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Understanding the Health Effects of Environmental PCB Contamination

Alicia Cunningham, MD MPH

Physician Consultant in Environmental Medicine
Center for Environmental Health
Massachusetts Department of Public Health

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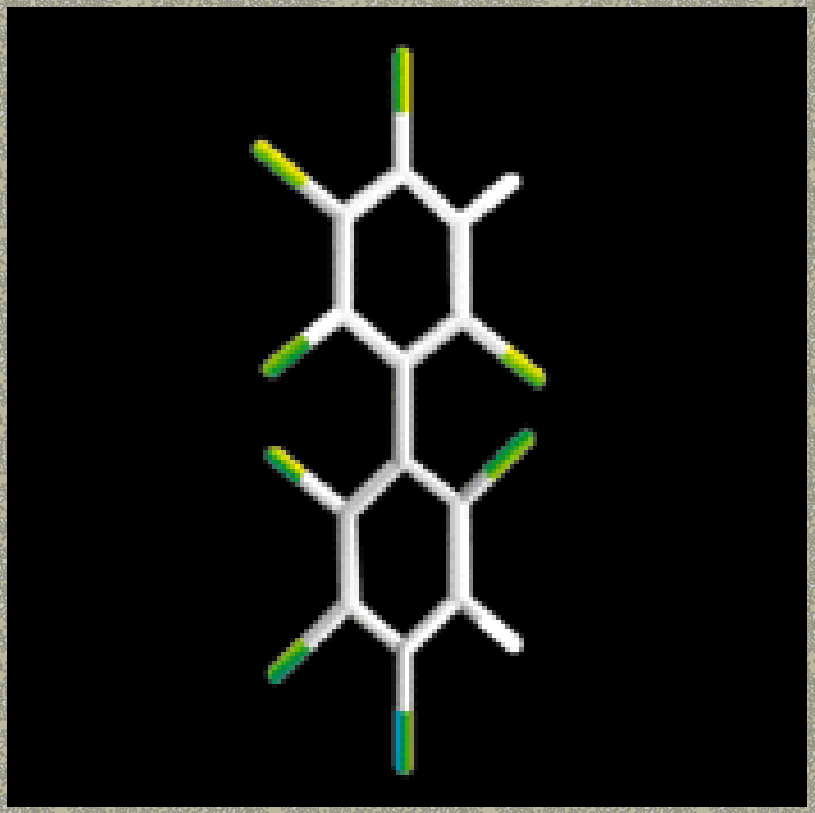
What are PCBs?



- Family of chemicals formed by attaching one or more chlorine atoms to a pair of connected benzene rings
- Depending on the number and position of chlorine atoms attached, 209 different PCB congeners can be formed with varying toxicologic and chemical properties
- Used in industry for insulating and nonflamable properties

Exposure Pathways

- PCBs are lipophilic and persist in the environment, concentrating upward in the food chain
- The primary non-occupational source of PCB exposure is fish from contaminated waters
- Previous occupational exposures at industrial plants utilizing PCBs
- Ongoing occupational exposure through maintenance or repair work

Who's at Risk

- Recreational and subsistence fishers who eat large amounts of locally caught fish
- Other populations are also at risk for increased PCB exposure
  - The offspring of low income subsistence fishers whose mothers ate large amounts of contaminated fish or game
  - Farmers and their families who consume PCB-contaminated food via farm-raised beef and dairy cattle
  - People living near incinerators, other PCB-disposal facilities, or PCB hazardous waste sites
  - People with compromised hepatic function

Biologic Fate

- PCBs are stored in adipose tissues
- The liver is the primary site of PCB metabolism
- The slow metabolism of PCBs leads to bioaccumulation

Physiologic Effects

- Adverse dermatologic, reproductive and developmental, endocrine, hepatic, and immunologic effects have been associated with exposure to PCBs

Dermatologic Effects

- Chloracne: acneform lesions arising as inflammatory response to sebaceous gland irritants
- Can result from dermal contact or ingestion
- Generally indicates systemic toxicity
- Weeks to months after exposure
- No reliable dose-response model

Developmental Effects

- PCBs cross the placenta and enter breast milk.
- Neurobehavioral and developmental deficits in newborns exposed to PCBs in utero; deficits continue in school-aged children.
- Deficits occur at PCB levels similar to those seen in New Bedford.
- Breastfeeding still recommended.

