

D.1 Introduction

Remediation optimization has been an ongoing effort and priority since the 1990s. The need for optimization was recognized when many remediation systems, especially P&T systems, failed to meet cleanup goals, and progress toward those goals had diminished. This gave birth to several federal and state optimization programs. Optimization was initially focused on enhancing the performance and effectiveness and/or reducing the operating costs of existing systems. Optimization then evolved into a more comprehensive view of the remediation life cycle covering the development of the CSM, remedy selection, design, operation, and monitoring. The goal of these optimization programs is to promote increased efficiency and effectiveness at all stages of the remediation life cycle. Existing optimization programs are not limited to P&T, but they tend to emphasize methods to ensure that P&T is used only when appropriate, and if used, to ensure that it is used effectively and with a strategy to transition to an alternate approach at the appropriate time, if necessary.

Table D-1 provides information about optimization programs for several agencies, including programs under the USEPA and the DOD. This table includes a brief description of the programs along with links to program websites. Information about the USEPA optimization program is maintained on the USEPA Clean Up Information Network (known as *Clu-In*) website. The Clu-In website hosts an extensive body of relevant work, including material and guidance specifically relevant to RPO and other elements of P&T. USEPA program information is also provided on the FRTR website, including a technology screening matrix, technology profiles, and optimization case studies. DOD optimization programs have been developed for the USACE, AFCEC, and NAVFAC. Websites for these programs include optimization guidance that presents a holistic view of optimization along with methodologies for performing optimization evaluations. They also include technical information, in the form of fact sheets and reports, about specific technologies that can support optimization, as well as optimization case studies. Few state programs reported in the state survey in Appendix E that they have formalized optimization programs like those that have been developed by several federal agencies. Optimization principles, practices, and methods are, no doubt, in use in state cleanup programs at individual sites, but formalized programs focusing on optimization have yet to coalesce.

Some resources in Table D-1 relate to questions of selection of P&T as a viable remedial alternative (e.g., guidance on remedy evaluation and selection), while others relate to the implementation of P&T, including design, operation, and optimization of P&T systems. Resources available from the websites presented in this table can support P&T evaluation/optimization throughout all phases of the remediation life cycle.

Table D-1. Existing optimization programs matrix

Agency/ Organization	Department/ Program	Description	Program Website/ Resources
USEPA	CLU-IN	USEPA's National Strategy to Expand Superfund Optimization Practices from Site Assessment to Site Completion (National Optimization Strategy). Information and technical resources for those seeking to implement optimization reviews and processes for their cleanup sites.	https://clu-in.org/Optimization/
USEPA	CLU-IN	A collection of optimization reports, grouped by four optimization stages: investigation, design, remedy, and long-term monitoring. The stage is based on the focus of the optimization review irrespective of the Superfund remedial pipeline stage.	https://clu-in.org/Optimization/reports.cfm
USEPA	CLU-IN	"Use of Phytoremediation to Augment Standard Pump and Treat Technologies at Superfund Sites." October 2020.	https://clu-in.org/conf/tio/DCHWS10/slides/1Slide_Presentation_for_Neil_J._Brown_Ecology_and_Environment_Engineering_and_Geology,_P.C..pdf

Agency/ Organization	Department/ Program	Description	Program Website/ Resources
USEPA	FRTR	Federal Remediation Technologies Roundtable Meeting Evolution of Subsurface Remediation: Lessons Learned from Technical Challenges to Achieving Cleanup Goals, May 2018. Optimization efforts presented by the DON, USEPA, USACE, AFCEC/CZTE, and DOE for complex remediation sites as well as meeting announcements and other federal agency project information.	https://www.frtr.gov/meetings2.cfm
USEPA	FRTR	Federal Remediation Technologies Roundtable Review. <i>Kirtland Bulk Fuels Facility Plume (BFF) during an FRTR meeting: Benefits of CSM Driven Remediation</i> November 2019. AFCEC CZTE subject matter experts Dr. Kent Glover and Mr. John Gillespie provide a presentation demonstrating CSM-driven remediation for a complex site using an adaptive remedial approach working with an interagency technical working group and site managers and regulators.	https://frtr.gov/pdf/meetings/nov19/presentations/glover-presentation.pdf
USEPA	FRTR	Federal Remediation Technologies Roundtable Review. <i>Lessons Learned Applying Multiple Remediation Technologies at Air Force Plant 4</i> , 9 May 2018. (CZOM). A summary of lessons learned for Air Force Plant 4 complex groundwater sites up to 2018 using high-resolution site hydrogeological characterization actions that took place as the site was moving forward in a focused feasibility study and ROD amendment in coordination with USEPA, TCEQ, and community participation.	https://frtr.gov/pdf/meetings/may18/presentations/handouts/allemann-handout.pdf
USEPA	FRTR	The FRTR is a collaboration of federal agencies providing a wide range of projects that includes P&T and optimization along with case study presentations.	https://frtr.gov/default.cfm
USEPA	OSWER	<i>Optimization Strategies for Long-Term Ground Water Remedies (with a Particular Emphasis on Pump and Treat)</i> , 2007. Information for federal, state, and private agencies and organizations discussing the benefits of optimization evaluations and optimization programs. It includes other optimization agencies and electronic links.	https://www.epa.gov/sites/default/files/2015-04/documents/opt_strat_long_term_gw_remed_542r07007.pdf

