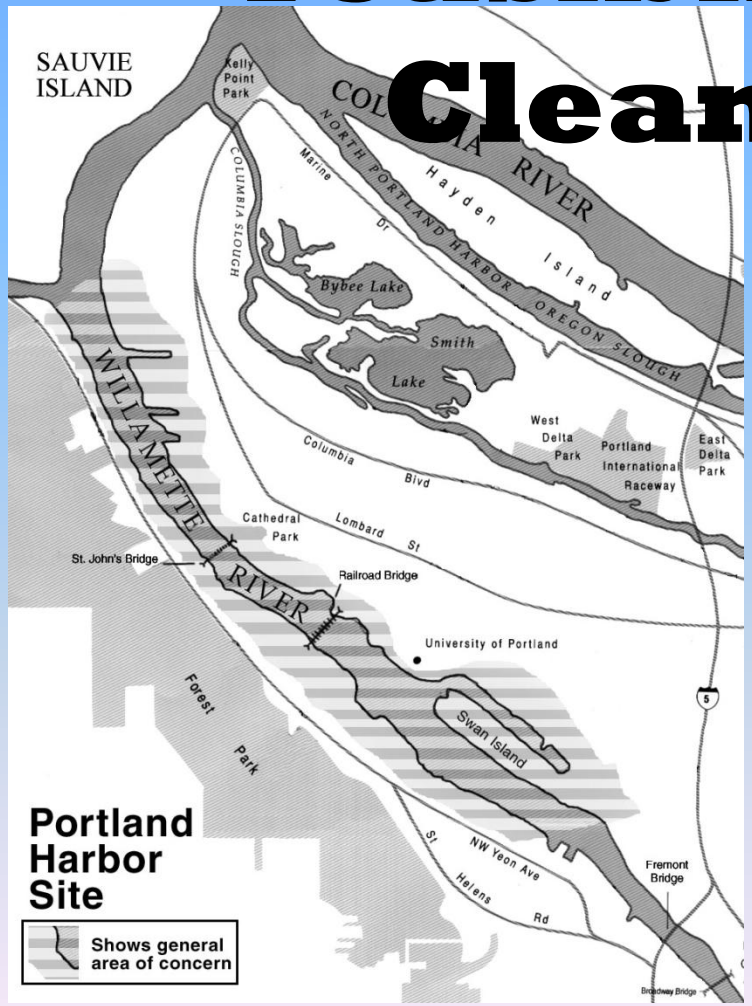
The Portland Feasibility Study and Cleanup Options



Dr. Peter deFur
Environmental Stewardship Concepts

March 11, 2010

Considerations for Cleanup Options

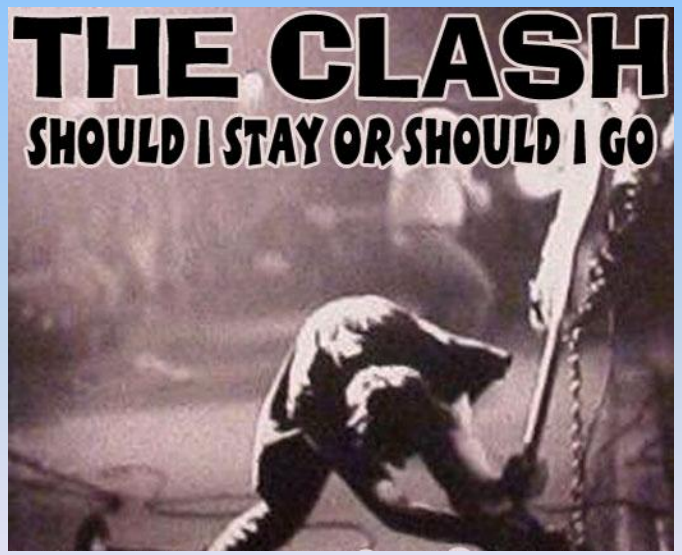
- Sediment transport: tides, currents, waves, wakes, scour, prop wash
- Water depth
- Ship traffic
- Contaminants
- Distribution of contaminants
- Future uses
- Wildlife

Alternative must meet criteria in the NCP

- Protect human health and the environment?
- Comply with local, state, federal laws (ARARs)?
- Is it possible?
- Effective over the short and long term?
- Treatment decrease the mobility and volume of contaminants?
- Do the community and state accept the alternative?

