TABLE 2.4
Technology/Process Option Evaluation—Surface and Near Surface Soil

General Response Action	Remedial Technologies	Process Options	Technical Implementability	Effectiveness	Cost	Comments
No Action	None	None	Good	Poor	None	Not protective of human health due to presence of elevated COPCs. Retained for comparison, per the NCP.
Institutional Actions	Access Restrictions	Fencing	Good	Fair	Low	Fencing to prevent access is incompatible with future redevelopment of the site.
		Land Use Restrictions	Fair	Poor	Low	Future park already slated for site. Community acceptance not viable.
	Monitored Natural Attenuation (MNA)	Monitoring	Good	Poor	Low	Retained. MNA or monitoring in general is critical to the implementation of any alternative.
Containment	Surface Controls	Grading	Good	Poor	Low	Retained. Typically used in conjunction with capping.
		Lagoon Buttress	Not applicable due to site conditions.			
		Revegetation	Good	Poor	Low	Retained. Potentially feasible with other technology.
	Capping	Clay/Synthetic Membrane	Good	Good	Moderate	Retained. Acts as dry containment. COCs in the zone are characteristically immobile; lack of percolation may slow down potential natural attenuation/degradation processes.
		Soil Cover	Good	Good	Low	Retained. Use onsite soil for cover.
		Multimedia	Good	Good	Moderate	Incompatible with future redevelopment plans for the site.
		Asphalt or Concrete Cap	Good	Good	Moderate	Incompatible with future redevelopment plans for the site.
	Horizontal Subsurface Barriers	Block Displacement	Not applicable for surface and near surface contamination.			

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Technology/Process Option Evaluation—Surface and Near Surface Soil

General Response Action	Remedial Technologies	Process Options	Technical Implementability	Effectiveness	Cost	Comments
		Grout Injection	Not applicable for surface and near surface contamination.			
In-Situ Treatment	Physical	Electrokinetic Separation	Fair	Poor	High	Effective for metal COPCs but not effective and even potentially dangerous for organic COPCs in surface or near surface conditions.
		Solidification/ Stabilization	Good	Fair	Moderate	Limited effectiveness for organic COPCs.
		Solvent Extraction	Fair	Poor	Moderate	Not effective for metal COPCs. Difficult to capture solvents without contamination of subsurface and potential migration to groundwater.
		Vitrification	Good	Good	High	Permanently encapsulates contaminants in a solid matrix. Considerable energy expended during process. Cost-prohibitive in relationship to levels and type of COPCs.
		Vapor Extraction	Poor	Poor	Moderate	Not effective for metal COPCs. Difficult to implement in surface and near surface conditions.
	Chemical	Oxidation/ Reduction	Poor	Poor	Moderate	Not effective for metal COPCs. Difficult to implement in surface and near surface conditions. Safety concerns.
	Biological	Aerobic	Good	Poor	Low	Not effective for metal COPCs. Difficult to degrade some of the organic contaminants aerobically.
		Anaerobic	Not applicable to site conditions or COPCs. Too close to surface to create an anaerobic environment.			
		Bioventing	Poor	Poor	Moderate	Not effective for metal COPCs. Difficult to implement in surface and near surface conditions.
		Soil Flushing	Fair	Poor	High	Reduces time of remediation compared to natural attenuation. Requires extensive water delivery and extraction system. Difficult to capture water without contamination of subsurface and potential migration to groundwater.
	Thermal	Electrical Resistance Heating	Fair	Poor	High	Not effective for metal COPCs. Difficult to implement in surface and near surface conditions.

TABLE 2.4
Technology/Process Option Evaluation—Surface and Near Surface Soil

General Response Action	Remedial Technologies	Process Options	Technical Implementability	Effectiveness	Cost	Comments
		Hot Air/Steam Stripping	Fair	Poor	Moderate	Not effective for metal COPCs. Difficult to implement in surface and near surface conditions.
		Radio Frequency	Fair	Poor	High	Not effective for metal COPCs. Effectiveness of technology for organic COPCs is not considered sufficient to justify its relatively high cost.
Removal	Excavation	Backhoe/ Front-End Loader	Good	Good	Low	Retained. Often combined with onsite treatment technologies applied to the excavated solids or offsite disposal. Assessment of soil volumes critical for cost purposes.
Ex-Situ Treatment (Post Collection)	Physical	Soil Washing/ Solvent Extraction	Good	Fair	Moderate	Retained. Treatment plant would need to be installed at the site for the duration of the soil excavation. Plant would require a series of steps for washing out metal and organic COPCs.
		Solidification/ Stabilization	Good	Fair	Moderate	High organic content will likely render this process unusable.
	Biological	Land Treatment/ Farming	Good	Poor	Low	Not effective for metal COPCs. Difficult to degrade some of the organic contaminants aerobically.
	Thermal	Low-Temp Desorption	Good	Fair	High	Not effective for metal COPCs.
		Onsite Incineration	Poor	Fair	High	Community acceptance of on-site incinerator unlikely.
		Offsite Incineration	Fair	Fair	High	Not cost competitive for soils.
Disposal	Onsite	RCRA Subtitle C Landfill	Not implementable administratively due to close proximity to a residential area.			
		Backfill/ Consolidation	Good	Poor	Low	Retained. Clean fill excavated during operations or treated soil if ex situ treatment is performed could be used during site redevelopment plans.
	Offsite	RCRA Subtitle C or D Landfill	Good	Poor	Moderate to High	Retained. Disposal in appropriate landfills would be subject to all applicable regulations and requirements.

TABLE 2.4
Technology/Process Option Evaluation—Surface and Near Surface Soil

General Response Action	Remedial Technologies	Process Options	Technical Implementability	Effectiveness	Cost	Comments
		Soil Reclamation/ Recycling	Good	Good	Low	Assuming soil meets acceptable analytical levels, road paving company or others may reclaim soil as suitable material for reuse. Liability issue.

Effectiveness is the ability to perform as part of a comprehensive alternative that can meet RAOs under conditions and limitations that exist at the site. Technical Implementability encompasses the applicability/feasibility of performing the process option under the regulatory, technical, and schedule constraints of the project. Cost is for comparative purposes only, relative to other processes/technologies that perform similar functions.

GAC	Granular activated carbon	RAOs	Remedial Action Objectives
GW	Groundwater	RCRA	Resource Conservation and Recovery Act
NA	Not applicable	SVE	Soil Vapor Extraction
NCP	National Contingency Plan	VOCs	Volatile Organic Contaminants
POTW	Publicly Owned Treatment Works		
TSDF	Treatment, storage, or disposal facility		