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USEPA	OSWER	The key document, "Elements for Effective Management of Operating P&T Systems," was prepared based on lessons learned from conducting optimizing evaluations at 20 Superfund P&T systems; it evaluates goals and performance of a system.	https://www.epa.gov/sites/default/files/2015-04/documents/factsheet_for_pt.pdf
USEPA	OSWER	"Green Remediation Best Management Practices: Pump and Treat Technologies." U.S. Environmental Protection Agency, Washington, DC, EPA 542-F-09-005, December 2009.	https://semsub.epa.gov/work/HQ/147210.pdf
USEPA	OSWER	"Cost Effective Design of Pump & Treat Systems," 2005, EPA 542-R-05-008.	https://semsub.epa.gov/work/HQ/174138.pdf
USEPA	OSWER	Keeley, J. F., "Ground Water Issue - Performance Evaluation of Pump and Treat Remediations," U.S. Environmental Protection Agency, Washington, DC, EPA/540/4-89/005, 1989.	https://www.epa.gov/sites/default/files/2015-06/documents/performance_eval_pump_treat.pdf
USEPA	Office of Land and Emergency Management	Green Remediation Best Management Practices: Pump and Treat Systems. A fact sheet about the concepts and tools for using BMPs for project planning, construction of P&T systems, systems O&M, and long-term monitoring.	https://www.epa.gov/system/files/documents/2022-02/gr_fact_sheet_pump_treat.pdf
USEPA	Superfund	BMPs: "EPA's series of BMP fact sheets describe practices for frequently used remedies, various field stages and other aspects posing significant opportunities to reduce the environmental footprint of cleanups. Topics of the 13 fact sheets developed to date include SVE, groundwater pump and treat technologies, landfill cover systems, site investigation, and renewable energy applications. Each fact sheet addresses all five core elements of a greener cleanup."	https://www.epa.gov/superfund/superfund-green-remediation#bmps
USEPA	Superfund	"Alternative Energy at Superfund Sites" website: "Renewable energy resources - wind, solar, biomass and geothermal energy - are non-polluting, inexhaustible and increasingly cost-competitive." The website provides examples and practices of alternate energy use at Superfund sites to help keep costs low and help communities create jobs and diversify local economies.	https://www.epa.gov/superfund-redevelopment/alternative-energy-superfund-sites

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USEPA	Superfund	Superfund Climate Resilience: Vulnerability Assessment website. Consideration of climate change implications in cleanup projects is most effective through use of a place-based strategy to assess the vulnerability of a site remedy. "Site resources to help project managers and other stakeholders understand climate change implications and identify potential hazards at specific sites are available online from EPA and other federal agencies."	https://www.epa.gov/superfund/superfund-climate-resilience-vulnerability-assessment
USEPA	Office of Water	The USEPA's water sector climate change provides several tools and resources that an optimization team can use to forecast water conditions over time.	https://www.epa.gov/climate-change-water-sector
USEPA	Office of Water	"Strategies for Saving Energy at Public Water Systems." U.S. Environmental Protection Agency, Washington, DC, EPA 816-F-13-004, July 2013. Site includes many links for tools and energy saving links and includes a case study of a public water system.	https://www.epa.gov/sites/default/files/2015-04/documents/epa816f13004.pdf
USEPA	Climate Change Adaptation Resource Center (ARC-X)	Adaptation and saltwater intrusion strategies, case studies, tools, library, and underlying science.	https://www.epa.gov/arc-x/climate-adaptation-and-saltwater-intrusion
USEPA	Environmental Monitoring Systems Laboratory, Office of Research and Development	"Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells," EPA160014-891034, March 1991. Initial groundwater installation handbook of suggested practices superseded by SESDGUID-101-R2, Design and Installation of Monitoring Wells.	https://19january2017snapshot.epa.gov/sites/production/files/2015-06/documents/fieldsamp-wellshandbook.pdf
USEPA	Region 4 Science and Ecosystem Support Division	Design and Installation of Monitoring Wells SESDGUID-101-R2, January 2018. The updated USEPA procedures are to be used by field personnel when designing, constructing, and installing groundwater monitoring wells.	https://www.epa.gov/sites/default/files/2016-01/documents/design_and_installation_of_monitoring_wells.pdf
USEPA	OSRTI	This document discusses a "Roadmap to Long Term Monitoring Optimization (LTMO)." The roadmap identifies steps involved in conducting and optimizing an LTMO program and discusses the benefits and uses of several tools and techniques (i.e., qualitative, quantitative, or some combination) that can be used in the process.	https://www.epa.gov/sites/default/files/2015-08/documents/roadmap_ltmo_542-r-05-003.pdf

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DOD	USACE	This link provides a breakdown of various RSE checklists for remediation performance evaluation, ranging from SVE and oil water separation to air stripping performance and green and sustainable remediation.	https://www.hnc.usace.army.mil/Missions/Environmental-and-Munitions/EM-CX-Checklists/
DOD	USACE	The LTMO link located in the Environmental & Munitions Center of Expertise provides examples and guidance to support cleanup and closeout decisions.	https://www.hnc.usace.army.mil/Media/Fact-Sheets/
DOD	USACE	This is an example from the USACE Fact Sheets section for two sites where remediation systems were evaluated and optimized, including P&T systems.	https://www.hnc.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/482099/remediation-system-evaluations/
DOD	NAVFAC	From the DON resources site, 2022: "This page includes a summary of Department of the Navy (DON) Environmental Restoration Program (ERP) policies, guidance, technical reports, and tools."	https://exwc.navy.mil/Products-and-Services/Environmental-Security/NAVFAC-Environmental-Restoration-and-BRAC/Resources/
DOD	NAVFAC	From the DON optimization site, 2022: "The goal of optimization is to maximize the effectiveness of cleanup actions, while minimizing costs and negative environmental and societal impacts." The DON website includes policies, guidance, and resources. The resource section includes optimization and site closeout case studies and many applicable topics included in this guidance.	https://exwc.navy.mil/Products-and-Services/Environmental-Security/NAVFAC-Environmental-Restoration-and-BRAC/Program-Support/Optimization/
DOD	NAVFAC	NAVFAC, 2012, "Guidance for Optimizing Remedial Action Operation (RA-O)."	https://frtr.gov/matrix/documents/Free-Product-Recovery/2012-Guidance-for-Optimizing-Remedial-Action-Operation.pdf
DOD	NAVFAC	NAVFAC 2010, Light Nonaqueous Phase Liquid (LNAPL) Site Management Handbook, November Provides an overview of effective strategies for managing LNAPL-contaminated sites and includes a case study on optimization of a multiphase extraction system with an aboveground P&T system at Former Fire Fighting Training Area (Naval Construction Battalion Center Gulfport).	https://exwc.navy.mil/Portals/88/Documents/EXWC/Restoration/er_pdfs/1/navfac-ev-hdbk-lnapl-mgmt-20101130.pdf?ver=NzA6R9OjpkLkKvI4_04jDA%3d%3d&timestamp=1651709217048

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DOD	NAVFAC	NAVFAC, DON Guidance for Optimizing Remedy Evaluation, Selection, and Design, March 2010. The application of key principles during planning and design through remedy technologies selection and optimization meeting RAOs objectives efficiently and cost-effectively. Two case studies on optimizations of P&T systems, cost considerations of using P&T systems, and footprint reduction techniques for operating pumps are in the guidance.	https://exwc.navfac.navy.mil/Portals/88/Documents/EXWC/Restoration/er_pdfs/gpr/navfacesc-ev-ug-2087-env-opt-remedy-20100309.pdf?ver=ZCDB0HB1QkTsgp9fZ04Fw%3d%3d&timestamp=16510865116033l
DOD	NAVFAC	NAVFAC 2012, User's Guide, UG-2093-ENV Rev.1, "Department of the Navy Guidance on Green and Sustainable Remediation."	https://exwc.navfac.navy.mil/Portals/88/Documents/EXWC/Restoration/er_pdfs/gpr/navfacesc-ev-ug-2093-env-gsr-20120405r1.pdf?ver=Ts0BEjYwdkc0FQ3mMxvFYQ%3d%3d
DOD	NAVFAC	NAVFAC 2014, Green and Sustainable Remediation Fact Sheet.	https://exwc.navfac.navy.mil/Portals/88/Documents/EXWC/Restoration/er_pdfs/g/navfac-ev-fs-gsr-201405v7.pdf?ver=aL0PGaj0NjNF-Q6C96h5yQ%3D%3D
DOD	AFCEC	AFCEC Restoration Systems and Strategies website falls under Environmental Restoration Technical Support Branch, CZTE. The focus of this link is remediation systems, exit strategies, complex site remediation, and green remediation. Environmental systems subject matter expert Dr. Kent Glover leads the Air Force complex site initiative. As remediation transitioned to performance-based remediation contracting strategies, critical process analysis and independent reviews of remedial system performance became a standard part of performance-based remediation contract technical surveillance.	https://www.afcec.af.mil/Home/Environment/Technical-Support-Division/Environmental-Restoration-Technical-Support-Branch/Restoration-Systems-and-Strategies/
DOD	AFCEC	AFCEC Hydrogeology Specialty is responsible for facilitating increased application of sound hydrogeological principles and practices in the areas of environmental management, compliance, and restoration. The hydrogeology group lead is Mr. John Gillespie, Environmental Restoration Technical Support Branch, CZTE. Mr. Philip Hunter led the Monitoring and Remediation Optimization System software, 3TMO, and GTS. Currently, GTS software is supported by the Air Force with the current GTS v1.1 available for download on the ITRC website. An updated version, GTS v1.2, will be available in FY23/24 time frame.	https://www.afcec.af.mil/Home/Environment/Technical-Support-Division/Environmental-Restoration-Technical-Support-Branch/Hydrogeology/

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DOD	AFCEC	The Environmental Restoration Technical Support Branch, CZTE, is part of the Technical Support Division in the AFCEC along with the Environmental Quality Branch. The environmental technical expertise includes the following: air quality, water quality, natural resources, cultural resources, ranges, integrated solid waste, remedial technology, engineering, chemistry, hydrogeology, risk assessment, toxicology, and technology transfer.	https://www.afcec.af.mil/Home/Environment/Technical-Support-Division/
DOD	SERDP/ ESTCP	The SERDP and the ESTCP are the DOD's environmental, resilience, and installation energy and water research programs, harnessing the latest science and technology to improve DOD's environmental cleanup performance, reduce life cycle costs, and enhance and sustain mission capabilities. Early efforts focused on the development of new technologies for treating contaminated groundwater. Many of these technologies are now used throughout DOD.	https://www.serdp-estcp.org/focusareas/d68c4915-6b7f-4f84-a424-b2961cdad84b
DOD	SERDP/ ESTCP	Saltwater Intrusion Impacts on DOD Installation Infrastructure, 2022. SERDP funded projects to continue tool development to examine DOD coastal installations with subsurface physical infrastructure vulnerable to saltwater intrusion. One tool example is the DOD Regional Sea Level Database, which provides sea level change information relevant to each coastal installation.	https://serdp-estcp.org/blogs/details/c087957f-b259-40ab-a13c-9bc625dcb171/saltwater-intrusion-impacts-on-dod-installation-infrastructure
DOD	SERDP/ ESTCP	Energy Assurance and Resilience SERDP projects to demonstrate and validate the latest advancements in microgrids, energy storage, and cybersecurity with project reports dating from 2016-2020 discussing benefits and challenges pertaining to DOD energy strategy. Examples include Portsmouth Naval Shipyard Microgrid and JBCC Microgrid, as well as other sites.	https://www.serdp-estcp.org/Featured-Initiatives/Energy-Assurance-and-Resilience

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DOD	SERDP/ ESTCP	SERDP/ESTCP Environmental Restoration Program Installation Restoration Focus addresses the cleaning and management of sites impacted by legacy and emerging environmental hazards on current and former military installations. This website includes groundwater remediation and management projects ongoing and completed over the years.	https://www.serdp-estcp.org/focusareas/939417ae-eef7-4902-8229-c66312b23710/installation-restoration#project
DOD	SERDP/ ESTCP	SERDP/ESTCP cleanup initiative has some breakdown topics on bioavailability, DNAPL source zone, long-term monitoring, molecular biology tools, perchlorate, vapor intrusion, and others. The long-term monitoring focus is SERDP reports from 2009-2014 with focus sensors, sampling, and optimization.	https://www.serdp-estcp.org/Featured-Initiatives/Cleanup-Initiatives
DOD	SERDP/ ESTCP	The Value of Battery Storage in Military Microgrids - An Assessment for ESTCP, July 2020. An assessment of seven DOD installations that include Army, DON, and Air Force facilities along with Air Reserve Bases.	https://serdp-estcp.org/toolsandtraining/details/8613302c-89f1-40a2-9145-418214135cc1/ew-storage-synthesis-report
U.S. Department of Agriculture	U.S. Forest Service	Sustainability and climate page including vulnerability assessment and adaptation resources that focus on vulnerability assessments of forest and ecosystems and ability to adapt to climate change using a Forest Service Climate Adaptation Plan to integrate climate change adaptation into the U.S. Forest Service's operations and mission. Website includes adaptation examples as well as links to other resources.	https://www.fs.usda.gov/managing-land/sc
U.S. Department of Agriculture	U.S. Forest Service	Wildfire-adapted communities. Risk reduction and mitigation actions to manage wildfires.	https://www.fs.usda.gov/managing-land/fire/fac
U.S. Department of Homeland Security	FEMA	Climate Change Portal: "Climate change is an urgent issue we face together. On this page, learn how we are addressing climate change and find resources for emergency managers."	https://www.fema.gov/emergency-managers/national-preparedness/climate-change
U.S. Department of Homeland Security	FEMA	"Protecting Building Utility Systems from Flood Damage Principles and Practices for the Design and Construction of Flood Resistant Building Utility Systems," FEMA P-348, Edition 2 / February 2017.	https://www.fema.gov/media-library/assets/documents/3729
U.S. Department of Homeland Security	FEMA	Flood map portal is the official public source for flood hazard information.	https://msc.fema.gov/portal/home
U.S. Department of Homeland Security		Drought information portal for planning in advance for a drought.	https://www.ready.gov/drought

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U.S. Department of Homeland Security		Flood preparedness and planning.	https://www.ready.gov/floods
U.S. Department of Homeland Security		Wildfire information portal. How to prepare for wildfires.	https://www.ready.gov/wildfires
U.S. Department of Commerce	NOAA	Sea level rise trends. Information on local relative sea levels along coastal areas worldwide.	https://tidesandcurrents.noaa.gov/sltrends/sltrends.html
U.S. Department of Commerce	NOAA	National storm surge risk maps.	https://www.nhc.noaa.gov/nationalsurge/
U.S. Department of the Interior	USGS	USGS has extensive publications on geographical information, webtools, software, hydrogeological tools, map releases, topographical maps, and many more publications.	https://www.usgs.gov/
U.S. Department of the Interior	USGS	"Ground-Water-Level Monitoring and the Importance of Long-Term Water-Level Data," 2001.	https://pubs.usgs.gov/circ/circ1217/
U.S. Department of the Interior	USGS	MODFLOW 6 is an object-oriented program and framework developed to provide a platform for supporting multiple models and multiple types of models within the same simulation.	https://www.usgs.gov/software/modflow-6-usgs-modular-hydrologic-model
New York Department of Environmental Conservation (DEC)	Division of Environmental Remediation	Program Policy (DER-10) - requires optimization of a treatment system before considering shutdown. The DEC performs its own optimizations on remedies it inherits from USEPA and performs optimizations on remedies for state sites. Typically, RSOs under DER occur: 1-2 years following completion of a remedy, 5 years following completion of a remedy, and any other time a concern exists regarding the effectiveness of the in-place remedy. Project managers are encouraged to evaluate the need for an RSO every 5 years for sites under Site Management (DEC's version of O&M), or on an as-needed basis. Periodic review reports also provide an excellent opportunity to evaluate the need for an RSO at a site.	https://www.dec.ny.gov/docs/remediation_hudson_pdf/der10.pdf
New York DEC	Division of Environmental Remediation	Site Management Plan Template that consultants use to create site management plans. Includes provisions and scoping for RSOs.	https://www.dec.ny.gov/docs/remediation_hudson_pdf/smtemplate1.pdf
California EPA	Department of Toxic Substances Control	Well Design and Construction for Monitoring Groundwater at Contaminated Sites, June 2014. Provides guidance for the design and construction of groundwater monitoring wells at contaminated sites.	https://dts.cdev.sites.ca.gov/wp-content/uploads/sites/112/2018/09/Well_Design_Constr_for_Monitoring_GWContam_Sites1.pdf

