

Table 6.3 Preliminary screening matrix

LNAPL remedial goal	LNAPL remediation objective	Technology group	Potentially useful LNAPL technology	Applicable Site Conditions						Example performance metric for remediation objective (d)
				Geology (a)		Zone (b)		LNAPL type (c)		
<i>LNAPL saturation-based goals</i>										
Terminate LNAPL body migration and reduce potential for LNAPL migration	Abate LNAPL body migration by sufficient physical removal of mobile LNAPL mass	LNAPL mass recovery	•Excavation	F	C	U	S	LV/LS	HV/HS	<ul style="list-style-type: none"> •Total system recovery rate vs. background LNAPL flux •LNAPL saturation profile •LNAPL footprint/center of mass stabilization •Stable dissolved-phase plume concentrations, dissolved-plume shape
			•Skimming		C		S	LV/LS	HV/HS	
			•Vacuum enhanced skimming	(F)	C	U	S	LV/LS	HV/HS	
			•Total liquid extraction		C		S	LV/LS	HV/HS	
			•MPE	(F)	C	U	S	LV/LS	HV/HS	
	Stop LNAPL migration by physical barrier	LNAPL mass control	•Phytotechnology	F	C	U	S	LV/LS	HV/HS	<ul style="list-style-type: none"> •No first LNAPL occurrence downgradient in LNAPL-unaffected soils
			•Physical/hydraulic containment	F	C		S	LV/LS	HV/HS	
			•In situ soil mixing	F	C	U	S	LV/LS	HV/HS	
Reduce LNAPL saturation when LNAPL is above the residual range	Recover LNAPL to practicable limit	LNAPL mass recovery	•Excavation	F	C	U	S	LV/LS	HV/HS	<ul style="list-style-type: none"> •LNAPL transmissivity •Decline curve analysis •Asymptotic performance of the recovery system •Cost per unit volume removed •Limits of technology
			•Skimming		C		S	LV/LS	HV/HS	
			•Vacuum enhanced skimming	(F)	C	U	S	LV/LS	HV/HS	
			•Total liquid extraction		C		S	LV/LS	HV/HS	
			•MPE	(F)	C	U	S	LV/LS	HV/HS	
Reduce LNAPL saturation when LNAPL is within the residual range	Further abate LNAPL beyond practicable limit of hydraulic recovery	LNAPL mass recovery	•Excavation	F	C	U	S	LV/LS	HV/HS	<ul style="list-style-type: none"> •Limits of technology •Asymptotic mass removal •Cost per unit volume removed •Soil concentration at regulatory standard
			•MPE	(F)	C	U	S	LV/LS	HV/HS	
			•Water flooding		C		S	LV/LS	HV/HS	
			•Surfactant enhanced subsurface remediation (SESR)		C		S	LV/LS	HV/HS	
			•Cosolvent flushing		C		S	LV/LS	HV/HS	
			•Steam injection	(F)	C	U	S	LV/LS	HV/HS	
			•Thermal conduction heating	F	C	U	S	LV/LS	HV/HS	
			•Electrical resistance heating	F		U	S	LV/LS	HV/HS	
			•Smoldering		C	U	S	LV/LS		
			•AS/SVE	(F)	C	U	S		HV/HS	
			•Biosparging/ bioventing	(F)	C	U	S	LV/LS	HV/HS	
•NSZD	F	C	U	S	LV/LS	HV/HS				

LNAPL compositional-based goals

Abate accumulation of unacceptable constituent concentrations in dissolved phase from an LNAPL source	Control or treat soluble plume to abate dissolved-phase concentrations at specified compliance point	LNAPL phase change	<ul style="list-style-type: none"> ●MPE ●Steam injection ●Thermal conduction heating ●Electrical resistance heating ●Smoldering ●AS/SVE ●Biosparging/ bioventing ●ISCO ●Enhanced anaerobic biodegradation ●NSZD ●Activated carbon ●Phytotechnology 	(F)	C	U	S	LV/LS	HV/HS		<ul style="list-style-type: none"> ●No first constituent occurrence at unacceptable levels downgradient ●Dissolved-phase regulatory standard met at compliance point ●Reduced dissolved-phase concentrations downgradient of the barrier ●Dissolved-phase plume stability ●Asymptotic performance of the recovery system
Abate accumulation of unacceptable constituent concentrations in soil vapor from an LNAPL source	Abate unacceptable vapor accumulations by sufficient depletion of volatile constituents in LNAPL	LNAPL phase change	<ul style="list-style-type: none"> ●AS/SVE ●Steam injection ●Thermal conduction heating ●Electrical resistance heating ●Biosparging/ bioventing ●NSZD 	(F)	C	U	S	LV/LS	HV/HS		<ul style="list-style-type: none"> ●LNAPL composition change ●Soil volatile organic compound (VOC) concentrations to below regulatory standard ●Soil volatile plume concentrations to below regulatory standard ●Asymptotic performance of the recovery system ●Cost of mass removal
Abate unacceptable soil concentrations from an LNAPL source	Reduction of risk from specific components	LNAPL phase change or LNAPL mass recovery	<ul style="list-style-type: none"> ●Excavation ●AS/SVE ●Steam injection ●Thermal conduction heating ●Electrical resistance heating ●Smoldering ●Biosparging/ bioventing ●ISCO ●Enhanced anaerobic biodegradation ●NSZD ●Activated carbon ●Phytotechnology 	F	C	U	S	LV/LS	HV/HS		

LNAPL aesthetic-based goals										
Abate other LNAPL concern(s) (saturation goal)	Abate geotechnical soil instability	LNAPL mass recovery or LNAPL mass control	•Excavation	F	C	U	S	LV/LS	HV/HS	•Specific soil concentration that results in desired soil stability •Geotechnical structural tests
			•In situ soil mixing	F	C	U	S	LV/LS	HV/HS	
Abate aesthetic LNAPL concern(s) (composition goal)	Further reduction of groundwater or vapor concentrations below acceptable levels (e.g. for odors/tastes)	LNAPL phase change	•SVE	(F)	C	U			HV/HS	•Vapor concentrations (to below odor threshold)
			•Biosparging/ bioventing	(F)	C	U	S	LV/LS	HV/HS	
			•NSZD	F	C	U	S	LV/LS	HV/HS	

a) LNAPL interval geology: F = clay to silt, C = sand to gravel. (F) = applicable to silt, but not clay. If the lithology is fractured rock, refer to Appendix D.

b) U = unsaturated zone, U* = unsaturated zone with ozone oxidant, S = saturated zone.

c) LNAPL type: LV/LS = low volatility, low solubility, medium or heavy LNAPL (e.g., weathered gasoline, diesel, jet fuel, fuel oil, crude oil); HV/HS = high volatility, high solubility, light LNAPL with significant percentage of volatile or soluble constituents (e.g., gasoline, benzene).

d) Overall, until such time as the risks are mitigated by the LNAPL remedial technology(ies), risks should be managed via engineering or institutional controls.

