

NATIONAL RESEARCH COUNCIL



GROUNDWATER & SOIL CLEANUP

IMPROVING MANAGEMENT OF PERSISTENT CONTAMINANTS

Groundwater And Soil Cleanup Improving Management Of Persistent Contaminants

**Judith Nathanail, Paul Bardos, Paul
Nathanail**



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Groundwater and Soil Cleanup National Research Council, Division on Earth and Life Studies, Commission on Geosciences, Environment and Resources, Committee on Technologies for Cleanup of Subsurface Contaminants in the DOE Weapons Complex, 1999-10-21 This book presents a comprehensive up to date review of technologies for cleaning up contaminants in groundwater and soil It provides a special focus on three classes of contaminants that have proven very difficult to treat once released to the subsurface metals radionuclides and dense nonaqueous phase liquids such as chlorinated solvents Groundwater and Soil Cleanup was commissioned by the Department of Energy DOE as part of its program to clean up contamination in the nuclear weapons production complex In addition to a review of remediation technologies the book describes new trends in regulation of contaminated sites and assesses DOE s program for developing new subsurface cleanup technologies

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Groundwater & Soil Cleanup, 1999 *New and Forthcoming Books* National Academy Press (U.S.), 2000

A Strategic Vision for Department of Energy Environmental Quality Research and Development National Research Council, Division on Earth and Life Studies, Board on Radioactive Waste Management, Committee on Building a Long-Term Environmental Quality Research and Development Program in the Department of Energy, 2001-10-01 The National Academies National Research Council undertook this study in response to a request from the Under Secretary of Energy to provide strategic advice on how the Department of Energy could improve its Environmental Quality R D portfolio The committee recommends that DOE develop strategic goals and objectives for its EQ business line that explicitly incorporate a more comprehensive long term view of its EQ responsibilities For example these goals and objectives should emphasize long term stewardship and the importance of limiting contamination and materials management problems including the generation of wastes and contaminated media in ongoing and future DOE operations

Natural Attenuation for Groundwater Remediation Commission on Geosciences, Environment, and Resources, Board on Radioactive Waste Management, Water Science and Technology Board, Committee on Intrinsic Remediation, 2000-07-31 In the past decade officials responsible for clean up of contaminated groundwater have increasingly turned to natural

attenuation essentially allowing naturally occurring processes to reduce the toxic potential of contaminants versus engineered solutions. This saves both money and headaches. To the people in surrounding communities though it can appear that clean up officials are simply walking away from contaminated sites. When is natural attenuation the appropriate approach to a clean up? This book presents the consensus of a diverse committee informed by the views of researchers, regulators and community activists. The committee reviews the likely effectiveness of natural attenuation with different classes of contaminants and describes how to evaluate the footprints of natural attenuation at a site to determine whether natural processes will provide adequate clean up. Included are recommendations for regulatory change. The committee emphasizes the importance of the public's belief and attitudes toward remediation and provides guidance on involving community stakeholders throughout the clean up process. The book explores how contamination occurs, explaining concepts and terms and includes case studies from the Hanford nuclear site, military bases as well as other sites. It provides historical background and important data on clean up processes and goes on to offer critical reviews of 14 published protocols for evaluating natural attenuation.

Research Needs for High-Level Waste Stored in Tanks and Bins at U.S. Department of Energy Sites, National Research Council, Division on Earth and Life Studies, Board on Radioactive Waste Management, Committee on Long-Term Research Needs for Radioactive High-Level Waste at Department of Energy Sites, 2001-10-05. The United States Department of Energy (DOE) has approximately 400 million liters (100 million gallons) of liquid high level waste (HLW) stored in underground tanks and approximately 4 000 cubic meters of solid HLW stored in bins. The current DOE estimate of the cost of converting these liquid and solid wastes into stable forms for shipment to a geological repository exceeds 50 billion to be spent over several decades.

DOE 2000. The Committee on Long Term Research Needs for Radioactive High Level Waste at Department of Energy Sites was appointed by the National Research Council (NRC) to advise the Environmental Management Science Program (EMSP) on a long term research agenda addressing the above problems related to HLW stored in tanks and bins at DOE sites.