Reproductive and Endocrine Effects

- Reproductive function can be disrupted by exposure to PCBs. More research is required.
- PCBs can mimic or disrupt the action of thyroid and/or female sex hormones

Hepatic Effects

- Although liver damage is common in PCB-exposed animals, overt hepatotoxicity is uncommon in humans
- Exposure to PCBs can increase serum levels of hepatic enzymes and can induce microsomal enzyme function

Carcinogenicity

- On the basis of results from high-dose animal studies, PCBs are considered probable human carcinogens (Group 2A classification, International Agency for Research on Cancer).

Other Effects

- Additional adverse effects of PCBs involve the neurologic, cardiovascular, immune, musculoskeletal, and gastrointestinal systems

Clinical Evaluation

- History and Physical Examination
- Signs and Symptoms
  - Acute Exposure: Chloracne is the only known overt sign of PCB toxicity; however, the absence of chloracne does not rule out exposure
  - Chronic Exposure: Signs of chronic exposure to PCBs are generally subtle, if present at all

Laboratory Tests

- Direct Biologic Indicators
  - Serum or adipose tissue PCB levels can indicate exposure, but they are difficult to interpret clinically
  - The American Academy of Pediatrics (AAP) does not recommend testing breast milk for PCBs, and encourages breastfeeding in all but the most unusual circumstances
- Indirect Biologic Indicators
  - Elevated hepatic enzyme levels are of limited value in diagnosing exposure to PCBs

Treatment and Management

- Acute Exposure
  - No antidote exists for PCB exposure; therefore, treatment is symptomatic
- Chronic Exposure
  - The goal of treatment in chronically exposed patients is to prevent any additional exposure to PCBs

New Bedford Area Research

- Prevalence studies conducted by MDPH and CDC in 1982 and 1991
- Channing Lab Study (New Bedford) Ongoing. Cord levels similar to Oswego cohort, where positive association found between PCB levels and Fagan test.

Additional Current Research

- Ongoing research on neurodevelopmental effects
- The role of specific PCB congeners on outcomes
- Standardizing exposure measurements
- Determining mechanisms by which PCBs exert health effects

Your Role

- Identify high risk patients (primarily women of childbearing ages and young children who consume locally caught fish AND subsistence fishers in general)
- Educate and prevent
- In rare circumstances, evaluate patients with acute exposures

