Development of EE/CA Removal Action Alternatives

January 25, 2012

Imagine the result

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Presentation Outline

- Introduction
- USEPA Contaminated Sediment Remediation Guidance
- Available remedial technologies
  - Technology Description
  - Overview of Implementation Process
  - Example Photos of Technologies
  - Examples from other Superfund sites
  - Pros/Cons
- Data gaps
- Path Forward

Introduction

- A range of risks are represented by the varying concentrations of detected COCs in Yosemite Slough
- Remedial alternatives for Yosemite Slough will be evaluated in terms of USEPA's Contaminated Sediment Remediation Guidance and account for the range of risks
- Alternatives will include multiple technologies

USEPA Contaminated Sediment Remediation Guidance (Dec. 2005)

- Focuses on considerations for feasibility studies and remedy selection for contaminated sediments
- In key considerations section for Feasibility Studies:
  - “Generally, Project Managers should evaluate each of the three major approaches: Monitored Natural Recovery (MNR), in-situ capping, and removal through dredging or excavation, at every sediment site.”
  - “At sites with multiple water bodies or sections of water bodies with different characteristics or uses, alternatives that combine a variety of remedial approaches are frequently the most promising.”

Available Remedial Technologies

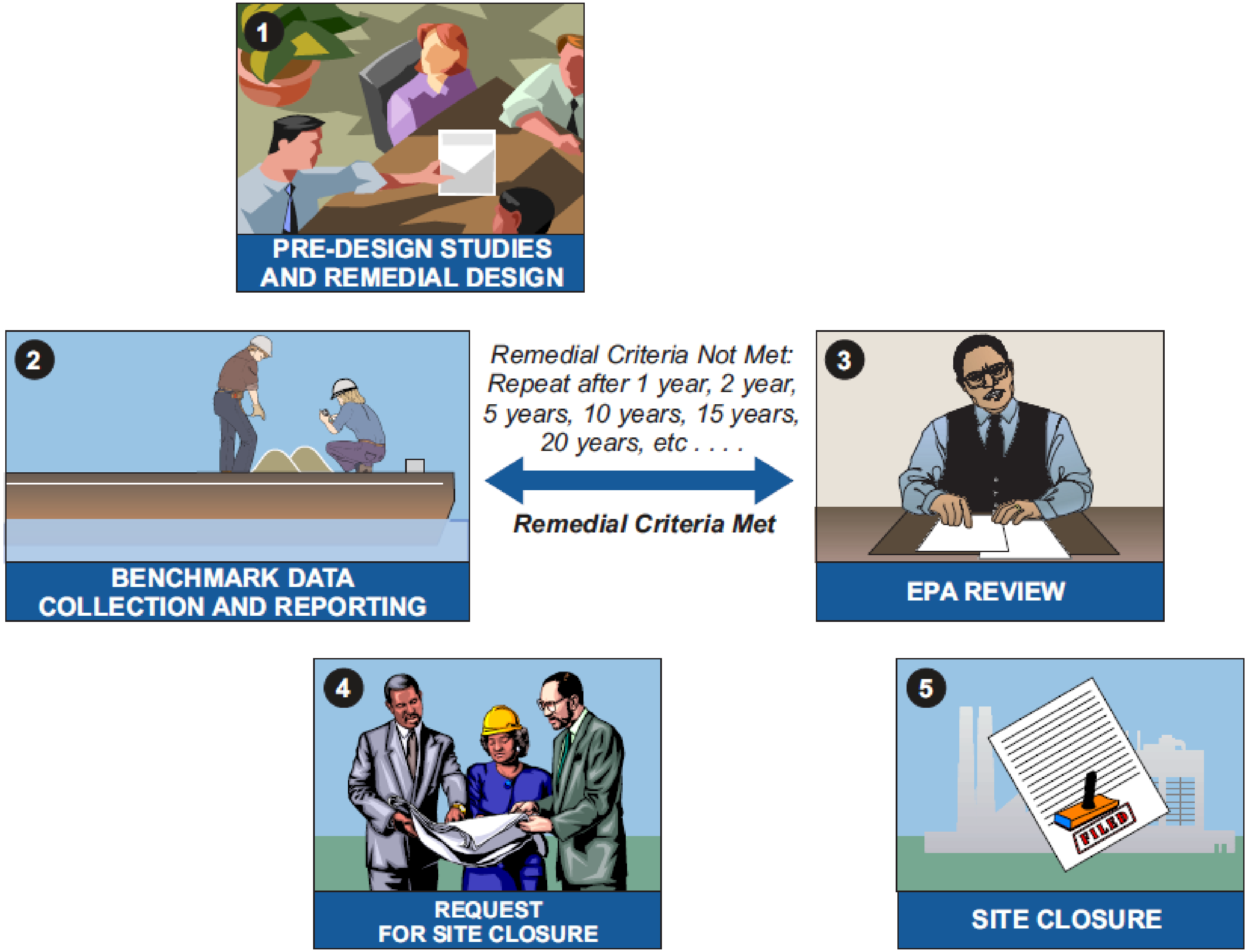
- Remedial technologies that should be considered for sediment sites:
  - Monitored Natural Recovery (MNR)
  - In-situ treatment (activated carbon)
  - Capping
    - Thin-layer
    - Activated
    - Isolation
  - Dredging and offsite disposal
- All technologies require source control measures to mitigate recontamination

