Advantages and Disadvantages of In-Situ Subaqueous Capping

Dr. Michael R. Palermo
Dr. Ram Mohan
In-Situ Capping

• ISC – placement of a subaqueous covering or cap of clean isolating material over an in-situ deposit of contaminated sediment.

• Potentially economical and effective remedy approach.

• Should be considered equally with other remedy options such as MNR or Environmental Dredging.

• Successfully implemented at a number of sites.
In-Situ Capping

• Advantages
  – Containment in place
  – Easy to implement
  – Quick and cost effective
  – Provides opportunities for habitat enhancement

• Disadvantages
  – Containment in place
  – Emerging technology
  – Water depths reduced
  – Subject to erosive forces
  – Long term monitoring/ maintenance required
Advantage – Containment in Place

• Does not require removal
• Quickly reduces exposure to contaminants and thereby quickly reduces risks
• Less infrastructure for materials handling, dewatering, treatment, and disposal
• No disposal site required
• No transfer of risks to other media
• Only viable remedy for some site conditions
Advantage – Easy to Implement

- Placement of granular cap materials involves conventional technologies
- Short term risks during implementation (resuspension and volatilization) are less than for dredging
- Less disruptive for nearby communities (no trucking of contaminated materials, etc).
Advantage – Quick and Cost Effective

• Can be implemented quicker than removal for most sites and conditions
• Comparison of cost per acre capped vs. cost per cubic yard removed often shows a significant cost advantage
Advantage – Provides Opportunities for Habitat Enhancement

• Cap material and armor materials may be selected to meet substrate requirements for target fish species or aquatic vegetation
Disadvantage – Containment In-Situ

- Sediments remain in the aquatic environment
- Containment by cap does not totally eliminate low-level releases
- Contaminants may be exposed if cap is disturbed
- Perception of just burying the problem
- Conventional caps do not meet the CERCLA preference for treatment
- Institutional controls may be required
- Future site uses may be constrained
Disadvantage – Emerging Technology

- Implemented at a number of sites, but not as commonly selected as removal
- A range of processes and drivers must be taken into account in determining effectiveness and implementability
- Acceptance by environmental agencies requires a convincing case
Disadvantage – Water Depths Reduced

• Changes to habitat type, flood-carrying capacity, or circulation must be evaluated
• May require partial dredging to mitigate potential effects
Disadvantage – Subject to Erosive Forces

- Episodic events must be considered
- Return periods an issue
- A range of drivers must be considered
  - Storm-generated waves
  - Flood-generated currents
  - Prop wash from vessels
  - Ice Scour and Ice-Induced Currents
- Armor layers may be required
Disadvantage – Long Term Monitoring/Maintenance Required

- Provisions for routine maintenance for some components may be needed
- Long term monitoring programs must be designed for site specific conditions
- Long term funding mechanisms must be established
In-Situ Capping – Take Home Message

- ISC – one tool in the toolbox
- Potentially economical and effective remedy approach.
- Should be considered equally with other remedy options such as MNR or Environmental Dredging.
- Requires a site-specific, sediment-specific, and project-specific engineered design.
Any Questions?

Email:
rkm@bbl-inc.com
mike@mikepalermo.com