Contaminants in the Subsurface, National Research Council, Division on Earth and Life Studies, Water Science and Technology Board, Committee on Source Removal of Contaminants in the Subsurface, 2005-03-23. At hundreds of thousands of commercial industrial and military sites across the country, subsurface materials including groundwater are contaminated with chemical waste. The last decade has seen growing interest in using aggressive source remediation technologies to remove contaminants from the subsurface but there is limited understanding of 1) the effectiveness of these technologies and 2) the overall effect of mass removal on groundwater quality. This report reviews the suite of technologies available for source remediation and their ability to reach a variety of cleanup goals from meeting regulatory standards for groundwater to reducing costs. The report proposes elements of a protocol for accomplishing source remediation that should enable project managers to decide whether and how to pursue source remediation at their sites.

Groundwater Management in Large River Basins Milan Dimkic, Heinz-Jürgen

Brauch, Michael Kavanaugh, 2008-11-15 Part of Groundwater Set Buy all six books and save over 30% on buying separately This book reviews the state of the art of groundwater management in large river basins providing an innovative informative and consistent approach with technical tools for planners decision makers and engineers Groundwater Management in Large River Basins provides comprehensive coverage of the basic elements of groundwater management in large river basins including Social economic and legislative framework goals practices and possible tools Review of EU groundwater legislation and its implementation Natural groundwater occurrence and natural circumstances and processes Groundwater management and maintenance issues Role of natural factors in groundwater management Different methods of groundwater abstraction and protection Groundwater treatment technologies Well ageing and maintenance Nitrate problems etc Groundwater modeling as a tool for groundwater assessment Aquifer restoration A spectrum of technical appendices for engineers which address groundwater issues Also included will be appendices intended to support the work of groundwater engineers This book will be of interest to groundwater engineers and planners as well as lecturers and postgraduate and postdoctoral students Research Needs in Subsurface Science National Research Council, Water Science and Technology Board, Board on Radioactive Waste Management, U.S. Department of Energy's Environmental Management Science Program, 2000-03-13 Research Needs in Subsurface Science provides an overview of the subsurface contamination problems across the DOE complex and shows by examples from the six largest DOE sites Hanford Site Idaho Engineering and Environmental Laboratory Nevada Test Site Oak Ridge Reservation Rocky Flats Environmental Technology Site and Savannah River Site how advances in scientific and engineering knowledge can improve the effectiveness of the cleanup effort This report analyzes the current Environmental Management EM Science Program portfolio of subsurface research projects to assess the extent to which the program is focused on DOE's contamination problems This analysis employs an organizing scheme that provides a direct linkage between basic research in the EM Science Program and applied technology development in DOE's Subsurface Contaminants Focus Area Research Needs in Subsurface Science also reviews related research programs in other DOE offices and other federal agencies see Chapter 4 to determine the extent to which they are focused on DOE's subsurface contamination problems On the basis of these analyses this report singles out the highly significant subsurface contamination knowledge gaps and research needs that the EM Science Program must address if the DOE cleanup program is to succeed Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites National Research Council, Commission on Geosciences, Environment, and Resources, Board on Radioactive Waste Management, Committee on the Remediation of Buried and Tank Wastes, 2000-11-09 It is now becoming clear that relatively few U S Department of Energy DOE waste sites will be cleaned up to the point where they can be released for unrestricted use Long term stewardship activities to protect human health and the environment from hazards that may remain at its sites after cessation of remediation will be required for over 100 of the 144 waste sites under DOE control U S Department of

Energy 1999 After stabilizing wastes that remain on site and containing them as well as is feasible DOE intends to rely on stewardship for as long as hazards persist in many cases indefinitely Physical containment barriers the management systems upon which their long term reliability depends and institutional controls intended to prevent exposure of people and the environment to the remaining site hazards will have to be maintained at some DOE sites for an indefinite period of time The Committee on Remediation of Buried and Tank Wastes finds that much regarding DOE s intended reliance on long term stewardship is at this point problematic The details of long term stewardship planning are yet to be specified the adequacy of funding is not assured and there is no convincing evidence that institutional controls and other stewardship measures are reliable over the long term Scientific understanding of the factors that govern the long term behavior of residual contaminants in the environment is not adequate Yet the likelihood that institutional management measures will fail at some point is relatively high underscoring the need to assure that decisions made in the near term are based on the best available science Improving institutional capabilities can be expected to be every bit as difficult as improving scientific and technical ones but without improved understanding of why and how institutions succeed and fail the follow through necessary to assure that long term stewardship remains effective cannot reliably be counted on to occur Long Term Institutional Management of U S Department of Energy Legacy Waste Sites examines the capabilities and limitations of the scientific technical and human and institutional systems that compose the measures that DOE expects to put into place at potentially hazardous residually contaminated sites *Contaminated Land Management* Judith Nathanail,Paul Bardos,Paul Nathanail,2011-11 **Alternatives for Managing the Nation's Complex Contaminated Groundwater Sites** National Research Council,Division on Earth and Life Studies,Water Science and Technology Board,Committee on Future Options for Management in the Nation's Subsurface Remediation Effort,2013-02-27 Across the United States thousands of hazardous waste sites are contaminated with chemicals that prevent the underlying groundwater from meeting drinking water standards These include Superfund sites and other facilities that handle and dispose of hazardous waste active and inactive dry cleaners and leaking underground storage tanks many are at federal facilities such as military installations While many sites have been closed over the past 30 years through cleanup programs run by the U S Department of Defense the U S EPA and other state and federal agencies the remaining caseload is much more difficult to address because the nature of the contamination and subsurface conditions make it difficult to achieve drinking water standards in the affected groundwater Alternatives for Managing the Nation s Complex Contaminated Groundwater Sites estimates that at least 126 000 sites across the U S still have contaminated groundwater and their closure is expected to cost at least 110 billion to 127 billion About 10 percent of these sites are considered complex meaning restoration is unlikely to be achieved in the next 50 to 100 years due to technological limitations At sites where contaminant concentrations have plateaued at levels above cleanup goals despite active efforts the report recommends evaluating whether the sites should transition to long term management

