Sediment Monitored Natural Recovery Evaluation Update

RTDF Sediments Remediation Action Team Meeting

October 29, 2002

John Davis, Dow Chemical
Tim Dekker, LimnoTech
Clay Patmont, Anchor Env.
Mike Swindoll, ExxonMobil
Presentation Outline

- RTDF Subgroup Overview
- Goals and Objectives
- Progress of Subgroup Activities
- Five Evaluation Elements
- Example Case History
- Path Forward
RTDF Sediments Remediation Action Team

- One of five current Action Teams under RTDF
- Representatives from government, industry, and academia
- Four sub-groups:
  - Assessment
  - Monitored Natural Recovery (MNR)
  - Capping
  - Treatment
RTDF Sediments MNR Core Workgroup

- John Davis: The Dow Chemical Company
- Tim Dekker: Limno-Tech, Inc.
- Victor Magar: Battelle Memorial Institute
- Dale Matey: EPA Office of Emergency and Remedial Response
- Douglas McLaughlin: Blasland, Bouck, and Lee, Inc.
- Clay Patmont: Anchor Environmental, LLC
- Mike Swindoll: ExxonMobil Biomedical Sciences, Inc.
Goals and Objectives

• Provide guidance on the technical confirmation of MNR for contaminated sediment
  • Framework for Evaluation (5 elements)
  • Case History Examples

• Apply the framework to assess the effectiveness of sediment MNR as a risk management alternative to reduce risk to human health and the environment
Sediment MNR: Five Assessment Elements

1. Characterization of historical contaminant sources/controls

2. Characterization of sediment stability and fate/transport processes

3. Compilation of a sufficient historical record for chemicals of interest to characterize temporal trends

4. Compilation of historical trends in relevant biological endpoints to corroborate chemical data

5. Development of acceptable and defensible modeling tools to allow prediction of future MNR
Progress of Workgroup

**Baltimore Sediment RTDF Meeting – February 2002:**
- Reviewed approach for evaluating MNR at sites
- Presented 2 example case histories

**Recent Activities:**
- Meetings - Ann Arbor (spring) & Columbus (summer)
- Conference calls
- Refined evaluation framework/developed template
- Additional case history examples
Initial Case History Sites

- Bellingham Bay, Washington
- Eagle Harbor, Washington
- Commencement Bay (Sitcum Wtwy under-pier), Washington
- Spokane River/Lake Coeur d’Alene, Washington/Idaho
- Palos Verdes Shelf, California
- Lake Hartwell, South Carolina
- Morrow Lake, Michigan
- James River, Virginia
MNR Case Histories – Washington State

- Bellingham Bay
- Spokane River
- Eagle Harbor
Element 1: Bellingham Bay Site Conditions - Verification of Source Control

- Identify Chemicals of Potential Concern
- Source Control Implementation
- Mercury & Wood Debris
  - Mercury - ’70
  - Wood - ’72, ’78, ‘99
Element 1: Mercury Release and Source Control in Bellingham Bay

Mercury Loading (kg/day)

Nooksack River – “Background”
Element 2: Sediment Stability and Fate/Transport Characterization – Bellingham Bay
Element 3: Historical Declines in Surface Sediment Mercury After Source Control – Bellingham Bay

- Station 3A (Log Pond; near release)
- Station 3 (Inner Bay)

Surface Sediment Mercury (mg/kg)

Sediment Cleanup Level

Element 3: Temporal Changes in Core Profiles - Inner Bellingham Bay

![Graph showing sediment mercury levels over time and depth](chart.png)
Element 4: Biological Recovery - Reduction in Sediment Toxicity, 1984 to 1996
Element 4: Biological Recovery - Reduction in Sediment Toxicity, 1996 to 2002
Element 5: Forecasting Models – Bellingham Bay

- Initial Model Development in 1980
  - Radioisotope Dating
- Model Refinements in 1989 and 1996
  - Sediment Traps; Resuspension Rates
- Several Models Used
  - Officer and Lynch; WASP
- Model Validation
  - Predicted Changes in Core Profiles
Primary modes of recovery: settling/burial, resuspension/advection, chemical decay/biodegradation
Natural Recovery and Navigation Dredging in Bellingham Bay

- Well documented 30-yr sediment natural recovery
  - Natural recovery of sediments now largely complete

- Washington State sediment standards also consider maintenance dredging in stability evaluation

- Navigation dredging – natural recovery connection
  - Natural recovery evaluation used to develop performance standards of dredge residuals
  - Models predict recovery of post-dredge residuals within 1 to 3 years
Path Forward

- Finalize MNR evaluation framework
- Complete case history template
- Document representative set of case histories
- Develop framework and case study presentations and publications
- Develop web site
Monitored Natural Recovery Case Studies - Morrow Lake, Michigan

Introduction
Morrow Lake is located just east of Kalamazoo, Michigan, at the upstream end of the Kalamazoo River Superfund site. While the lake is not part of the Superfund site, extensive data has been collected in the lake because the fish, sediment, and water in the lake contain PCBs that are representative of an upstream source to the system. Morrow Lake is approximately XX acres in size, with average depth ranging from XX to XX feet, and is downstream of the cities of XX, XX, and Battle Creek.

Assessment Elements
1. Summary of historical contamination sources and controls.
   Major industrial sources of PCBs to the Kalamazoo River system are primarily downstream of Morrow Lake. PCB discharges upstream of the Lake are not well characterized, and are related to diffuse industrial sources. Because of the diffuse nature of the sources, specific actions taken to reduce upstream contaminant discharges are generally unknown, but are thought to coincide with the general phase-out of PCBs that occurred in the early-to-mid-1970s. Coring data from the lake also indicates a trend of decrease in loadings since the 1970s.
Initial Case History Sites

- Bellingham Bay, Washington
- Eagle Harbor, Washington
- Commencement Bay (Sitcum Wtwy under-pier), Washington
- Spokane River/Lake Coeur d’Alene, Washington/Idaho
- Palos Verdes Shelf, California
- Lake Hartwell, South Carolina
- Morrow Lake, Michigan
- James River, Virginia
Objective Defined

Procedure for Evaluating MNR

Case History summaries

Other Sites

Case History Evaluation (detail)

RTDF Web Site

Draft Manuscript

Technical Presentations

Draft Manuscript

RTDF Review

Peer Review Publication

RTDF Review

Peer Review Publication
Great Lakes Areas of Concern: Index map of US Areas of Concern - Microsoft...  

Great Lakes

Areas of Concern (AOCs) On-line

In an effort to clean up the most polluted areas in the Great Lakes, the United States and Canada, in Annex 2 of the Great Lakes Water Quality Agreement, committed to cooperate with State and Provincial Governments to ensure that Remedial Action Plans (RAPs) are developed and implemented for all designated Areas of Concern (AOCs) in the Great Lakes basin.

- Ashtabula River, Ohio
- Black River, Ohio
- Buffalo River, New York
- Clinton River, Michigan
- Cuyahoga River, Ohio
- Deer Lake, Michigan
- Detroit River, Michigan
- Eighteenmile Creek, New York
- Grand Calumet River, Indiana
- Kalamazoo River, Michigan
- Lower Green Bay and Fox River, Wisconsin
- Menominee River, Michigan

Click on a dot to see information about US Areas of Concern.

Information about Binational and Canadian Areas of Concern is maintained by Environment.