- Note: Typically, the population of benthic organisms is greatest in the top few centimeters of sediment. The PCB TMDL for San Francisco Bay assumes an active sediment layer of 15 cm (approximately 6 inches)

Monitored Natural Recovery

- Let natural processes, such as sedimentation, reduce surface concentrations over time
- MNR is an active remedy which includes regular monitoring of process, including bathymetry surveys to track sedimentation, and sediment sampling to confirm that surface concentrations are reducing
- Enhanced MNR includes placement of a thin layer of sand to promote recovery (See capping remedy description)
- Need to demonstrate sediment is stable, under anticipated flow conditions and tidal fluctuations

Monitored Natural Recovery



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Monitored Natural Recovery

Monitored Natural Recovery

Examples

- Palos Verdes Shelf – EPA Region 9 – Interim ROD prescribed MNR at this offshore site to be implemented as part of a multi-technology approach which also includes capping and institutional controls. Baseline monitoring has begun.

- Bremerton Naval Complex – EPA Region 10 – Enhanced MNR was applied to 16 acres of subtidal sediment with PCB concentrations greater than 6 mg/kg. Recent sampling demonstrated an increased likelihood for achieving the 10-year remedial targets.

- Thea Foss Waterway – EPA Region 10 – MNR and enhanced MNR were used in a multi-technology approach in conjunction with dredging and various capping methods.

- Duwamish Waterway – EPA Region 10 – MNR has been identified as a key remedial action as part of the multi-technology approach discussed in the FS.

Monitored Natural Recovery

- Pros
  - Reduced need for equipment and material staging areas
  - Takes advantage of natural processes already at work in Slough
  - As compared to other technologies:
    - Less complex to implement
    - Less intrusive to ecology
    - Fewer impacts to neighborhood from construction traffic when compared to a removal and disposal option
    - Lower cost
- Cons
  - Effectiveness depends on sedimentation rates
  - Time to complete remedy is longer than other technologies
  - COC mass remains in place

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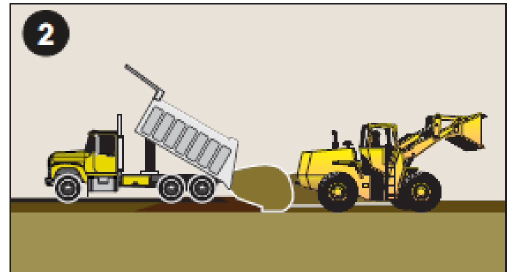
In-Situ Treatment