The New Bedford Harbor Superfund Site

U.S. Environmental Protection Agency

New England Region

First some quick PCB history

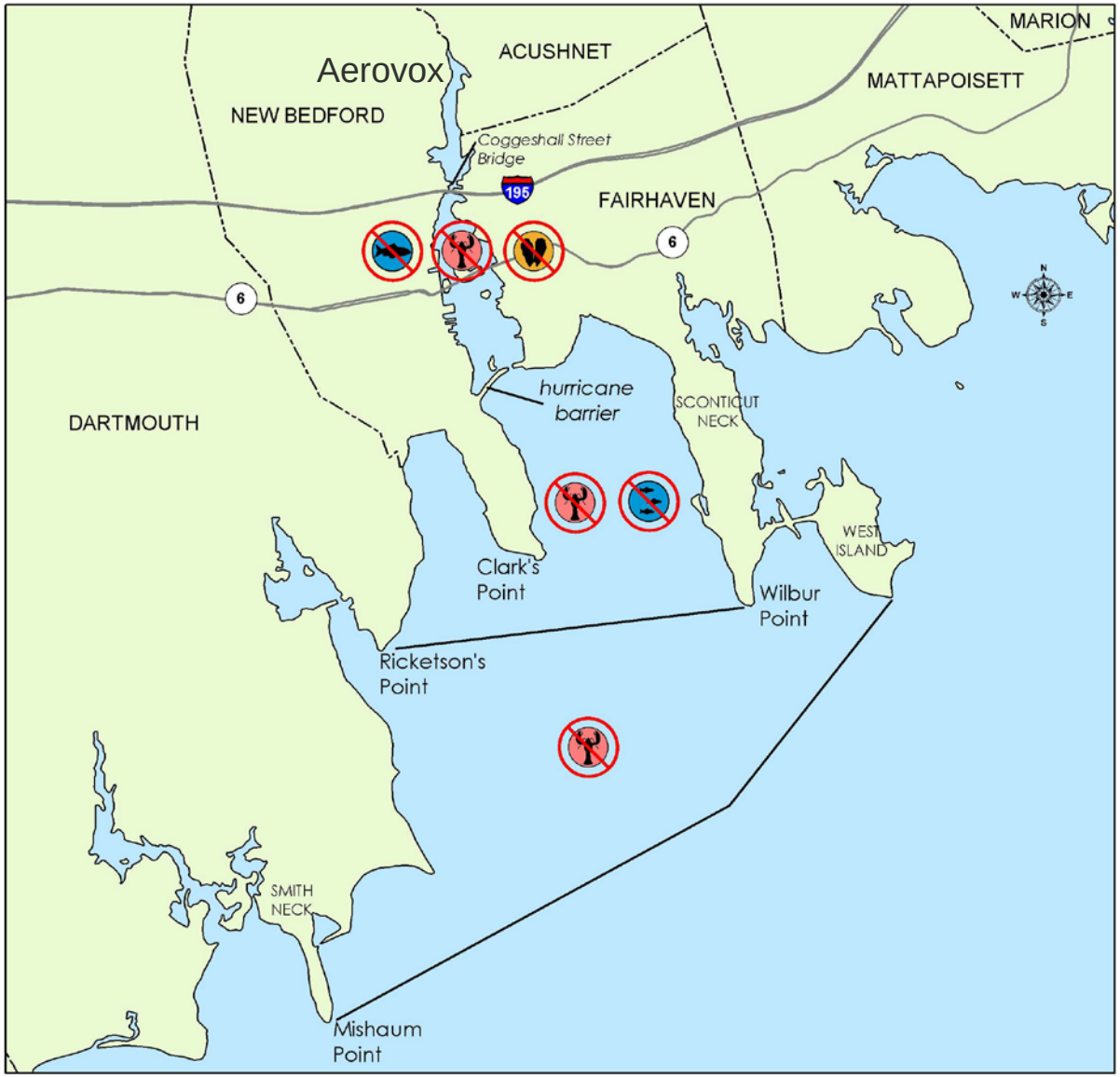
- c. 1940 two factories move to New Bedford, begin using PCBs
- PCB oil used as an insulator/dielectric fluid in capacitors
- oily PCB waste discharged to harbor (and sewers) leading to very high levels of PCB-contamination in sediments and fish
- PCBs banned by USEPA in 1977
- State fishing ban for the harbor area enacted in 1979 due to PCB-contaminated local seafood

You are here

The Aerovox facility

The 1979 state fishing ban

Fish Smart ... Read This Chart !



- Don't eat any fish
- Don't eat any lobster
- Don't eat any shellfish
- Don't eat any bottom fish (flounder, scup, tautog and eel)

