through a 0.45 um membrane filter after the sample is acidified to pH 1.5 to 2.0 with nitric acid.

6. The New York State drinking water standard in Part 701 for cadmium in Classes AA, AA-s, A and A-s is 10 ug/1. The protocol in Part 701, 8(d)(4) can be used to calculate standards to prevent bioaccumulation of cadmium in fish. EPA (1985) calculated bioaccumulation factors (BF) for fresh and saltwater of 756 and 225.7. The BF were based on whole body data which is appropriate for saltwater, (based on invertebrates), but not for freshwater. The geometric mean of the three BF in EPA (1985) for muscle of brook trout is 17. Criteria to prevent bioaccumulation of cadmium can be calculated as follows:

-in freshwater: $$35.7 \text{ ug/l} = \frac{10 \text{ ug/l} \times 2 \text{ l/d}}{0.033 \text{ Kg/d} \times 17 \frac{\text{ug/Kg}}{\text{ug/l}}}$$

-in saltwater: $$2.7 \text{ ug/l} = \frac{10 \text{ ug/l} \times 2 \text{ l/d}}{0.033 \text{ Kg/d} \times 225.7 \frac{\text{ug/Kg}}{\text{ug/l}}}$$

Standard Derivation

The cadmium criteria proposed by EPA (1985) is the product of the most recent review and evaluation of the literature on cadmium toxicity and follows the revised National Guidelines. The freshwater criterion calculated in #6 above is greater than EPA criteria, therefore the EPA four-day average should be adopted as standards for all freshwater classes except D. The EPA one-hour average should be adopted as the standard for class D.

In saltwater, the criterion calculated in #6 above is less than the EPA (1985) criterion, therefore, it is recommended that 2.7 ug/l cadmium be adopted as the standard for all salwaters classes.

"Acid-soluble" is currently the best estimate of the bioavailable form of cadmium and should be used for the NYS standard.