RETURN TO 1998 ROD AR INDEX

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Memorandum

To: Dave Dickerson
CC: Cindy Catri
From: Ann-Marie Burke
Date: June 30, 1998
Subject: Area specific cleanup levels for New Bedford Harbor

On June 23rd, Dave Dickerson, Ann-Marie Burke and Cindy Catri surveyed the shoreline along the Acushnet River starting from Sawyer Street in New Bedford, up to the Wood Street Bridge and then down to the Coggeshall Street Bridge in Fairhaven. The purpose of this trip was to better define the types of exposures which could occur in each of these areas in order to refine cleanup levels and focus cleanup efforts. The following are proposed cleanup levels for specific areas of the upper and lower sections of New Bedford Harbor.

1. **New Bedford side, Cove Area:** This area contains 3 subareas; the Coffin Street playground, the CDF and a recently cleared waterfront property.

a. Coffin St. Playground: This is a well established playground with swings, a playset, ballfield, hockey court and an old outdoor shower. Adjacent and very close to this area is the shoreline bordered by a narrow strip of saltmarsh. There is currently a fence between the playground and shoreline although there was evidence at the time of our trip of individuals trespassing over the fence, (i.e an old door had been propped up against the fence to facilitate passage over the fence). In addition, well worn paths were present within the fenced area to the shoreline. The playground is surrounded by homes. It is reasonable to assume that an older child, (ages 7-18)could access the shoreline and saltmarshes 2X/wk for the 3 months of summer and 1X/wk for an additional 2 months per year.

b. CDF: It is reasonable to assume that the CDF could be converted into a recreational park in the future. If a park were developed it is likely that some buffer to the shoreline, such as a seawall would exist. Based on this future scenario, a future receptor could be an older child, (ages 7-18), who would visit the shoreline and saltmarsh area 2X/wk for the 3 months of summer and 1X/wk for an additional 2 months per year.

c. Vacant waterfront property: This area was recently cleared for purposes of resale or reuse. The future use of this parcel is unknown, however, it is not unlikely that this area would be developed for some type of waterfront recreational use which would be consistent with the land use on either side of this property. The potential exposures and receptor would be the same as for the CDF and Coffin St. playground.

d. Proposed cleanup level: All three areas of the Cove have the same receptor and exposure pathways, thus the same cleanup level should be attained in all three areas. The 95% Upper Confidence Level on the arithmetic mean of exposed sediments in these areas should meet the cleanup goal since this is the statistic utilized in assessing exposure in risk assessments.

CLEANUP LEVELS FOR PCBS IN SEDIMENTS IN AREAS OF BEACHCOMBING ACTIVITIES

$$Cs\ (mg/kg) = \frac{THQ \times BWc \times Atnc}{FxD\left[\left(\frac{1}{RfDo} \times \frac{IRc}{106\ mg/kg}\right) + \left(\frac{1}{RfDo} \times \frac{SAc \times AF \times RAFd}{106mg/kg}\right)\right.}$$

C s = PCB concentration in soil = soil cleanup level
THQ = target hazard quotient - 1
ATnc = averaging time, noncarcinogen (12yrs x 365dys/yr) - 4380 days
RfD = reference dose for PCBs (2E-05mg/kg-dy) - IRIS, 10/1/96
F = exposure frequency (32 dys/yr) - 2dys/wkx 4wks/mo x 3mos/yr+ 1dy/wk for 2 mos/yr
IR= sediment ingestion rate, equal to: 100mg/dy (soil ingestion rate for older child) x 0.5 (fraction of total soil/sediment from source) = 50mg/dy
BW = ave body weight of child 7-18yrs - 47kg
D = *duration - 12yrs*
SA = surface area of an older child exposed = head, hands, lower arms and lower legs = 4380cm2
AF = skin adherence factor = child ages 7-12 exposed to wet soils (1mg/cm2) Kissel et al, 1996); and older child, ages 13-18 (reed gatherers, Based on Kissel et al, 1996); both adherence factors are weighted by surface area exposed and then averaged over the two age groups = 0.61mg/cm2
RAFdermal = 14%; dermal relative absorption factor = amount absorbed via the dermal route from the site/amt absorbed from tox study (From Wester et al, 1993)

Substituting the above values into the equation:

$$C(mg/kg) = \frac{(1)(47)(4380)}{32 \times 12\ \left[\frac{(1)}{2x10\text{-}5} \times \left(\frac{100x0.5}{106}\right) + \frac{1}{} \times \frac{4380 \times 0.6x\ 0.14}{2E\text{-}05\ \ 106}\right.}$$

$$= \frac{(205860)}{384\left(\frac{50}{20} + \frac{374}{20}\right)}$$

= (205860)/8141.8 = 25.2 or 25ppm

2. Industrial area north of Coffin Street Playground continuing to Woods Street Bridge: A heavily industrialized area extends north from the Coffin Street playground to Woods Street Bridge. *This area is unlikely to be visited on a regular basis by children or adults since it is on* private property, not very accessible and not very attractive. We assumed that an older child, ages 7-18, might visit this area 1X/week for 5 months of year (about 20 dys/yr).

Proposed Cleanup Goal

$$Cs\ (mg/kg) = \frac{THQ \times BWc \times Atnc}{FxD\ [(\frac{1}{RfDo} \times \frac{IRc}{106\ mg/kg}) + (\frac{1}{RfDo} \times \frac{SAc \times AF \times RAFd}{106mg/kg})}$$

C s = PCB concentration in soil = soil cleanup level
THQ = target hazard quotient - 1
ATnc = averaging time, noncarcinogen (12yrs x 365dys/yr) - 4380 days
RfD = reference dose for PCBs (2E-05mg/kg-dy) - IRIS, 10/1/96
F = exposure frequency (20 dys/yr) - 1dys/wkx 4wks/mo x 5mos/yr
IR= sediment ingestion rate, equal to: 100mg/dy (soil ingestion rate for older child) x 0.5 (fraction of total soil/sediment from source) = 50mg/dy
BW = ave body weight of child 7-18yrs -47 kg
D = duration - 12yrs
SA = surface area of an older child exposed = head, hands, lower arms and lower legs = 4380cm2
AF = skin adherence factor = child ages 7-12 exposed to wet soils (1mg/cm2) Kissel et al, 1996); and older child, ages 13-18 (reed gatherers, Based on Kissel et al, 1996); both adherence factors are weighted by surface area exposed and then averaged over the two age groups = 0.61mg/cm2
RAFdermal = 14%; dermal relative absorption factor = amount absorbed via the dermal route from the site/amt absorbed from tox study (From Wester et al, 1993)

Substituting the above values into the equation:

$$C(mg/kg) = \frac{(1)(47)(4380)}{20 \times 12\ [(\frac{1}{2x10^{-5}}) \times (\frac{100x0.5}{106}) + \frac{1}{} \times \frac{4380 \times 0.61 \times 0.14}{2E-05\ \ 106}}$$

$$= \frac{(205860)}{240(\frac{50}{20} + \frac{374}{20})}$$

$$= \frac{(205860)}{5088}$$

= 40.4 or 40ppm

3. Houses just north of Wood St. Bridge (New Bedford Side): There are three houses just north of the Wood St. bridge which sit on the Acushnet River. Paths lead from each home through a thin band of salt marshes to the river. Due to the close proximity of the river and the easy access to the river and sediment, the cleanup goal for all sediment areas adjacent to these homes should be consistent with a "residential cleanup goal" (see below).

Sediment cleanup level for residential exposures

The following cleanup level applies to residential properties which abut areas of the harbor with exposed sediments. This cleanup level is protective of a young child, (ages 0-6yr), who would access these sediments as if they were an extension of their backyard. This cleanup level should be attained in surface soils, (i.e.0-1ft). The following calculation assumes two potential exposure pathways from soil; accidental ingestion of soil and dermal absorption of soils. The inhalation pathway is not expected to contribute significantly to the total risk from contaminated soils since the major route of exposure would be via volatilization and PCBs are not expected to volatilize to any great extent due to a low vapor pressure.

$$Cs\ (mg/kg) = \frac{THQ \times BWc \times Atnc}{FxD\left[\left(\frac{1}{RfDo} \times \frac{IRc}{106\ mg/kg}\right) + \left(\frac{1}{RfDo} \times \frac{SAc \times AF \times RAFd}{106 mg/kg}\right)\right.}$$

C s = PCB concentration in soil = soil cleanup level
THQ = target hazard quotient - 1
ATnc = averaging time, noncarcinogen (6yrs x 365dys/yr) - 2190 days
RfD = reference dose for PCBs (2E-05mg/kg-dy) - IRIS, 10/1/96
F = exposure frequency (150 dys/yr) - amount of time that ground is not frozen or covered with snow
IR = sediment ingestion rate, equal to: 200mg/dy (soil ingestion rate for young child)
BW = body weight of child 0-6yrs - 15kg
D = duration - 6yrs
SA = surface area of a young child exposed = head, hands, lower arms and lower legs = 2900cm2
AF = skin weighted adherence factor = 1mg/cm2 (Based on unpublished data from Kissel et al, 1996, for young children)
RAFdermal = dermal relative absorption factor = amount absorbed via the dermal route from the site/amt absorbed from tox study = 14% (From Wester et al, 1993)

Substituting the above values into the equation:

$$= \frac{(1)\ (15)\ (2190)}{(150)(6)\left[\left(\frac{1}{2x10\text{-}5} \times \frac{200}{106}\right) + \left(\frac{1}{2x10\text{-}5} \times \frac{2900 \times 1 \times .14}{106}\right)\right.}$$

$$= \frac{32850}{900\left[\frac{200}{20} + \frac{406}{20}\right]}$$

$$= \frac{32850}{900\ (30.3)} = 32850\ /27270 = 1.2 \text{ or } 1ppm$$

4. South of the Wood Street Bridge (Acushnet Side): Just south of the Wood Street Bridge is a small industrial area proceeded by continuous shoreline with extensive salt marshes. These salt marshes extend inland quite a bit before meeting houses or roads and are difficult to get to. It is likely that only an older child or adult would access these wetlands on a regular basis. Thus the most reasonable exposure pathway is for an older child, (12-18 years of age), who would visit this area for 1X/wk for 5 months per year. The cleanup level would be the same for

#2 above; the industrial area north of the Coffin St. playground.

5. Veranda St. Inlet (Acushnet Side), right across from the Cove on the New Bedford Side:

This area contains many homes whose lawns extend right down to the river. There is very little slope and the river is essentially at the level of the lawn (most likely well within floodplain). Thus the river is *in the backyards* of these residences. The cleanup goal for exposed sediments adjacent to and extending into residential backyards in this area should attain the residential cleanup level of 1ppm, (as derived in #3 above).

6. Marsh Island, homes just south of the Radio towers: Just south to Marsh Island and extending up to Route 6 are several homes which are adjacent to the harbor. The backyards of these homes gently slope down to the harbor and several homes have beaches essentially in their backyards. The 95%UCL of PCBs in exposed sediments in these areas should attain the residential cleanup level of 1ppm (see #3 above).

7. Pope's Island: This is a well developed area accessed on either side by a bridge. The island contains a playground and appears to be used for general recreation, (i.e. walking the dog, picnics, fishing, etc). The sides of the island slope down steeply to the water and there are rock walls sloping down to the water on all sides of the island. There does not appear to be an area in which people could be exposed to sediments. No direct contact cleanup level established.

8. Crow Island(?): This is a small, (apparently private ?) island adjacent to Pope's Island. There are no bridges to the island but there is a house with a large sandy beach on the island. The 95%UCL of PCBs in exposed sediments in this area should attain the residential cleanup level of 1ppm (see #3 above).

total daily ingestion of soil/sediment which comes from sediment in NBH)= 50mg/dy
Terra value: RME value for young child is 65mg/dy, RME value for older child - 50mg/dy

Oral and dermal bioavailability factor for PAHs

1989 NBH BRA: oral abs = 100%, dermal abs = 7% (best available data at time)(based on recent review of the literature)
My values: oral abs = 100%, dermal abs = 14% (From(Wester et al, 1993)
Terra's values: none presented, just that 1989 values an overestimate

Duration of exposure for young children

1989NBHBRA: 5yrs
My value: 6 yrs (for child 0-6yrs)
Terra's Value: 4yrs

Frequency of exposure

1989 NBH BRA: Area I RME value for young child/older child: 20/100
Area II, RME value for young child/older child - 100/100
My value: Based on scenario and applies to both area 1 and 2: residential - 150dys/yr, playground - 48dys/yr (young child only), beachcombing - 24dys/yr
Terra's value: area 1 older child only, RME value - 24dys/yr
Area 2, young child only, RME value - 54dys/yr

CONCLUSIONS

Based on the most current exposure and risk information, safe levels of PCBs have been calculated for sediments which abut residential properties and playground areas, and which exist where individual might go beachcombing. These levels are 2ppm, 10ppm and 50ppm. If dioxin-like PCBs are present in sediments these levels may not be protective. IN addition, these levels are protective of direct contact exposures but may not be protective of the sediment to fish to human scenario. A fishing ban is currently in effect I nNew Bedford Habor thus risk from fish ingestion is a potential future risk.