Agency/ Organization	Department/ Program	Description	Program Website/ Resources
Georgia Department of Natural Resources (DNR)	Environmental Protection Division, Land Protection Branch	Part of Georgia DNR's evaluation of Corrective Action Progress Reports includes an analysis of short-term effectiveness, usually through a running three-year contaminant trend. P&T systems are optimized more on an ad hoc basis rather than through a formal program.	https://epd.georgia.gov/about-us/land-protection-branch
Florida DEP		"Monitoring Well Design and Construction Guidance Manual," 2008.	https://floridadep.gov/sites/default/files/monitoring-well-manual-formatted-final_2.pdf
Sustainable Remediation Forum (SURF)		SURF provides a range of sustainability and resiliency downloadable guidance and tools at their website.	https://www.sustainableremediation.org/guidance-tools-and-other-resources
University of Delaware		Clearinghouse for saltwater intrusion information for the Delaware, Maryland, and Virginia Peninsula.	https://sites.udel.edu/delmarvasalt/
Duke University	Nicholas Institute for Energy, Environment & Sustainability	Climate resilience adaptation that includes a wide range of social and ecological systems.	https://nicholasinstitute.duke.edu/issues/climate-resilience-and-adaptation
Indiana University	Center for Climate Adaptation	Climate implications, saltwater intrusion. The case study link leads to a database of areas of interest.	https://eri.iu.edu/erit/implications/saltwater-intrusion.html
Rutgers University	Center for Climate Adaptation	Climate adaptation resources driven by science, policy, engineering, and planning.	https://impact.rutgers.edu/the-rising-tide/
Stanford	Doerr School of Sustainability	Environmental geophysics and sustainability resources.	https://enviro.stanford.edu/
United Nations		A Practical Guide to Climate-resilient Buildings & Communities, July 2021. "This practical guide demonstrates how buildings and community spaces can be constructed to increase their resilience to climate change, especially in developing countries where structures are largely self-built. The publication provides an overview of the fundamental types of interventions at the building scale, including the use of nature-based solutions."	https://www.unep.org/resources/practical-guide-climate-resilient-buildings

Notes: AFCEC = Air Force Civil Engineer Center, Air Force = United States Air Force, BMP = best management practice, CLU-IN = Contaminated Site Clean-UP Information, CZTE = Environmental Restoration Technical Support Branch, DEC = Department of Environmental Conservation, DEP = Department of Environmental Protection, DNR = Department of Natural Resources, DOD = Department of Defense, DOE = Department of Energy, DON = United States Department of the Navy, EPA = United States Environmental Protection Agency, ERP = Environmental Restoration Program, ESTCP = Environmental Security Technology Certification Program, FEMA = Federal Emergency Management Agency, FRTR = Federal Remediation Technologies Roundtable, ITRC = Interstate Technology and Regulatory Council, LNAPL = light nonaqueous-phase liquid, LTMO = long-term monitoring optimization, NAVFAC = Naval Facilities Engineering Command, NOAA = National Oceanic and Atmospheric Administration, O&M = operations and maintenance, OSWER = United States Environmental Protection Agency Office of Solid Waste and Emergency Response, P&T = pump & treat, ROD = record of decision, RSE = remedial system evaluation, RSO = Remedial System Optimization, SERDP = Strategic Environmental Research and Development Program, SURF = Sustainable Remediation Forum, SVE = soil vapor extraction, TCEQ = Texas Commission on Environmental Quality, USACE = United States Army Corps of Engineers, USEPA = United States Environmental Protection Agency, and USGS = United States Geological Survey.