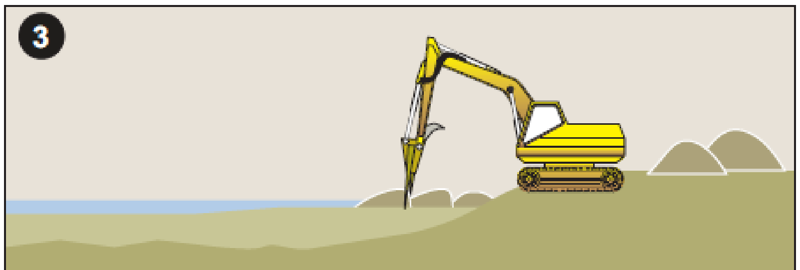
- Process uses sorbent material mixed in with surface sediment to adsorb hydrophobic organic chemicals (*i.e.*, PCBs)
- The remedial action focuses on reducing the bioavailability of these organic chemicals
- Need to demonstrate sediment is stable, under anticipated flow conditions and tidal fluctuations
- Still an emerging technology – full scale and long term application has not been completed

In-Situ Treatment

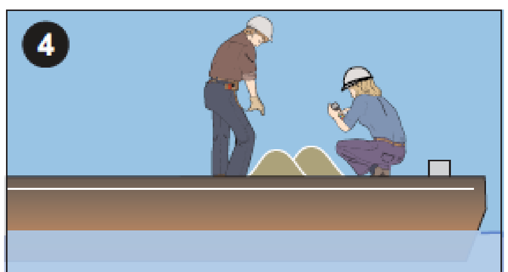
PRE-DESIGN STUDIES AND REMEDIAL DESIGN



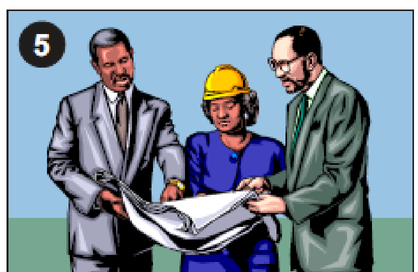
ACTIVATED CARBON STAGING AREA



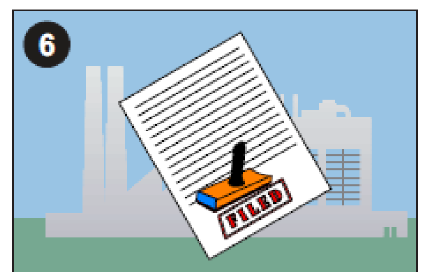
APPLICATION AND MIXING OF ACTIVATED CARBON



VERIFICATION DATA COLLECTION AND REPORTING



5 YEAR REVIEW AND REQUEST FOR SITE CLOSURE



SITE CLOSURE

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In-Situ Treatment

In-situ Treatment

Examples

- Hunters Point – EPA Region 9 – In-situ stabilization with activated carbon was evaluated in the FS for Hunters Point. A field pilot study (2008) led by the Department of Defense and Stanford University documented a reduction in PCB bioavailability.
- Grasse River – EPA Region 2 – A pilot study focused on in-situ stabilization with activated carbon was conducted in 2006 in sediments in the lower Grasse River. The pilot confirmed that PCBs adsorbed onto the activated carbon and became less bioavailable.

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In-Situ Treatment

Pros

- Positive results have been observed in lab-scale and field pilot studies
- Potentially less costly technology
- Fewer impacts to neighborhood from construction traffic when compared to a removal and disposal option

Cons

- Technology is unproven in full scale implementation and over the long term
- Regulatory acceptance is unknown
- Inorganics (*i.e.,* metals) are not sorbed using activated carbon
- Technology is dependent on cohesive sediment, localized depositional and scour rates, source control measures, installation and mixing capabilities
- Time to remedy effectiveness is longer than other technologies