Two categories of remediation

- Removal
- Non-removal



Removal

- Dredging
  - –Hydraulic
  - – Mechanical (clamshell, environmental bucket)

Dredge Equipment

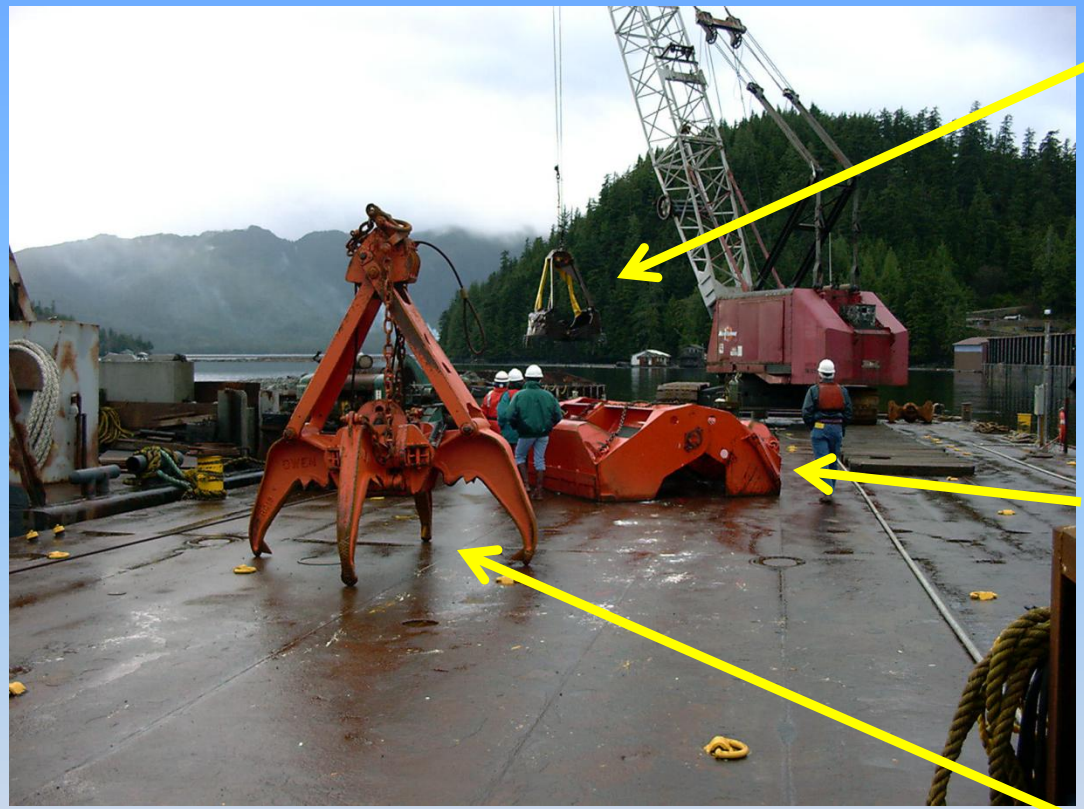


Photo from Ward Cove Superfund Cleanup in Alaska, courtesy of EPA

Standard clamshell digging bucket – used to dredge more compact sediments

Environmental Bucket - used to dredge soft sediments

Grapple – removes sunken logs and debris

Environmental Bucket
One type of mechanical dredging

- Can be cheaper than the hydraulic method, if sediment spoil areas are adjacent to the dredged area
- The Cable Arm Bucket has been proven and is the most widely accepted tool for excavation of contaminated aquatic material.
- Less turbidity than hydraulic dredges
- Will handle much larger debris than a hydraulic dredge
- People do not come in contact with contaminated material

Hydraulic

- Faster than mechanical dredging
- Typically the most cost-effective for large dredging projects
- Can get clogged easily by debris
- Water and sediment are treated on-shore
  - Water is returned to waterway
  - Sediment is disposed or treated

Hydraulic vs. Clamshell

- For every 100,000 gallons treated:
  - Clamshell: 60% sediment, costing $256,893 to $1,031,140
  - Hydraulic: 12% sediment, costing $1,284,466 to $5,155,702
    - Unit Costs from Federal Remediation Technologies Roundtable website www.frtr.gov