where risks would be monitored and harmful exposures prevented but at reduced costs In Situ Remediation of Chlorinated Solvent Plumes Hans F. Stroo, C. Herb Ward, 2010-09-10 In the late 1970s and early 1980s our nation began to grapple with the legacy of past disposal practices for toxic chemicals With the passage in 1980 of the Comprehensive Environmental Response Compensation and Liability Act CERCLA commonly known as Superfund it became the law of the land to remediate these sites The U S Department of Defense DoD the nation's largest industrial organization also recognized that it too had a legacy of contaminated sites Historic operations at Army Navy Air Force and Marine Corps facilities ranges manufacturing sites shipyards and depots had resulted in widespread contamination of soil groundwater and sediment While Superfund began in 1980 to focus on remediation of heavily contaminated sites largely abandoned or neglected by the private sector the DoD had already initiated its Installation Restoration Program in the mid 1970s In 1984 the DoD began the Defense Environmental Restoration Program DERP for contaminated site assessment and remediation Two years later the U S Congress codified the DERP and directed the Secretary of Defense to carry out a concurrent program of research development and demonstration of innovative remediation technologies As chronicled in the 1994 National Research Council report Ranking Hazardous Waste Sites for Remedial Action our early estimates on the cost and suitability of existing technologies for cleaning up contaminated sites were wildly optimistic Original estimates in 1980 projected an average Superfund cleanup cost of a mere 3 **Advances in Environmental Technologies III** Ji Zhao, Aijie Wang, Xin Yong Li, Xiao Yi Wang, 2014-06-18 Selected peer reviewed papers from the 2014 International Conference on Energy and Environmental Protection ICEEP 2014 April 26-28 2014 Xi'an China **The Department of Energy's Support for the Savannah River Ecology Laboratory (SREL).** United States. Congress. House. Committee on Science and Technology (2007). Subcommittee on Investigations and Oversight, 2008 Bioavailability of Contaminants in Soils and Sediments National Research Council, Division on Earth and Life Studies, Water Science and Technology Board, Committee on Bioavailability of Contaminants in Soils and Sediments, 2003-04-03 Bioavailability refers to the extent to which humans and ecological receptors are exposed to contaminants in soil or sediment The concept of bioavailability has recently piqued the interest of the hazardous waste industry as an important consideration in deciding how much waste to clean up The rationale is that if contaminants in soil and sediment are not bioavailable then more contaminant mass can be left in place without creating additional risk A new NRC report notes that the potential for the consideration of bioavailability to influence decision making is greatest where certain chemical environmental and regulatory factors align The current use of bioavailability in risk assessment and hazardous waste cleanup regulations is demystified and acceptable tools and models for bioavailability assessment are discussed and ranked according to seven criteria Finally the intimate link between bioavailability and bioremediation is explored The report concludes with suggestions for moving bioavailability forward in the regulatory arena for both soil and sediment cleanup *Science and Technology for DOE Site Cleanup* National Research Council, Division on

Earth and Life Studies, Nuclear and Radiation Studies Board, 2010-03-05 The Department of Energy's Office of Environmental Management is developing a technology roadmap to guide planning and possible future congressional appropriations for its technology development programs. It asked the National Research Council of the National Academies to provide technical and strategic advice to support the development and implementation of this roadmap specifically by undertaking a study that identifies principal science and technology gaps and their priorities for the cleanup program based on previous National Academies reports updated and extended to reflect current site conditions and EM priorities and input from key external groups such as the Nuclear Regulatory Commission, Defense Nuclear Facilities Safety Board, Environmental Protection Agency and state regulatory agencies. In response, this book provides a high level synthesis of principal science and technology gaps identified in previous NRC reports in part 1. Part 2 summarizes a workshop meant to bring together the key external groups to discuss current site conditions and science and technology needs.