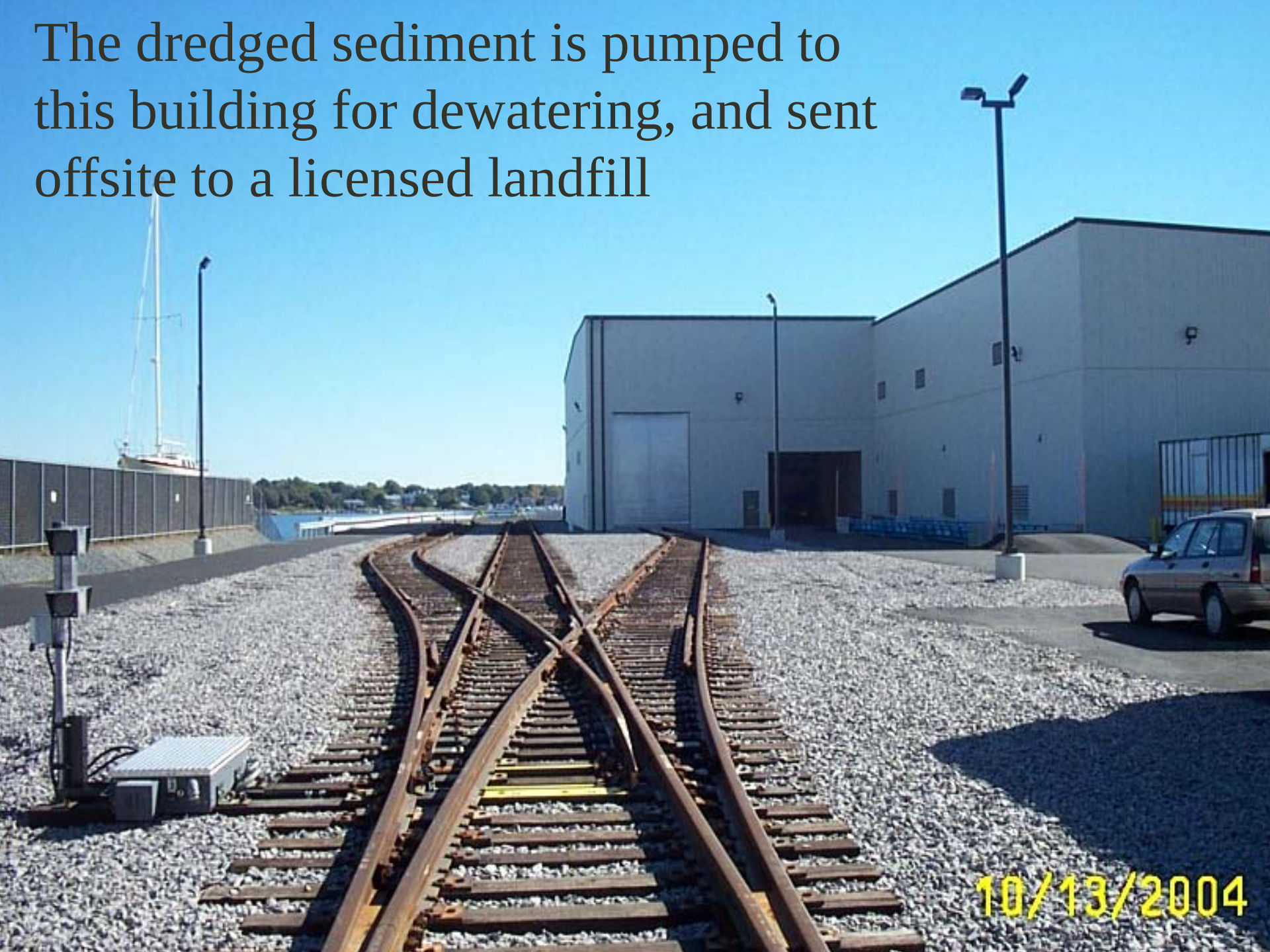
Produced By The US EPA New England GIS Center
30-May-2003

Site summary

- 18,000 acre study area
- Max PCB levels >100,000 ppm
  (the highest levels we're aware of in US)
- Full scale cleanup began fall 2004
  - several targeted cleanups completed previously
- App. 900,000 cubic yards of sediment (260 acres) to be removed - one of the larger cleanups in the country
- Cleanup could take 10 to 20 years or more depending on funding

Full scale dredging started 9/04

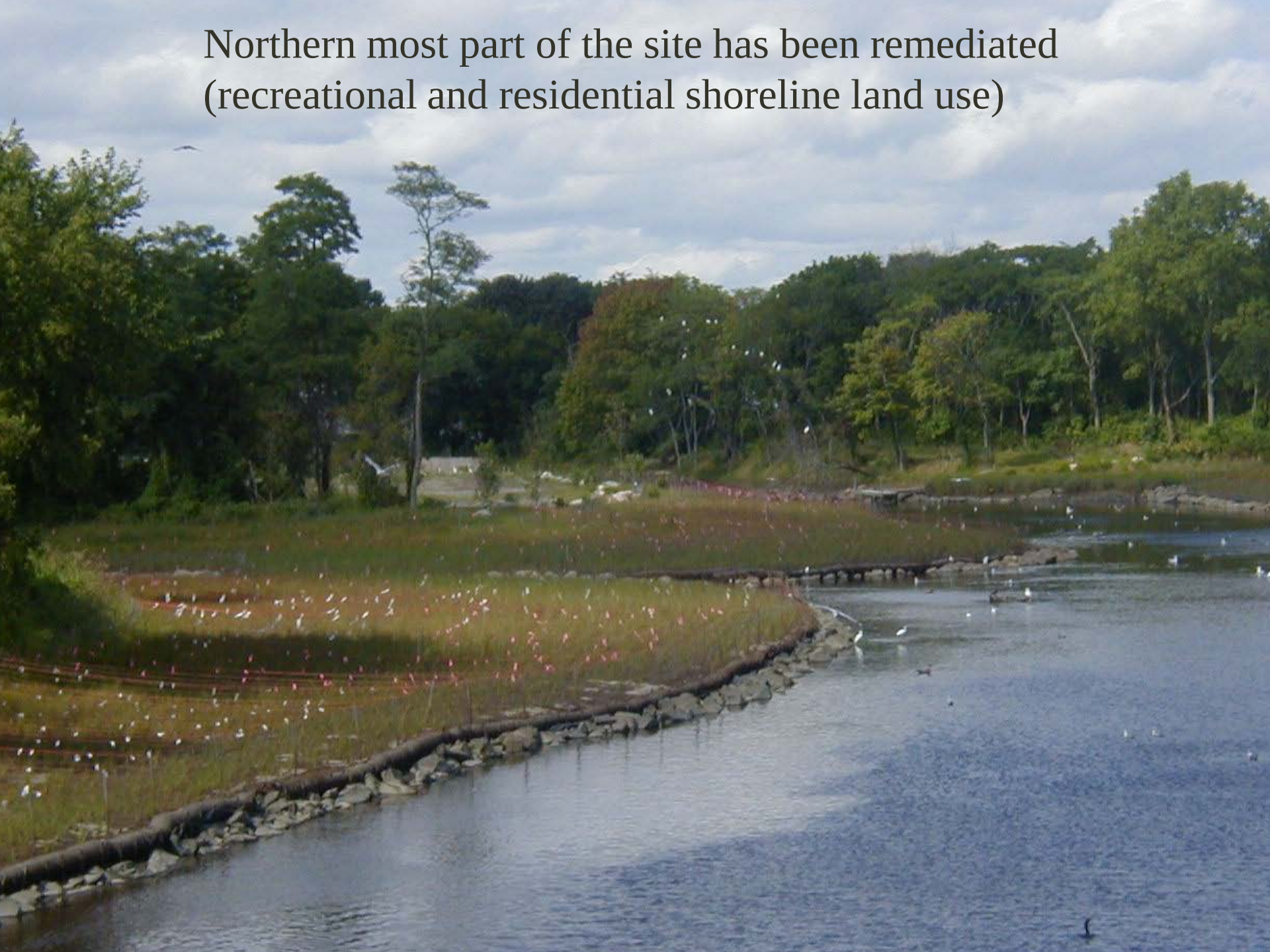
The dredged sediment is pumped to this building for dewatering, and sent offsite to a licensed landfill



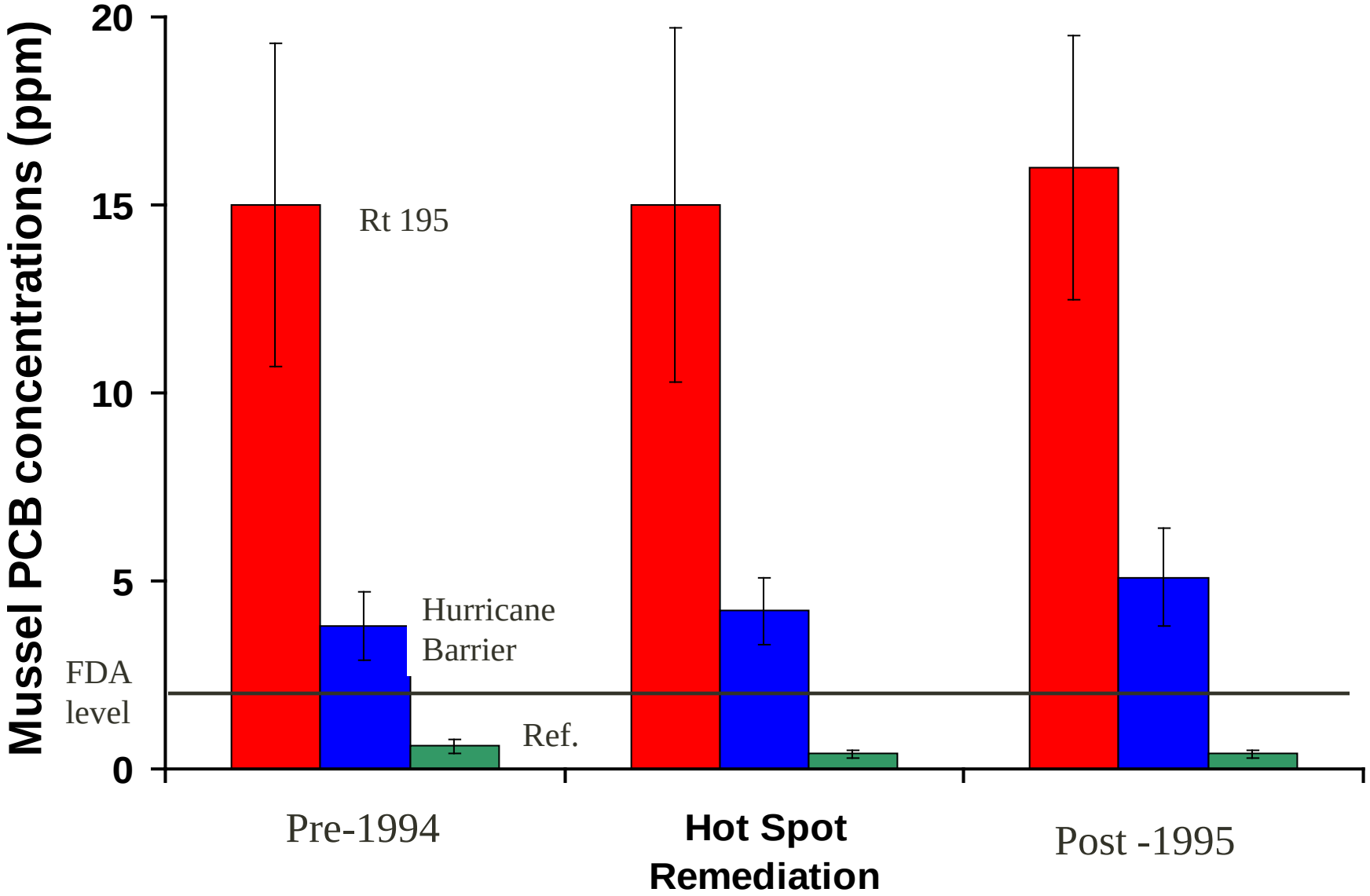
Human Health Risk

- Seafood consumption risk is 40 times higher than Superfund action levels (higher under worst case scenarios).
- Dermal contact with inter-tidal sediment is 4 times higher than Superfund action levels (higher under worst case scenarios).

Northern most part of the site has been remediated (recreational and residential shoreline land use)



But local seafood will remain contaminated for some time



NO FISHING!

PCB-Contaminated Fish

Until the ongoing cleanup of PCBs (poly-chlorinated biphenyls) in New Bedford Harbor is complete, no fish or shellfish shall be taken from these waters.

For more information go to www.epa/ne/nbh

PROIPIDO PESCAR!

PCB-Peixe Contaminado

Até a presente limpeza de PCBs (Policlorinato Bifenilos) no Porto de New Bedford estar completa, nenhum peixe ou marisco deverá ser retirado destas águas.

Para mais informações visite a internet www.epa/ne/nbh

¡PROHIBIDO PESCAR!

Los peces están contaminados con PCB

No se permite la pesca de peces o mariscos en estas aguas, hasta que no se haya terminado la limpieza actual de los PCBs (Bifenilos policlorados) en el puerto de New Bedford.

Para más información visite www.epa/ne/nbh

Warning! Catch and Release

PCB-Contaminated Fish

Until the ongoing cleanup of PCBs (poly-chlorinated biphenyls) in New Bedford Harbor is complete, fish caught in these waters should be immediately released.

For more information go to www.epa/ne/nbh

Aviso!

Captura e Libertação

PCB-Peixe Contaminado

Até a presente limpeza de PCBs (Policlorinato Bifenilos) no Porto de New Bedford estar completa, o peixe capturado nestas águas deverá ser imediatamente lançado à água.

Para mais informações visite a internet www.epa/ne/nbh

¡Aviso!

Sólo se permite la pesca si se devuelven los peces al agua. Los peces están contaminados con PCB.

Toda la pesca de estas aguas debe devolverse inmediatamente al agua mientras se lleva a cabo la limpieza de los PCBs (Bifenilos policlorados) en el puerto de New Bedford.

Para más información visite www.epa/ne/nbh

Fish Smart Campaign

- Targeted Audiences:
  - Women of Child-Bearing Age;
  - Children;
  - Fishing Population

(Note that this target audience is consistent with MA DPH's statewide fish advisory for mercury and PCBs – for more info go to www.mass.gov/dph/beha/beha.htm)

Campaign Strategy

- Partnerships:
  - Local Medical Providers – GR, GNBHC
  - Social Service Providers – Immigration Assistance Center, Dept. of Transitional Assistance
  - Marinas & bait shops throughout the area
  - Schools – Gomes Elementary School

Campaign Tools

- Posters
- Health Flyers
- Direct Mailer
- Bus & Public Housing Posters
- Media: radio, cable, print.
- No fishing signs along the shore

Requested Assistance

- Hanging Posters
- Distributing Health Flyers
- Inquiring about Fish Consumption Habits & Advising Patients

REPOSITORY TARGET SHEET

US EPA New England
Superfund Document Management System /
RCRA Document Management System
Native Files Target Sheet

SDMS Document ID #: 507929

Site Name: NEW BEDFORD

File Break: 13.04

File Type(s) Attached (examples: Excel file or .jpg): POWERPOINT PRESENTATION

Document Type this Target Sheet Represents:

[ ]	Map	[ ]	Photograph	[ ]	Graph/Chart
[ ]	Video	[ ]	Compact Disc	[X]	Other (Specify below)

Description or Comments:
GR.N04.ppt

To view the attached files, open the "Attachment Panel" by clicking on the paper clip - - at the bottom left of this window.

** Please note to view attachments the software corresponding with the specified file type is necessary. **

For any additional assistance please contact the EPA New England Office of Site Remediation and Restoration Records and Information Center-
Telephone (617) 918 1440