Cleanup and Remediation

of Persistent Bioaccumulative Toxics in the Great Lakes Basin

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PBT Strategy Team Maumee Bay Meeting

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Purpose and Scope of White Paper

- Bring the PBT team up to a general level of knowledge on existing activities
- "Describe how, and how much remediation of toxic substances happens in the basin, over against what we think the overall problem is"

Information Tapped

- USEPA and IJC sources
- GE database of sediment remediation
- GLRC PBT and AOC teams correspondence and web postings

The Problem as it relates to Existing PBT Sediment Deposits

- Lake-wide mass balance modeling efforts show resuspension of surficial contaminated sediment deposits control the current rate of reduction of banned chemicals such as PCBs, rather than watershed or atmospheric load reductions
- or, Putting Clean Water in the Dirty Bathtub Results in Dirty Water, for a time...

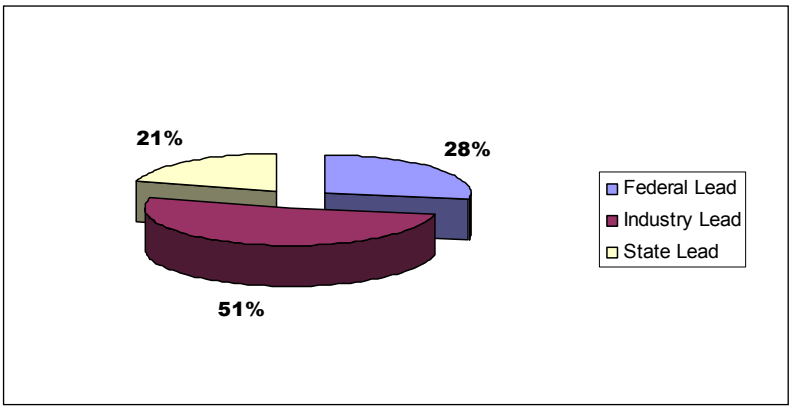
Existing Remediation Drivers

- CERCLA, RCRA, Clean Water Act
- Port Redevelopment - address loss of use
- Liability Reduction - address NRDA
- Prime Real Estate Redevelopment
- Private/public partnerships
- Voluntary Actions

Remediation Funding Sources

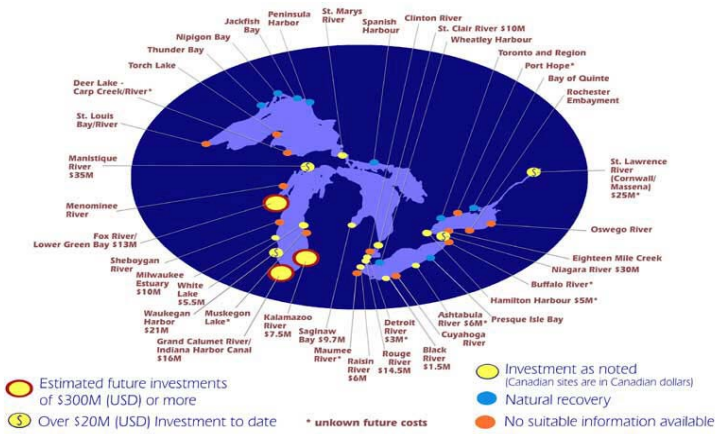
- Industry
- Insurance Settlements
- Superfund
- WRDA
- Great Lakes Legacy Act
- Direct congressional inserts in bills
- State, municipal and local funds

Sediment Cleanups By Sector

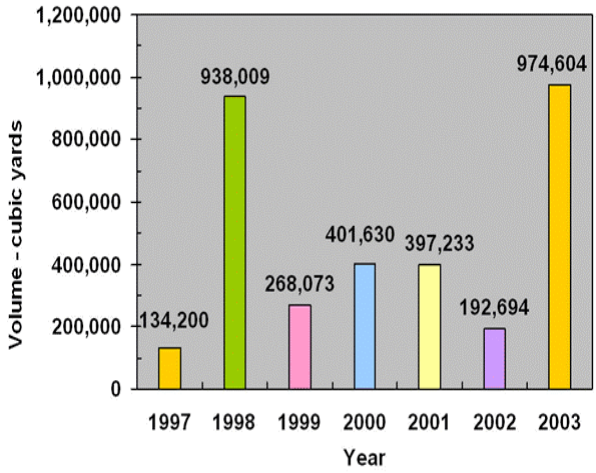


Total Number = 86
Active and Completed Projects
Data Obtained from USEPA and
Sediment Database Published by GE