Best Practices for Risk-Informed Decision Making Regarding Contaminated Sites National Research Council, Policy and Global Affairs, Science and Technology for Sustainability Program, Division on Earth and Life Studies, Nuclear and Radiation Studies Board, Committee on Best Practices for Risk-Informed Remedy Selection, Closure and Post-Closure of Contaminated Sites, 2014-07-21 The Department of Energy's Office of Environmental Management's EM mission is the safe cleanup of sites associated with the government led development of nuclear weapons and nuclear energy. While many of these legacy sites have completed cleanup, the largest and most complex sites have not been fully remediated. The cleanup of these sites is proceeding under legally enforceable agreements with timelines for hundreds of milestones. EM is reviewing alternative approaches to increase effectiveness and improve cost efficiencies of its cleanup activities especially for sites that will have residual contamination when active cleanup is complete. This report is the summary of two workshops convened in October 2013 and January 2014 on best practices for risk informed remedy selection, closure and post closure control of radioactive and chemically contaminated sites that present significant difficulty for remediation to unrestricted release. The workshop series aimed to explore best practices that promote effective risk informed decision making and future opportunities to improve remediation approaches and practices. In the Workshop 1 section of Best Practices for Risk Informed Decision Making Regarding Contaminated Sites, the report examines holistic approaches for remediating sites with multiple contaminant sources and post closure uses and approaches for incorporating a sustainability framework into decision making regarding site remediation, closure and post closure control. In Workshop 2, the report focuses on post closure controls, assessment of long term performance of site remedies and best practices for risk based remediation decisions.

Phytoremediation of Metal-Contaminated Soils Jean-Louis Morel, Guillaume Echevarria, Nadezhda Goncharova, 2006-06-23 Phytoremediation, the use of plants to remediate environmental media, is being pursued as a new approach for the cleanup of contaminated soils and waters including groundwater. Plant assisted bioremediation, sometimes referred to as a type of phytoremediation,

involves the interaction of plant roots and the microorganisms associated with these root systems to remediate soils containing elevated concentrations of organic compounds. These techniques could provide cost-effective methods of remediating soils and groundwater contaminated with metals, radionuclides, and various types of organics with fewer secondary wastes and less environmental impact than would be generated using traditional remediation methods. All plants extract necessary nutrients, including metals, from their soil and water environments. Some plants, called hyperaccumulators, have the ability to store large amounts of metals, even some metals that do not appear to be required for plant functioning. In addition, plants can take up various organic chemicals from environmental media and degrade or otherwise process them for use in their physiological processes. Phytoremediation technologies are in the early stages of development, with laboratory research and limited field trials being conducted to determine processes and refine methods. Additional research, including genetic engineering, is being conducted to improve the natural capabilities of plants to perform remediation functions and to investigate other plants with potential phytoremediation applications. Large areas in Western and Eastern countries are polluted with heavy metals and radionuclides in natural, rural, urban, or industrial areas.

Unveiling the Energy of Verbal Artistry: An Mental Sojourn through **Groundwater And Soil Cleanup Improving Management Of Persistent Contaminants**

In some sort of inundated with displays and the cacophony of instantaneous transmission, the profound power and mental resonance of verbal beauty usually diminish in to obscurity, eclipsed by the continuous assault of noise and distractions. However, set within the musical pages of **Groundwater And Soil Cleanup Improving Management Of Persistent Contaminants**, a interesting work of literary splendor that pulses with fresh emotions, lies an unique journey waiting to be embarked upon. Published with a virtuoso wordsmith, this exciting opus guides readers on a psychological odyssey, delicately revealing the latent possible and profound impact embedded within the delicate web of language. Within the heart-wrenching expanse with this evocative examination, we shall embark upon an introspective exploration of the book is key themes, dissect their interesting writing design, and immerse ourselves in the indelible impact it leaves upon the depths of readers souls.

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