Table D-1
Advantages and Disadvantages of Various Sediment Remedial Technologies

Remedial Technology	General Description	Typical Process Options	Specific Parameters to Consider	Potential Benefits	Potential Limitations	Precedent
In-Place Containment Technologies						
Engineered Capping	Controlled placement of various materials (e.g., sand, fill, gravel/cobbles, geotextile material) to physically isolate sediments from the overlying water column	Multimedia Sand cap AquaBlock ™ Revetments	Cost/location of capping material source Sediment surface topography Flooding characteristics Groundwater flow Benthic activity Water depths Water velocity Navigational traffic Constraints on access Erosion potential Sensitive/protected biological environment	Reduction of COC bioavailability Reduction of water-column COC concentrations Facilitation of conditions conducive to natural degradation processes Minimization of downstream contaminated sediment migration	COCs remain in place Resuspension and/or mixing of COC-containing material during placement COC release in the water-column during placement Benthic community alteration Long-term diffusion/advection of COCs through cap material Long-term erosion Cap surface recontamination Alteration of river hydraulics Disruption to recreational and commercial in-river and near-shore activities Placement may be challenging in deeper waters, areas with wave action, boat traffic or large targeted surface area Navigational dredging requirements AquaBlok™ creates an effective low permeability area, but is more prone to erosion Sand/gravel cap may improve fish habitat areas, but may need to be supplemented with revetments in higher velocities Multimedia cap (w/geotextile) provides the greatest integrity in erosion prone areas	Convair Lagoon (CA) Duwamish Waterway (WA) Puget Sound (WA) Hamilton Harbour (Ontario) St. Lawrence River (NY) Sheboygan River and Harbor (WI) Central Long Island Sound Disposal Site (NY) Mud Dump Site (NY)

Remedial Technology	General Description	Typical Process Options	Specific Parameters to Consider	Potential Benefits	Potential Limitations	Precedent
Particle Broadcasting	Placement of a thin layer (generally several inches) of clean material (e.g., clean sediment, sand, topsoil, or mixture thereof) to mitigate chemical flux to the water column and enhance natural attenuation processes	None	Water depth Water velocity Sediment type Navigational traffic Flood frequency Groundwater flow Constraints on access Sediment surface topography Erosion potential Placement technique Cap material availability	Retardation of dissolved chemical flux to water column Translocation of bioturbation zone upward and out of contaminated sediment Acceleration of COC reduction in sediment, biota, and water column Limited effect on benthic community Less intrusive to the environment	COCs remain in place Limited precedent for use Installation of the appropriate thickness required Accurate placement of cap material Cap erosion Navigational dredging requirements Resuspension and/or mixing of existing sediments during installation Challenging to implement in deep water and/or over a large surface area Requires greater volume of material to achieve nominal depth	None
Hydraulic Modifications	Physical alteration of existing water body to help control the movement/release of tainted sediments and/or promote deposition of clean sediments	Rechannelization (construction of a "new" channel and diversion of the present channel) Damming Construction of sedimentation basins Subsurface diversion structures (control the movement/release of COC-containing sediment and promotes sediment deposition)	Areal extent of contaminated sediments Extent of development in surrounding area Physical configuration of river Space/access constraints Navigational traffic Available property Extent to which water levels would be raised Resident fish movement within the river (for damming technology) Areal extent of targeted sediment Water velocity Navigational traffic Flood capacity Erosion potential	COC-containing sediment physically separated from new channel Reduction of bioavailability Reduction of water-column and biota COC concentrations May enhance navigability Containment of COC-containing sediments within a smaller areal extent Controls contaminated sediment migration Promotes sediment deposition in the river	Alteration/modification of ecological habitat and surrounding area Available property Future use of old channel Flooding/hydraulic effects Alteration of benthic community and fish habitat Alteration of river hydraulics Topography Establishment of a habitat type that favors different aquatic species Resuspension of sediments during high flow events Upstream flooding considerations Available construction space Alteration of river hydraulics Sediment accumulation behind dam/sedimentation basin may require periodic removal High relative cost Limits movement of resident fish	Moss American Triana/Tennessee River Mississippi River

Remedial Technology	General Description	Typical Process Options	Specific Parameters to Consider	Potential Benefits	Potential Limitations	Precedent
Removal Technologies						
Dredging	Excavation of sediment from a water way; removed sediment will require subsequent management	Hydraulic (e.g., cutterhead, horizontal auger, dust pan, match box, plain suction) Mechanical (e.g., clamshell bucket, backhoe, bucket ladder, dipper, dragline) Specialty (e.g., PNEUMA® Pump, Dry Dredge™, Soli-Flo)	Desired solids concentration Desired production rate Dredging accuracy Sediment/dredging depth Ability to handle debris Water depth Water velocity Navigational traffic Access constraints Presence of boulders/debris Bottom conditions Disposal requirements	Permanently removes contaminated sediment	Residual sediment due to mixing of COC-containing material with underlying material or surrounding sediment during dredging Areas missed by dredge Sediment resuspension/downstream migration Elevated COC levels in residual sediments Long- or short-term increases in COC bioavailability Alteration or destruction of benthic community Achieving low COC cleanup levels unlikely Presence of boulders/debris	Sheboygan River and Harbor (WI) Grasse River (NY) St. Lawrence River (NY) New Bedford Harbor (MA) Manistique River and Harbor (MI) Marathon Battery (NY) Shiawassee River (MI) Williamette River (OR) Duwamish Waterway (WA) Waukegan Harbor (IL) River Raisin (MI) Monguagon Creek (MI) Willow Run Creek (MI) Lake Jarnsjon (Sweden)
Dry Excavation	Removal of sediment following significant dewatering of the water body; removed sediment will require subsequent management	Area dewatering achieved via sheeting, coffer dam, water-filled structures, soil dams, by-pass pumping	Water depth Water flow/velocity Groundwater flow/infiltration Navigational traffic Access constraints Volume of water to be removed/contained Location, configuration, and extent of targeted sediment	Permanent removal of contaminated sediments	Residual sediment may contain elevated COC levels Long- or short-term increases in COC bioavailability Suspension and downstream transport of residual sediment Alteration or destruction of benthic community Inability to remove all sediment due to the presence of an impenetrable surface Inability to maintain “dry” conditions Excessive disruption to in-shore near-water recreational activity	Ruck Pond (WI) Unnamed Tributary (OH) Rouge River-Evans Product Ditch (MI) Town Branch Creek (KY)

Remedial Technology	General Description	Typical Process Options	Specific Parameters to Consider	Potential Benefits	Potential Limitations	Precedent
Management Technologies						
Treatment	Management of removed sediments prior to disposal	Dewatering (e.g., filter press hydrocyclone) Stabilization (typically used to meet disposal requirements)	Sediment/COC type Available space Water content of removed sediments COC concentration Management of water generated from dredge spoils Ultimate disposal location Location of treatment facility	Dewatering reduces wet volume (and potentially weight) of sediment for disposal Stabilization increases volume of sediment May decrease mobility of sediment	Obtaining necessary space requirements usually slows down removal operation	Typically utilized at most removal sites
Disposal	The final disposition for sediments that are removed/treated	In-water/upland confined disposal facilities (CDF) On-site/off-site landfills beneficial reuse	Volume of sediment COC concentration Access/space requirements Navigational traffic	Mitigation of potential risks associated with removed sediment	Necessary space requirements Interference with boat traffic Location of disposal facility Availability and capacity Increased risk of exposure and transportation accidents	CDF: New Bedford Harbor (MA) Landfills: most other removal sites