Of 26 US-only AOCs, sediment remediation ongoing in 14, re April 2003 IJC report



Yearly volume of sediment removed from US Great Lakes Basin



Estimated Quantities Removed from Great Lakes Basin

- **Per USEPA estimate**
  - **3.3 M cubic yards from 1997 thru 2003 in U.S.**
- **Per Great Lakes Binational Toxics Strategy, 2003**
  - **596 tons of PCB in U.S.**
  - **519 tons DDT in U.S.**
  - **3 tons benzo(a) pyrene in Canada**
  - **43 pounds mercury in Canada**
  - **total 34,000 cubic yards in Canada**

Estimated Future Quantities and Cost

- As of January 2005, USEPA GLNPO has estimated there are 76 M cubic yards of contaminated sediment in the AOCs to be remediated, at a cost between $1.6 to $4.4 billion

How the Remediation is done

- Monitored Natural Recovery
- Capping (includes reactive caps)
- Dredging

- At many sites, a combination of these approaches are implemented

Monitored Natural Recovery

- Uses known, ongoing, naturally occurring processes to contain, destroy, or otherwise reduce the bioavailability or toxicity of contaminants in sediment.
- Burial by clean sediment is often the dominant process
- Can be effective for low-risk sites where long-term stability of sediment bed is not a concern

Capping

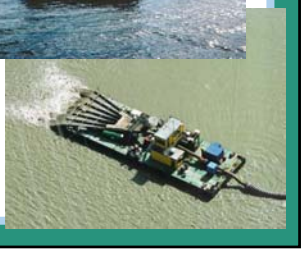
- Definition: "placement of a subaqueous covering or cap of clean isolating material over an in-situ deposit of contaminated sediment".
- Generally constructed of clean sediment, sand, or gravel, but can also include geotextiles, liners, or the additions of material such as organic carbon to sequester contaminants
- Functions:
  - Physical isolation from benthos
  - Physical stabilization
  - Reduction in contaminant flux

Capping

- Typically less expensive than environmental dredging
- Requires long-term monitoring as contaminants left in place

Placement Equipment and Techniques

- Conventional Placement
  - Hopper dredge
  - Pipeline
  - Barge
- Spreading Methods
- Submerged discharges



Dredging

- Typically most expensive remedy, results in greatest mass removal
- Currently most common means of sediment remediation in the Great Lakes Basin
- Can be conducted in the dry, after water body or portion of is diverted or drained

Dredging Components

- sediment removal
- staging
- dewatering
- water treatment
- sediment transport and possible treatment
- potential re-use
- disposal

Environmental Dredging Equipment Categories

Conventional Clam

Enclosed Bucket

Articulated Fixed-Arm

Conventional Cutterhead

Horizontal Auger

Pneumatic

Diver-Assisted

Major Dredging Considerations

- Have clear objectives, goals, and standards
- Coordinate equipment availability and selection
- Must understand:
  - Removal rate and precision
  - Resuspension of sediment during dredging
  - Release of dissolved and volatile contaminants
  - Residual sediment left behind
  - Requirements for transport for treatment or disposal

Dewatering after dredging

Fox River OU1 2004 Pilot Test geotubes

Beneficial Uses of Dredged Material

Examples of Beneficial Use

Clean
- Habitat Restoration
- Beach Nourishment
- Top Soil
- Parks and Recreation
- Agriculture, Forestry, Horticulture
- Shoreline Stabilization

Slightly Contaminated
- Construction and Industrial Fill
- Material Transfer
- Top Soil

Contaminated
- Mine Reclamation
- Landfill Daily Cover
- Recycled Soil Manufacturing Technology

Beneficial Reuse of Dredge Material

- **Particle separation to create clean fraction**

Beach Nourishment

Q & A