

Sustainable Approaches to Brownfields Remediation

Whether you choose an in-situ or ex-situ remediation technique, you can use specific sustainable approaches to reduce the environmental impact.

Remediation type	Suggested sustainable approaches	Benefit			
		Conserve energy/fuel	Conserve water	Reduce GHG and air emissions	Minimize and recycle waste
In-situ treatment	Minimize or optimize use of reagents.	✓			✓
	Optimize extraction rate.	✓	✓		
	Optimize number of injection sites.	✓			
	Use existing wells as injection points.	✓			✓
	Recirculate extracted groundwater to blend reagents.		✓		
	Use direct-push drilling methods.				✓
	Use reagents that are waste byproducts from other processes (in-situ chemical oxidation reagents or bioremediation amendments).				✓
Use renewable energy sources to power injection pumps.	✓		✓		
Ex-situ treatment — groundwater pump and treat	Optimize extraction systems.	✓	✓		✓
	Minimize sampling requirements.	✓			
	Reuse extracted water.		✓		
	Minimize use of reagents.				✓
	Use renewable energy sources to power extraction pumps.	✓		✓	
Ex-situ treatment — soil excavation	Consider treating soils on site, rather than off site.	✓		✓	
	Avoid unnecessary extraction.	✓		✓	✓
	Re-use soils where possible to avoid the need for clean fill.				✓
	Crush and recycle uncontaminated waste materials for use as fill.				✓
	Use renewable energy sources or clean fuels to power equipment and vehicles.	✓		✓	
	If material must be moved, transport it to a location as close as possible to the site.	✓		✓	

Examples of specific sustainable remediation techniques include:

- Solar heating to enhance bioremediation.
- Wind turbine compressors to power pumps for surface water, groundwater or skimming units.
- Gravity irrigation systems for phytoremediation systems (use of plants to remediate soil and groundwater).
- Micro-turbines to convert landfill gas to electricity.
- Solar-powered groundwater recirculation techniques.