Resuspension

- One concern of dredging

- Dredging can cause contaminants to float up into the water column instead of being captured

- Resuspension rates are dredge-specific
  - Usually less than 0.5% for cutterhead dredges (Bridges 2008)
  - Usually less than 1% for bucket dredges without barge overflow (Bridges 2008)

Resuspension and prevention

- Spills during: bite, lift, empty, barge fill
- Operations: GPS, silt curtains, wq monitors, no overflow barge loading
- Operating conditions: wind, waves, flow, temperature, ship traffic
- Operators: experience, training, skill
- Vigilance: monitoring and observers
- Goals- largest volume fast OR clean removal

Treatments etc.

- Washing
- Thermal
- Chemical
- Sonic
- Bioremediation
- Landfill

Nonremoval

1. Capping
2. Natural Recovery
3. Enhanced Natural Recovery
4. Treatment

In place treatment

- Limited options for sediments- deep water
- Fewer for PCBs
- Bacteria
- Maybe fungi
- Some plants -under development
- Metals – break the Cl bond
- Mostly treatment of dredged sediments

Capping

Placing a covering or cap over the contaminated sediment to keep the contamination in place

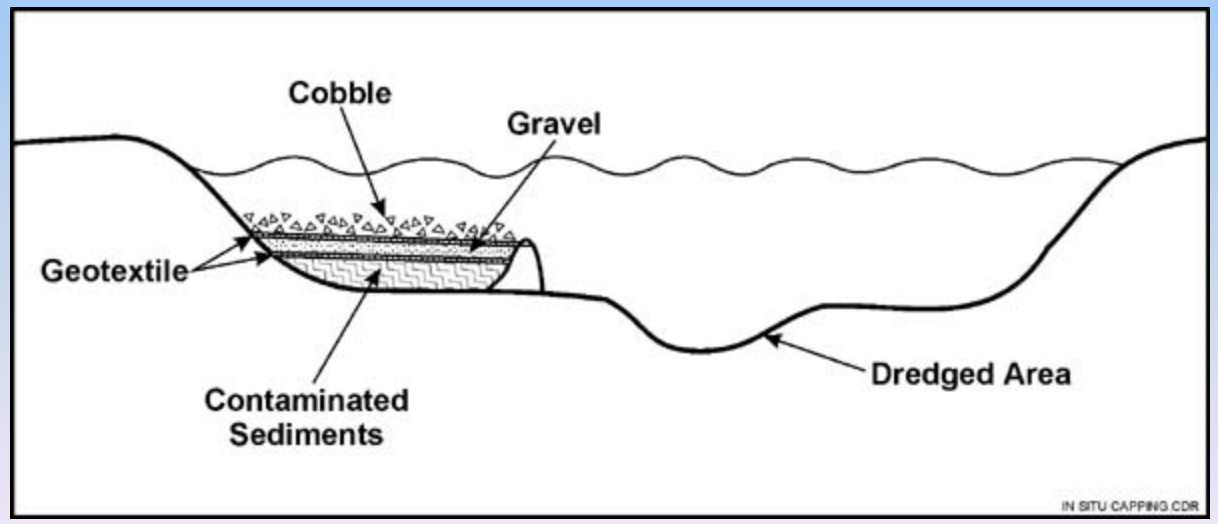


Photo courtesy of US Navy

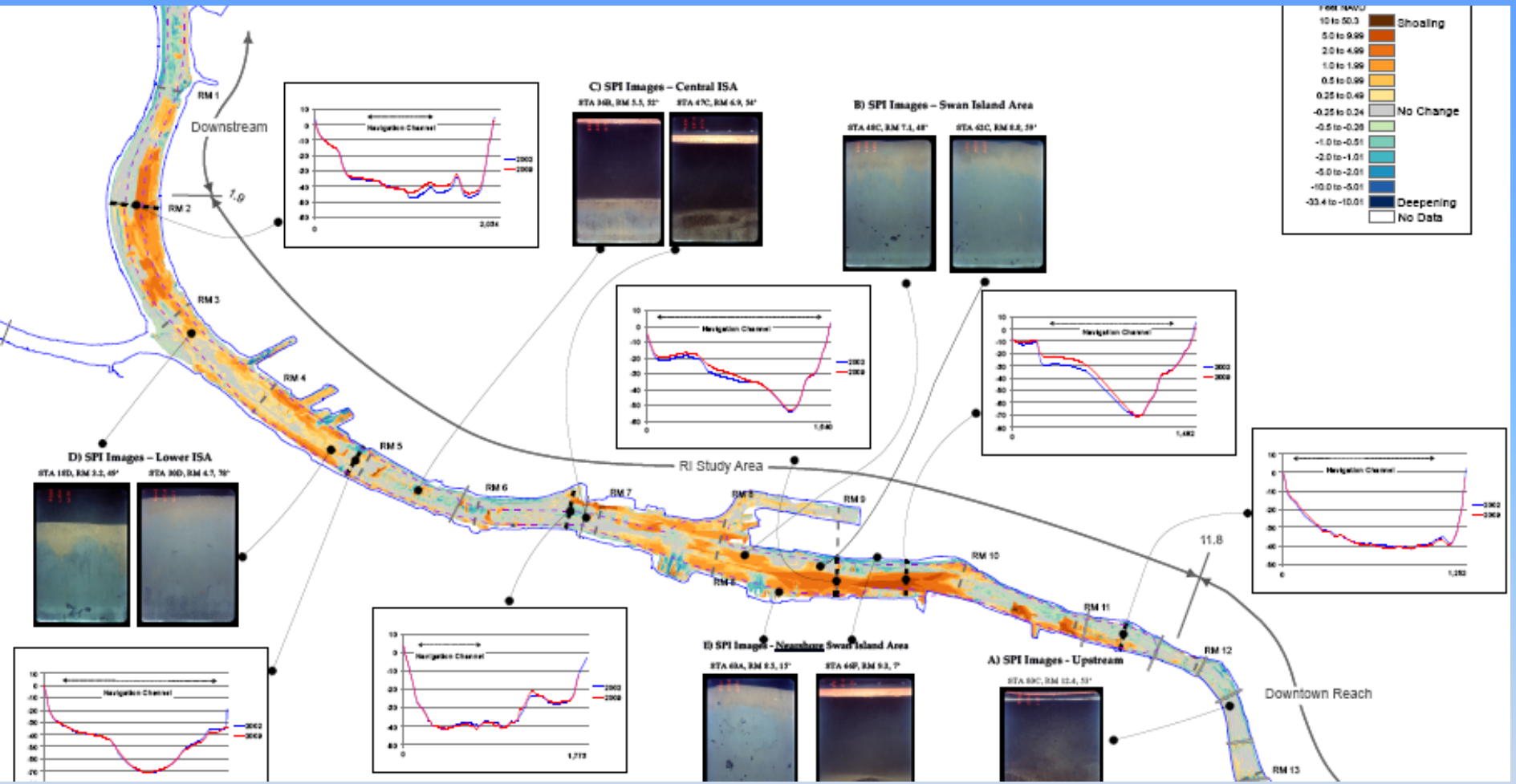
Monitored Natural Recovery

