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Groundwater Remediation For UST Sites

In Situ Bioventing Combined With Low Flow Air Sparging (Biosparging)

In situ bioventing combined with low flow air sparging (biosparging) *stimulates the aerobic biodegradation of organic contaminants in groundwater by delivering oxygen to the saturated and unsaturated zones. The oxygen is delivered at a slow rate to encourage biodegradation rather than volatilization.*

Biosparging degrades volatile organic compounds (VOCs) in place, reducing the need for subsequent vapor treatment and the costs of remediation. This technique is most effective in permeable aquifers.

Petroleum Types And Constituents

- Fresh or weathered gasoline, diesel, jet fuel, kerosene, motor oil, fuel oil, lubricating oils, and crude oils
- Volatile organic compounds (VOCs) such as benzene, toluene, ethylbenzene, and xylene (BTEX); and residual semivolatile organic compounds (SVOCs) such as polynuclear aromatic hydrocarbons

In Situ Bioventing Combined With Low Flow Air Sparging (Biosparging)	
Advantages	• Degrades volatile organic compounds (VOCs) in place • Reduces air emissions and subsequent need for vapor treatment
Limitations	• Effectiveness is limited in low permeability or heterogeneous media • Difficult to control air distribution in groundwater • Limited performance data available
System Components	• Vertical or horizontal extraction and injection wells • Vacuum pump, compressor, or blower • Aboveground vapor treatment (optional)

Wastestream Treatment	• Vapor treatment options (might be needed for high concentrations of contaminants):
	  • *Vapor phase biofilters*
	  • *Granulated activated carbon*
	  • *Internal combustion engine*
	  • *Catalytic oxidation unit*
	  • *Thermal incinerator*

Parameters to Monitor[1]	• Vacuum/pressure monitoring at the pump, compressor, blower, and observation points • Airflow rate • Dissolved oxygen • Water levels • Constituent concentrations in groundwater
Cleanup Levels and Timing[2]	• Generally achieves maximum contaminant levels (MCLs) for volatile constituents • New application; to date, few sites have been fully remediated
Costs[3]	• Estimates for an ideal site[4], $60,000 to $180,000 • Estimates for an average site[5], $120,000 to $200,000 • Costs vary depending on vapor treatment costs and treatment time

[1]"Parameters to monitor" are for performance purposes only; compliance monitoring parameters vary by state.
[2]Cleanup standards are determined by the state.
[3]Costs include equipment, and operation and maintenance.
[4]An "ideal site" assumes no delays in corrective action and a relatively homogenous, permeable subsurface.
[5]An "average site" assumes minimal delays in corrective action and a moderately heterogeneous and permeable subsurface.