

1. INTRODUCTION

Estimated cumulative human health and ecological risks associated with the Subsurface Disposal Area (SDA) are presented in this Ancillary Basis for Risk Analysis (ABRA) report. The ABRA assesses potential risk associated with Waste Area Group (WAG) 7 Operable Unit (OU) 7-13/14, which is the comprehensive remedial investigation/feasibility study (RI/FS) for the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering and Environmental Laboratory (INEEL). The ABRA is focused exclusively on the SDA, which is the radioactive waste landfill in the RWMC. Though the ABRA has no formal standing under the Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991), it was prepared in accordance with U.S. Environmental Protection Agency (EPA) RI/FS guidance (EPA 1988). Much of the future RI/FS, including identification of contaminants of concern (COCs), will be taken directly from this ABRA report.^a

Risk analysis identified 12 radionuclides and four chemical human health contaminants of concern (COCs): Am-241, C-14, I-129, Nb-94, Np-237, Sr-90, Tc-99, U-233, U-234, U-235, U-236, U-238, carbon tetrachloride (CCl₄), methylene chloride, nitrates, and tetrachloroethylene (PCE). In addition, Pu-238, Pu-239, and Pu-240 were classified as special case groundwater COCs to acknowledge uncertainties about plutonium mobility in the environment and to reassure stakeholders that risk management decisions for the SDA will be fully protective. Ecological risk assessment identified four radionuclides and three chemical ecological COCs: Am-241, Pu-239, