Table 1. *EXAMPLE* Initial Alternative Screening Table (Comprehensive List of Potential Treatment Technologies)

This table is an example initial alternatives screening table. This table does not provide a comprehensive list of potential treatment technologies. Please provide a comprehensive list of technologies screened for each site, including technologies not retained.

General Response Action	Technology Type	Process Options	References	Evaluation Factors						Retained[5]	Treatability Study Needed?		
				Implementability[1, 2]		Effectiveness[3]		Cost[4]					
				Rank	Evaluation Comment	Rank	Evaluation Comment	Rank	Evaluation Comment	Yes/No	Yes/No	Pilot Test (PT), Bench Test (BT), bench, etc.	Timing = during FS or during remedial design
Soil (includes sludge if present)													
No Further Action	None	None	Inclusion of this option is required by DEQ as a baseline.	High	Easily implementable	Low	Will not remove contamination or reduce risk to human health and the environment.	$	No cost.	Yes	No	N/A	N/A
Institutional Controls	Land Use Controls	Zoning, Deed Notices, Environmental Control Easement	USEPA (2012)	Moderate	Easily implementable for properties owned by ABC Company, but low implementability for properties owned by other parties.	Moderate	Protects human health by limiting site uses and related exposures to contaminated soil. Not protective for the leaching to groundwater pathway. Requires long-term maintenance and enforcement of land use controls.	$	Cost is relatively low compared to other options, but does require long term maintenance/inspection and enforcement.	Yes	No	N/A	N/A
In Situ Soil Treatment	Immobilization	Solidification/Stabilization Cementing and/or stabilizing agents are mixed with impacted soils to bind contaminants and reduce their mobility (solidification). May also include a chemical amendment to transform contaminant to lower mobility/toxicity (stabilization).		High	Fully developed, moderate use. May not be compatible with all land uses.	High	Medium to High - can be highly effective a immobilizing inorganics. pH typically increased, which may increase the mobility of arsenic. Decreases potential exposure pathways.	$-$$	Cost is medium because of operation/maintenance. Capital cost is high.	Yes	Yes	BT	FS
	Extraction	Electrokinetic Separation Low-intensity direct current to desorb contaminants from the soil, then transport the charged particles toward electrodes for removal. Applicable to metals and polar organics in low permeability soils.		Moderate	Moderately developed, limited use. Most implementable in low permeability soils.	Moderate	Effectiveness is uncertain based on limited application of the technology.	$$$	Cost is high because of operation/maintenance. Capital cost is medium.	No (not retained based on implementability and effectiveness uncertainties due to highly permeable soils, and relatively high cost)	N/A	N/A	N/A
		Soil Flushing Water, or water containing an additive to enhance contaminant solubility, is applied to the soil or injected into the groundwater to raise the water table into the contaminated soil zone. Contaminants are leached into the groundwater, which is then extracted and treated.		Moderate	Fully developed, limited use for inorganics.	Moderate	Low to Medium - depends on site specific conditions and soils. May temporarily increase concentrations in groundwater.	$$	Cost is medium because of operation/maintenance. Capital cost is medium.	No (not retained based on potential to increase arsenic concentrations in groundwater)	N/A	N/A	N/A
Ex Situ Soil Treatment[6]	Bioremediation	Land Farming Contaminated soil is excavated and placed into lined beds; the soil is then mixed or tilled to stimulate aerobic degradation. Liners and other methods are used to control leaching of contaminants.	FRTR (2007), USDA (2002)	Moderate	Likely requires physical separation of stones and rubble prior to treatment. Requires use of a liner and leachate collection system for PCP treatment. Requires a large area and management to prevent offsite migration or contaminant transport.	Moderate	Applicable to PCP and petroleum constituents; limited applicability to dioxins and furans.	$$	Cost is relatively low compared to other options, but does require long term maintenance/inspection and enforcement.	Yes (retained for possible use in conjunction with other technologies)	Yes	PT	Remedial Design
		Biopiles A full-scale technology in which excavated soils are mixed with soil amendments and placed on a treatment area.	FRTR (2007)	Moderate	Requires leachate collection systems to control runoff.	Moderate	Applicable to PCP and petroleum constituents; limited applicability to dioxins and furans.	$$	Cost is relatively low compared to other options, but does require long term maintenance/inspection and enforcement.	Yes (retained for possible use in conjunction with other technologies)	Yes	PT	Remedial Design
	Chemical Reduction / Oxidation	Reduction / Oxidation Converts hazardous contaminant to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert.		High	Fully developed. Limited use for inorganics.	Moderate	Depends on site specific conditions and soils.	$$	Cost is relatively high compared to other options, but does require long term maintenance/inspection and enforcement.	No (not retained based on implementability and effectiveness uncertainties for inorganics and relatively high cost)	No	N/A	N/A

Table 1. *EXAMPLE* Initial Alternative Screening Table (Comprehensive List of Potential Treatment Technologies)

This table is an example initial alternatives screening table. This table does not provide a comprehensive list of potential treatment technologies. Please provide a comprehensive list of technologies screened for each site, including technologies not retained.

NAPL and Groundwater													
No Further Action	None	None	Inclusion of this option is required by DEQ as a baseline.	High	Easily implementable	Low	Will not remove contamination or reduce risk to human health and the environment.	$	No Cost	Yes	No	N/A	N/A
Institutional Controls	Groundwater Use Restrictions	Controlled Groundwater Area	USEPA (2012)	Moderate	Easily implementable for properties owned by ABC Company, but low implementability for properties owned by other parties.	Moderate	Protects human health by limiting groundwater uses and related exposures to contaminated groundwater. Limited effectiveness for contaminant removal or treatment until residual source treated. Requires public outreach and long-term maintenance and enforcement of land use controls.	$	Cost is relatively low compared to other options, but does require long term maintenance/inspection and enforcement.	Yes	No	N/A	N/A
Monitored Natural Attenuation	Monitored Natural Attenuation/Long-Term Monitoring	Monitored Natural Attenuation	USEPA (2012)	Moderate - High	Easily implementable	Moderate	Effectiveness depends on site-specific conditions and completeness of source removal. Requires long-term monitoring to assess the progress of natural attenuation. Limited effectiveness for contaminant removal or reduction of risk to human health and the environment in the short term.	$ - $$	Cost is relatively low compared to other options, but term requires long term monitoring.	Yes (retained for possible use in conjunction with other technologies)	No	N/A	N/A
In Situ Treatment	Phytoremediation	Phytoremediation Use plants to reduce concentration of contaminants in groundwater through enhanced rhizosphere biodegradation, phyto-degradation, and phyto-volatilization. Plants can also provided hydraulic control through reducing infiltration and lowering the groundwater table.	USEPA (2012)	Moderate	Fully developed, limited use.	Low	Effectiveness depends on large tracts of land and shallow subsurface impacted.	$	Low operation/maintenance cost; low capital cost.	No (not retained because subsurface impacts are deep)	No	N/A	N/A
	Permeable Reactive Barrier	Permeable Reactive Barrier (PRB) Installed across the flow path of a contaminant plume, allowing the groundwater to be treated passively as it flows through the wall. PRB media consists of granular ZVI and/or organic material with permeable soils. Treatment can be achieved through sorption and/or co-precipitation with iron minerals as groundwater flows through the PRB media. Groundwater can be directed into the PRB by use of a funnel and gate configuration.	USEPA (2012)	Moderate	Fully developed, limited use.	Moderate	Effectiveness depends on groundwater flow being directed through the PRB and permeability and reactivity of the PRB can be maintained. Bench-scale testing is typically conducted.	$$	Medium operation/maintenance cost; low capital cost; may have to be replaced.	Yes (retained for possible use in conjunction with other technologies)	Yes	BT	FS
NAPL Collection, Reduction, and/or Treatment	Bioremediation	Bioventing/Biosparging Bioventing enhances the natural biological activity by supplying oxygen in the subsurface to reduce petroleum hydrocarbon mass in the vadose and smear zone.	ITRC (2009), USEPA (2005)	High	Easily implementable	Moderate	High for fuels and nonhalogenated SVOCs; however, less effective in low-permeability settings or heterogeneous settings where mass is not accessible to air flow. Low for inorganic constituents.	$$	Requires long term maintenance and inspection.	Yes (retained for possible use in conjunction with other technologies)	Yes	PT	depends

Table 1. *EXAMPLE* Initial Alternative Screening Table (Comprehensive List of Potential Treatment Technologies)

This table is an example initial alternatives screening table. This table does not provide a comprehensive list of potential treatment technologies. Please provide a comprehensive list of technologies screened for each site, including technologies not retained.

FOOTNOTES:

1 = If the technology is not implementable, do not fill out the information for the other evaluation factors.

2 = Implementability refers to how readily an alternative can be implemented at a site and includes availability, site conditions, permits required, etc. This section should also identify whether the technology is an EPA presumptive remedy and should include all applicable EPA presumptive remedies (only not included if site specific conditions make them not implementable). If presumptive remedy is not implementable, a written justification should be provided. Rankings are as follows: high = easily implemented and equipment/expertise readily available (use site-specific information to justify); moderate = some challenges to implementation but challenges can be overcome to allow implementation with proper planning/timing, etc.(use site-specific information to justify); and low = implementation is unlikely or impossible due to challenges that cannot be overcome (identify site-specific challenges in comments to justify). Implementability is also referred to as Developmental Status.

3 = Effectiveness refers to how well the alternative can address the contaminants of concern, taking into consideration site-specific conditions, as well as reliability, maintainability, etc. Rankings are as follows: High = highly effective at addressing contaminants of concern given site-specific conditions (use site-specific information to justify); moderate = can be effective for specific contaminants or under specific circumstances (site-specifics called out in comments to justify); low = not effective for specific contaminants or due to site-specific considerations (specifics called out in comments to justify).

4 = Cost refers to the capital and operation and maintenance costs of an alternative and are ranked based on relative costs as follows: technologies that are highest in cost relative to other process options are given a ranking of $$$; technologies that are lowest in cost relative to other technologies are given a ranking of $; and middle-range costs are ranked "$$." Keep in mind that institutional controls also have a cost (periodic inspection and enforcement, etc.) and these costs should be included.

5 = Some technologies may need to be combined with other technologies in order to meet cleanup goals. In this case, it is not appropriate to tie different technologies together; rather, identify the technology as follows: "Yes (retained for possible use in conjunction with other technologies)" and ensure that the site-specific circumstances are clearly identified in the evaluation criteria comments for the technology.

6 = For all ex situ soil treatment or disposal alternatives, excavation is assumed to be a part of the technology/option and need not be listed separately. Retained technologies will be further evaluated in the FSWP and FS Report.

OTHER NOTES:

Please include full references, as appropriate, to support rank and other information provided on this table.
Please define all acronyms used.