Capping

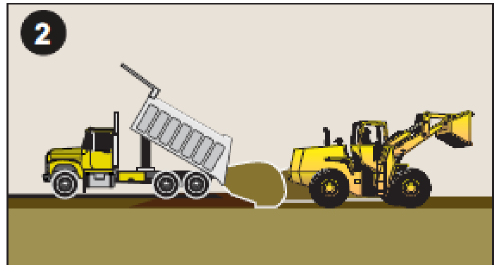
- Removal of surface sediments to create capacity for cap materials, so that final surface is flush with surrounding sediments
- If cap is placed on top of existing sediments, habitat would be impacted
- Need to demonstrate sediment is stable, under all flow conditions and tidal fluctuations
- May require armoring
- Will require monitoring

Capping Types

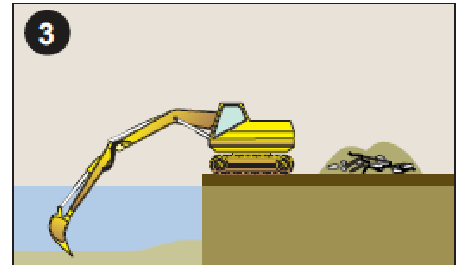
- Thin-layer capping:
  - 4 to 6 inches of clean sand
  - Intended to enhance natural recovery
  - Not designed for high-velocity or highly erosional areas
- Activated capping:
  - Uses materials such as organoclay, granular activated carbon, or coke breeze to enhance chemical isolation capacity and reduce cap thickness
- Isolation cap:
  - Typically clean sand 6 to 12 inches thick
  - Thickness of cap > bioturbation zone
  - May incorporate armoring to mitigate erosion

Capping

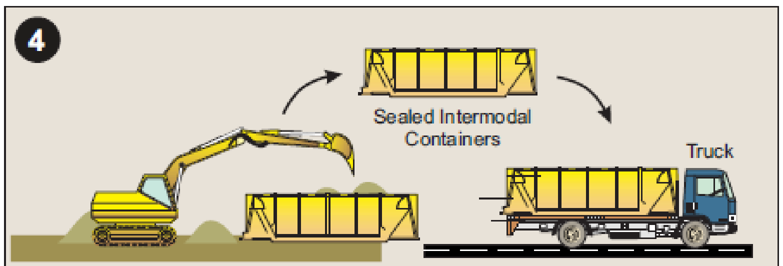
PRE-DESIGN STUDIES AND REMEDIAL DESIGN



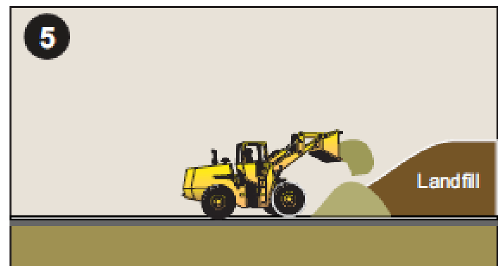
CAP MATERIAL HANDLING



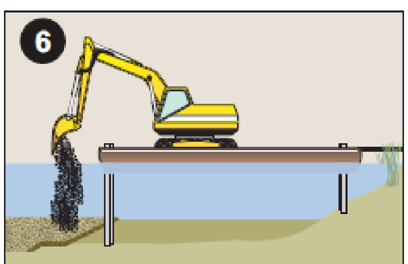
REMOVAL OF SURFACE MATERIAL



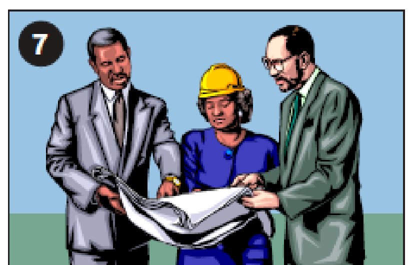
OFF-SITE MATERIAL HANDLING AND TRANSPORTATION ACTIVITIES



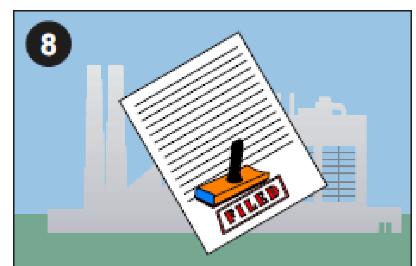
OFF-SITE DISPOSAL ACTIVITIES



CAP PLACEMENT ACTIVITIES



5 YEAR REVIEW AND REQUEST FOR SITE CLOSURE



SITE CLOSURE

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Capping

Capping

Examples

- Palos Verdes Shelf – EPA Region 9 – Interim ROD prescribed placement of a 300 acre cap over sediments impacted by PCBs as part of multi-technology approach
- East and West Eagle Harbor – EPA Region 10 – Both the east and west OUs associated with the Eagle Harbor Superfund Site used capping to isolate contaminated sediments in subtidal, nearshore and deep water areas.
- McCormick and Baxter/Old Mormon Slough – EPA Region 9 – In 2006, a ~2 ft. thick sand cap was placed over contaminated sediments in Old Mormon Slough in Stockton, CA.

