Reducing the Footprint of Contaminated Lands: US Department of Energy Sites as a Case Study

Joanna Burger, Michael Greenberg, Charles W. Powers and Michael Gochfeld

The legacy of the Cold War and of 20th century industrial development has left us with contaminated lands, both public and private, that require remediation and conversion to other uses. Many contaminated US Department of Energy sites left over from the Cold War have large buffer areas of uncontaminated land that once served a security purpose. In this paper we propose a management plan for reducing the size of contaminated land holdings, particularly where these sites contain uncontaminated buffer lands such as those held by the Department of Energy. We examine the disciplines, research, and other considerations whose involvement is essential to reducing the footprint of these contaminated lands. After the land necessary for continued missions and for long-term stewardship of contamination is established, the land that remains can be returned to other uses. Remediation options for these decommissioned lands, ecological considerations, and economic/cultural values should be incorporated into future land use decisions. Some of these lands have unique species assemblages and ecosystems that should be evaluated before the land is turned over to industrial or other uses. Land use options are constrained by regulatory, governmental, environmental and legal concerns that must be examined before transfer. Once the decision has been made to transfer lands, there are a number of administrative, bio-monitoring, and institutional controls that are essential. Buffer lands that are returned to other uses (ranging from conservation and recreation areas to industry or housing) might require regular bio-monitoring to ensure that there is no health risk to biota or people. Institutional controls and monetary responsibilities must be in place before land is transferred to ensure that there are neither appreciable future risks to the public and ecosystems nor appreciable liabilities and costs to the new owners. Each of these steps should involve multiple disciplines (eg public health, toxicology, ecology, land use planning, economics, risk communication) and agencies, as well as multiple stakeholders in an interactive and iterative process.

Key Words: Contaminated land; risk; reducing footprint; interdisciplinary; ecological; future land use

Introduction

In the US, the Department of Energy (DOE), the Department of Defense (DOD), other federal organizations, and the private industrial sector have land holdings that contain chemical and radiological wastes requiring remediation and restoration, or long-term stewardship, to prevent risks to humans and other receptors. However, many such sites also contain land that is not contaminated, or only lightly so, as well as areas currently used for recreational, agricultural, or
Reducing the Footprint of Contaminated Lands

industrial purposes. With the ending of the Cold War, and the recognition that some contaminated federal facilities contain land valuable to surrounding communities or to the nation at large, managers and policy makers are faced with the task of determining how to reduce land holdings within the current regulatory framework, while protecting human and ecological health. Turning some of the lightly contaminated land into industrial sites or ecological reserves can be a positive move, for two reasons: the land can then be used for other economic or ecological purposes, and it can be removed from the responsibility of the original owners. For example, many brownfields within urban and suburban areas are in the process of being converted to other productive uses (Simmons, 1998; Powers et al., 2000; US Conference of Mayors, 2000). Other countries also have a Cold War legacy of contaminated lands, and are faced with determining not only how to deal with the contamination (and contaminated facilities) but with adjacent buffer lands that are not contaminated.

In this paper, we identify the major steps that are required to reduce the physical size, or footprint, of contaminated lands. There is a range in the spatial extent, magnitude, and bio-availability of contamination on sites that have chemical and radiological wastes. We suggest that an integrated and iterative process that involves a wide range of disciplines, agencies, and stakeholders will allow some currently contaminated land to be returned to productive uses—ranging from industrial, through preserves and parks, to residential—without compromising human and ecological health. We focus on the DOE as a case study. While source reduction is key to managing contaminated lands, this paper does not focus on source reduction and remediation, but on dealing with buffer lands which surround contaminated sites but which are not themselves contaminated. We deal with the issues involved in returning some of these buffer lands to productive uses, as conservation or preservation areas, as recreational lands, or for other purposes (Burger et al., 2003). Ultimately, for these sites to be sustainable, managers and society should both reduce further contamination and remediate or remove present contamination (or stabilize until further technological development can deal with those wastes that cannot be remediated with current technology).

The clean-up task on contaminated sites in the US, as elsewhere, is daunting. For example, the DOD has sites in all states that require cleanup and many await decisions on future land use. The US Army is the executive agent for the clean-up programs, and the Army Corps of Engineers manages and executes the program (Lubbert and Chu, 2001). The DOE has an environmental management task averaging about six billion dollars a year over the last decade, and representing 20 per cent of the world’s environmental remediation market (Sink and Frank, 1996), nearly equalling the budget of the US Environmental Protection Agency’s myriad functions. The US nuclear weapons complex has some 5000 facilities located at 16 major sites and more than 100 smaller sites (Crowley and Ahearne, 2002). Some 113 of the DOE sites around the country contain chemical and radiological wastes generated by the production of nuclear weapons (Department of Energy, 2000). To complicate matters, both the DOE and DOD do not currently own all of the property they are responsible for cleaning up (Lubbert and Chu, 2001). Other smaller contaminated sites, owned by private industry or government, and often called brownfields, also face clean-up and conversion to other entities and/or functions (Powers et al., 2000).

Some of the contaminants on these sites are solvents, metals and radionuclides in mixed waste, in huge containers of varying integrity, for which there is no technological method of clean-up. In the past, site contamination problems were typically addressed by remediation engineers and environmental scientists. However, we suggest that the complexity, geographical size, and magnitude of the problems caused by chemical and radiological contamination require interdisciplinary teams to address the conversion of sites to productive uses or ecological preserves (Burger et al., 2003). Productive uses span a continuum from highly industrial or commercial, through residential and recreational, to parks and wildlife refuges. Multi-disciplinary teams (representing, for instance, public health, toxicology, ecology, land use planning, economics, risk communication) are faced with a multitude of interrelated challenges. These include addressing