

Table A-16.C. Technical implementation considerations for enhanced anaerobic

Data requirements	Site-specific data for technology evaluation	Site size and soil characteristics	Soil porosity, soil moisture, temperature, salinity, bulk density, total organic carbon, site boundary.
		Groundwater characteristics	Hydraulic conductivity, gradient, temperature, pH, geochemistry (including dissolved oxygen, alkalinity, redox potential), electron acceptor and nutrient concentrations, microbes, and microbial activity.
		LNAPL characteristics	LNAPL volume, chemical properties, concentrations, co-contaminants.
		LNAPL location and depth	Affects delivery method(s) for enhancements.
		Permit consideration	Regulatory approval may be needed for enhancements/injections.
	Bench-scale testing	Soil characteristics	Soil moisture; soil temperature; carbon, nutrient and microbial content.
		Destruction efficiency	Determine dose and effect of added electron acceptor or nutrient on microbial activity and reduction of LNAPL.
	Pilot-scale testing	Placement/number of monitoring wells	Plume size and stability.
		Groundwater characteristics	pH, geochemistry (including dissolved oxygen, alkalinity, redox potential), electron acceptor and nutrient concentrations, microbes, and microbial activity.
		Number of injection locations	Delivery volume and rate; method of electron acceptor and nutrient addition (e.g., injection or recirculation).
		Site conditions	Ability of site to accept enhancements, ROI, heterogeneities, change in microbial activity.
	Full-scale design	Placement/ number of monitoring wells	Plume size and stability
		Groundwater characteristics	pH, geochemistry, electron acceptor and nutrient concentrations, microbes, and microbial activity.
		Number of injection locations	Delivery volume and rate; method of electron acceptor and nutrient addition (e.g., injection or recirculation).
		Site conditions	Ability of site to accept enhancements, ROI, heterogeneities, change in microbial activity.
	Performance metrics	Contaminant reduction	Plume size and stability; long term monitoring
		Groundwater characteristics	Geochemistry and microbial activity; presence and concentration of biodegradation byproducts.
	Modeling tools/applicable models		
	Further information		EPA, 2013, Introduction to In Situ Bioremediation of Groundwater, EPA 542-R-13-018 https://www.epa.gov/sites/production/files/2015-04/documents/introductiontoinsitubioremediationofgroundwater_dec2013.pdf
			Hazen 2013, In Situ: Groundwater Bioremediation https://clu-in.org/download/techfocus/biochlor/Hazen_in_situ_bio_2009.pdf
		EPA, 2016, In-Situ Groundwater Bioremediation, Chapter X in How to Evaluate Alternative Cleanup Technologies for Underground Storage Tank Sites, EPA 510-B-16-005 https://www.epa.gov/sites/production/files/2014-03/documents/tum_ch10.pdf	