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interoffice MEMORANDUM

SDMS DocID 46276

to: Dave Dickerson
from: Ann-Marie Burke
subject: Target levels for PCBs in fish for the New Bedford Superfund Site
date: September 22, 1997

The following are health-based target levels for finfish and lobster for the New Bedford Superfund site. To derive these levels I have used as much site-specific information from the "Draft Final Baseline Public Health Risk Assessment (PHRA), New Bedford Harbor Feasibility Study, August, 1989" as possible. I calculated target levels for the local resident who eats some quantity of their total seafood from New Bedford Harbor and for the local commercial fisherman who keeps some portion of his catch to eat. These target levels are somewhat uncertain because of the fish ingestion rate assumed, but I was unable to find anything more definitive than this report for site specific fish ingestion rates. In addition, based on the 1989 report it appears that 12 out of 13 dioxin-like PCBs were detected in fish from the harbor. As a result the target levels for dioxin-like PCBs should be separate from those for non-dioxin like PCBs and will be lower than those calculated below. If you have any questions about this calculation, please do not hesitate to call me at 223-5528.

The following equations were used to estimate target levels based on cancer and noncancer endpoints for both the local resident and fisherman. It is up to you to choose the final target level. As a reference the FDA standard for PCBs in fish is 2mg/kg.

Target Level for carcinogenic endpoint

$$C_f = \frac{TR \times BW \times AT}{IR \times FI \times F \times D \times CPF}$$

Where;
C_f = contaminant concentration in fish (mg/kg)
TR = target excess cancer risk level (1×10^{-6})
BW = adult body weight (kg)
AT = averaging time (period over which exposure is averaged - days) (25550 dys)
IR = ingestion rate (kg/dy) - *see discussion on receptor*
FI = fraction of fish ingested from contaminated source (unitless) - assumed 1
F = exposure frequency (days/yr) - 365dys/yr
D = exposure duration (30yrs)
CPF = slope factor, $(mg/kg\text{-}dy)^{-1}$

For the local resident

$$C_f = \frac{(10^{-6})(70)(25550)}{(0.043)(1)(365)(30)(2)} = \frac{1.7885}{941.7} = \underline{0.002 mg/kg}$$

For ingestion rate, the 1989 PHRA assumed three potential ingestion rates - 1 fish meal/dy, 1fish meal/wk and 1fish meal/month. A survey was conducted at the time of the assessment to determine ingestion rates from New Bedford Harbor for lobster. Most people interviewed chose the interval of "less than 1X/month- at least 1x/yr".The next higher group chose "< 1X/wk, at least 1X per month. As a conservative measure of the RME I chose 1X/wk for 52 weeks per year for estimating a target cleanup level for both lobster and finfish. In addition I assumed a fish meal size of 305 g (this is the upper end of the range of fish meal sizes in the latest EPA, Exposure Factor's Handbook (EFH).) Using these values results in a daily resident lobster and finfish ingestion rate of 52meals/yr x 305g/meal = 15860g/yr - 365dys/yr = 43.4g/dy or 0.043kg/dy. It is interesting to note that a recommended literature source in the EFH cites the 95% percentile for marine fish ingestion for the general population in the Northeast as 50 mg/dy (Ruffle, et. al, 1994, Lognormal Distributions for Fish Consumption by the General U.S Population, Risk Analysis, Vol. 14, No. 4, 1994.)

For the local fisherman

$$C_f = \frac{(10^{-6})(70)(25550)}{(0.087)(1)(365)(30)(2)} = \frac{1.7885}{1905.3} = 0.0009 mg/dy$$

I assumed the same fish meal size (305g/meal) but assumed a more frequent consumption rate. The EFH does not have recommended ingestion rates for a commercial fisherman who keeps portions of their catch. I assumed an ingestion rate of 2 meals/wk based on professional judgement. This results in a fish ingestion rate of 2 fish meals/wk x 52 weeks/yr = 104 meals/yr 104 meals/yr x 305g/meal = 31720g/yr - 365 dys/yr = 87g/dy.

Target Level for Noncancer endpoint

$$C_f = \frac{HQ \times RfD \times BW \times AT}{IR \times FI \times F \times D}$$

Where:
C_f = contaminant concentration in fish (mg/kg)
HQ = target noncancer hazard (1)
RfD = reference dose ($2x10^{-5}$ for aroclor 1254)
BW = adult body weight (kg)
AT = averaging time (period over which exposure is averaged - days) (10950 dys)

IR = ingestion rate (kg/dy) - *see discussion on receptor*
FI = fraction of fish ingested from contaminated source (unitless) - assumed 1
F = exposure frequency (days/yr) - 365dys/yr
D = exposure duration (30yrs)

For local resident

$$C_f = \frac{(1)(2 \times 10^{-5})(70)(10950)}{(0.043)(1)(365)(30)} = \frac{15.3}{470.0} = 0.03\text{mg/kg}$$

For local fisherman

$$C_f = \frac{(1)(2 \times 10^{-5})(70)(10950)}{(0.087)(1)(365)(30)} = \frac{15.3}{952.7} = 0.02\text{mg/kg}$$

So for the local resident:

Conc. In fish (mg/kg)	Cancer Risk level	HQ
0.002	1×10^{-6}	<<1
0.02	1×10^{-5}	1
0.2	1×10^{-4}	10

For the local fisherman

0.0009	1×10^{-6}	<<1
0.009	1×10^{-5}	<1
0.09	1×10^{-4}	5

As you can see, the projected risk to the local fisherman is higher than to the resident so protection of the local fisherman who keeps a portion of his catch to eat, will drive the target level.