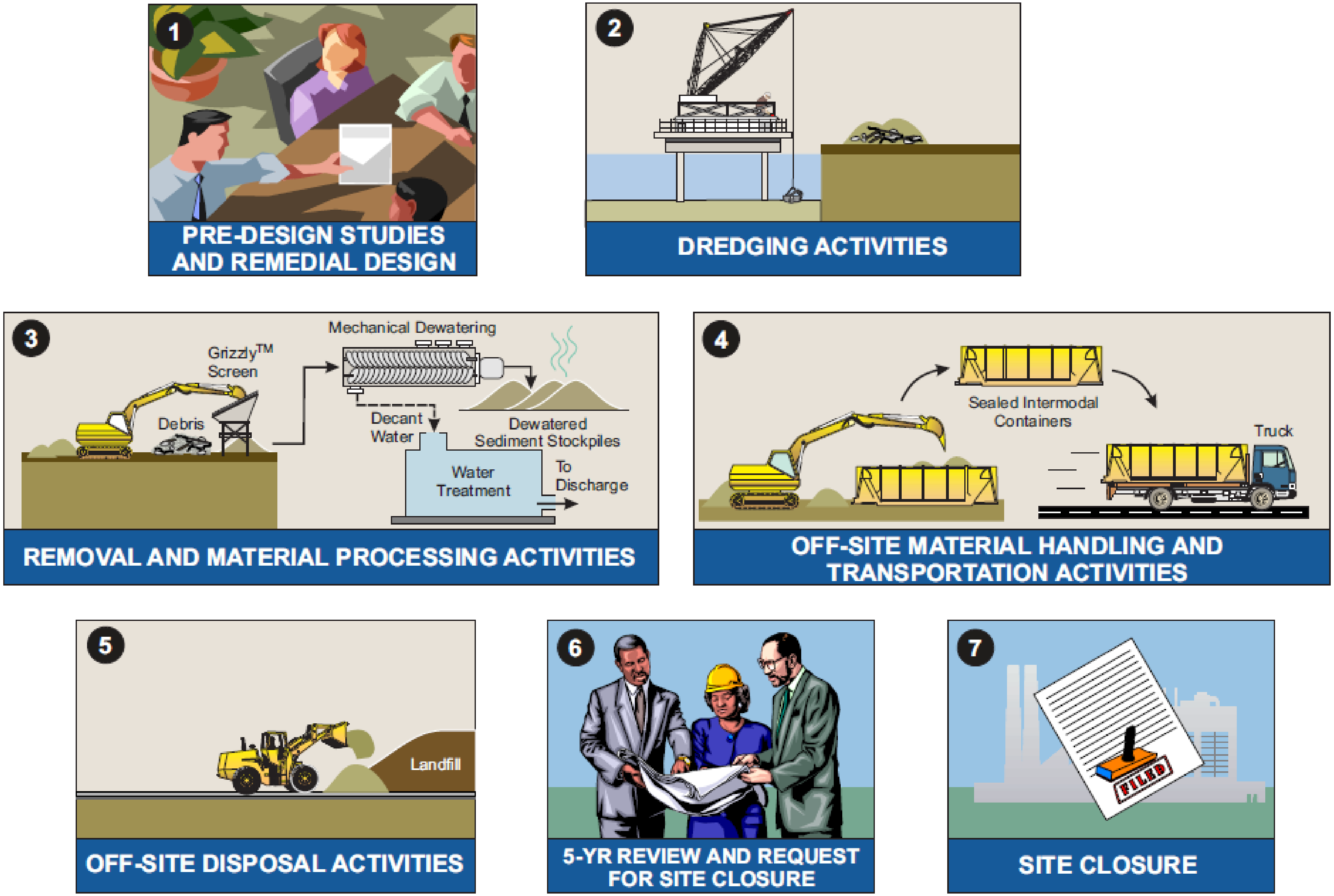
Capping

- Pros
  - Less material for disposal
  - Time to remedy effectiveness is relatively short
  - Can be designed for specific habitat objectives
- Cons
  - Restrictions on future use of submerged land, *i.e.*, maintenance dredging, anchoring, recreation
  - Long-term operation and maintenance, particularly after storm events
  - Seasonal restrictions on removal work associated with capping due to presence of fish species and recreational site use
  - Presence of debris can complicate removal necessary for construction of cap

Dredging

- Removal of impacted sediments
- Can be done hydraulically or mechanically
- Two mechanical options
  - “In the wet,” removing material through water column using turbidity barriers
  - “In the dry,” isolating work area from surrounding water body
    - Sheetpile cofferdam
    - Portadam
    - Soil berm
- Backfill or engineered cap placed to return dredged areas to grade

Dredging


1
PRE-DESIGN STUDIES AND REMEDIAL DESIGN
2
DREDGING ACTIVITIES
3
Mechanical Dewatering
Grizzly™ Screen
Debris
Decant Water
Dewatered Sediment Stockpiles
Water Treatment
To Discharge
REMOVAL AND MATERIAL PROCESSING ACTIVITIES
4
Sealed Intermodal Containers
Truck
OFF-SITE MATERIAL HANDLING AND TRANSPORTATION ACTIVITIES
5
Landfill
OFF-SITE DISPOSAL ACTIVITIES
6
5-YR REVIEW AND REQUEST FOR SITE CLOSURE
7
FILED
SITE CLOSURE

Dredging

Dredging

Notable Examples

- Thea Foss Waterway – EPA Region 10 – dredging is a primary remedial action taken at the Thea Foss Waterway.

- Duwamish Waterway – EPA Region 10 – dredging is identified as a remedial action in every multi-technology approach discussed in the FS.

- Gowanus Canal – EPA Region 2 – dredging has been identified as part of a multi-technology approach, along with various types of capping, in the recently published Draft FS for the Gowanus Canal.

- United Heckathorne Site – EPA Region 9 – Approximately 107,620 CY of sediment was dredged from the Parr Canal and Lauritzen Channel in 1996 and 1997 to remediate DDT contaminated sediments. The third Five-Year Review Report demonstrated that sediments have been recontaminated due to high concentrations of DDT left in inaccessible areas of the site.

Dredging

- Pros
  - Mass reduction technology
  - Does not restrict the future use of site (*i.e.*, allows for future navigational and recreational uses)
- Cons
  - Handling of large quantities of sediment could be problematic
    - Largest impact to surrounding community due to scale of construction activities required
    - Adjacent land used for parking during fall months for sporting events
  - Seasonal restrictions on dredging work due to presence of fish species and recreational site use
  - Most expensive technology when treatment/dewatering, transportation and disposal considered
  - Presence of debris can complicate dredging

Data Gaps

- Definition of extent of the site
- Bathymetry of Slough, including Mean High Water line
- Sediment stability
- Slough hydraulics, tidal fluctuations, and range of seasonal flow
- Geotechnical properties of Slough sediments
- Potential impacts of the surrounding wetlands mitigation work

Path Forward

- Collect data to close existing data gaps
- Screen available remedial technologies based on site characterization
- Develop remedial alternatives based on technology screening
- Evaluate costs and implementability of various remedial approaches

Questions/Discussion