- Uses ongoing, naturally occurring processes to contain, destroy, or reduce the bioavailability or toxicity of contaminants in sediments – EPA 2005 guidance


WHAT WE DO IS TREAT A SMALL AREA AND THEN THE REST WILL CLEAN UP WITH 'NATURAL RECOVERY'.
DNR
EPA
FOX RIVER
A RIVER TAKEN TO THE CLEANERS.
LAHEY

Enhanced Natural Recovery

- Involves placing a thin layer of sand over the contaminated sediment to encourage natural recovery processes
- Still depends on river sediment deposition
- Track record?



Map 3.5-1 from RI 2009 shows areas of deposition in brown and erosion in blue According to scale in upper right. Potential natural recovery areas ?

In place

- Activated carbon cover to isolate
- Some metals will also help isolate
- Caps most effective in low flow backwaters
- ENR limited track record
- NR poor/limited track record

Limitations in water

- Groundwater upwelling
- High flow/scour
- Ships, prop wash and large objects (trees)
- Plan for next steps

Items /issues

- Modeled flood- is it large enough
- Anticipate future flow changes- more extreme
- Metals and the organic contaminants from RI
  - PAHs, DDTs, PCBs, Dioxins/furans
- The locations with metals and not organics have to be addressed
- Remediation goal setting on basis of risk and more