Portland Harbor Superfund Site

Remedial Technologies Screening Process and Use of Alternative Technologies

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Kira Lynch and Sean Sheldrake, U.S. EPA Region 10

When did EPA consider alternative technologies?





Technology Types and Process Screening Options



- Screening technology types reduces number of process options to consider
- Innovative technologies warrant special consideration
- A variety of technology information resources is available

Screening Process Options



Effectiveness Implementability **Relative Cost**

(continued

Relationship of Screening Criteria to the Nine Evaluation Criteria





PROBLEM: MANAGING EXPOSURE FROM HISTORIC DEPOSITS OF CONTAMINATED SEDIMENTS



- Contaminated sediment sites are large and often have many contaminants.
- How do you clean up an ecologically sensitive site without destroying it?
- Current cleanup options limited to removal, containment, and natural recovery.
- Innovative techniques that reduce risks focus on changing sediment geochemistry to alter bioavailability in containment options.



Questions?



Remedial Technologies Selected During Feasibility Study Screening Process









UNITED STATED

GENCY

ENVIRO





TED STAT

Source: Ghosh et. al., 2011



Monitored Natural Recovery (MNR)



ENVIRU



The cleanup will consist of different combinations of:





In-Situ Treatment

With carbon amendments in some caps and sand covers

Natural Recovery

Remedial Technology		Area (Acres)	Time (Years)	Cost
Clamabell Dredge Contaminated Dredged Marinal Barge Contaminated Contaminated Science of Contaminated	Dredging	215		
Dredging Clean Sand Clean Sand Cl	Dredge/Cap	32	13	\$1,054 Million
	Capping	118		
<image/>	In-Situ Treatment (with other technologies)	131		
Riprap Armored Bank 6-9" of Sand	ENR	28		
Net Burial Recent Sediment Buried Contaminants Newly Deposited Green River Sediment Sediment	MNR	1,774	?	



Questions?



Other Remedial Technologies Not Selected During FS Screening Process

Why were technologies screened out?



- Many treatment technologies for the dredged contaminated sediment were considered during the Feasibility Study
- **Remember:** For all treatment technologies the following criteria were used for screening:
 - Implementability
 - Effectiveness
 - Cost

Treatment technologies were screened out if **they did not meet** one or more of these criteria

Land Farming/Composting





Source: EPA 2005, Figure 3-6

Source: EPA 2006, Figure 3-6

Biopiles





Source: EPA 2017, Exhibit IV-1

Fungal Biodegradation





Source: Harms et al. 2011, Figure 1

Slurry-phase Treatment





Source: Zhang et al. 2001, Figure 1

Solvent Extraction





Source: EPA 1996, Figure 1

Incineration





Source: EPA 2012a, Figure 1

High Temperature Thermal Desorption





Onsite thermal desorber.

Source: EPA 2012b



Vitrification





Source: Khan et al. 2004, Figure 3



Questions?



Use of Alternative Technologies at the Portland Harbor Superfund Site

Use of Alternative Technologies



- Technologies not selected during the sitewide feasibility study screening process may have viability on a specific project-area basis
- Can be used to supplement dredging and capping
- Will need to be evaluated during treatability study phase of remedial design

USE OF AMENDMENTS FOR IN-SITU REMEDIATION OF SUPERFUND SEDIMENT SITES

OSWER Directive 9200.2-128FS; April 2013





- In situ sequestering or destruction of contaminants with:
 - Activated carbon
 - Organoclay
 - Phosphate additives
- Promote degradation of contaminants, reduce contaminant transport, reduce cap thickness, increase erosion resistance
- Placed within a geotextile mat, onto or into sediment, combined with other capping materials



ACTIVATED CARBON (and other carbon sources) -- treats PAHs, PCBs, dioxins

How Activated Carbon Works













Integrated Conceptual and Actual View of AquaBlok® Capping Material (EPA Tech Trends, February 2000)

PHOSPHATE ADDITIVES (such as apatite) -- treats metals



RECENT DEMONSTRATION PROJECTS

San Francisco Bay, CA, USA, 2006



SLURRY INJECTION AND ROTOTILLER.

Grasse River, NY, USA, 2006



SLURRY INJECTION AND COVERED ROTOTILLER

Trondheim Harbor, Norway, 2006



SLURRY INJECTION WITH AND WITHOUT CLAY

Berry's Creek, NJ, USA, 2012



PELLETIZED CARBON DELIVERY (SEDIMITE) Grenlandsfjords, Norway, 2009



ACTIVE CAP OF SITE CLAY AND ACTIVATED CARBON MIXTURE

Abraham's Creek, MD, USA, 2014



PELLETIZED CARBON WITH DEGRADERS DELIVERY (SEDIMITE)

Bailey Creek, VA, USA, 2009



PELLETIZED CARBON DELIVERY (SEDIMITE) Canal Creek, MD, USA, 2010



PELLETIZED CARBON DELIVERY (SEDIMITE)

Want more information?

Check out our fact sheet!



IN SITU AMENDMENTS

at Contaminated Sediment Superfund Sites Innovative technology for cost-effective sediment remediation. WHAT ARE IN SITU AMENDMENTS?

Specialized materials used to reduce risk through in situ sequestering or destruction of contaminants in sediment.

- Activated carbon
- Organoclay
- Phosphate additives

WHY USE AMENDMENTS?

- Decrease contaminant bioavailability by sorption
- Reduce thickness of traditional sand caps
- Reduce advective transport of contamination by ebullition, non-aqueous phase liquid (NAPL) or groundwater flow
- Enhance resistance to erosion events
- Promote degradation of contaminants

HOW ARE AMENDMENTS APPLIED?

Used alone or in conjunction with other sediment remedies.

- Contained within a geotextile mat (amendment mat)
- Placed into or onto sediment surface, alone or temporarily adhered to a higher density conglomerate (bulk placement)
- Mixed into sediment
- Combined with other capping materials



Questions?

Kira Lynch | lynch.kira@epa.gov | 206-553-2144

Sean Sheldrake | sheldrake.sean@epa.gov | 206-553-1220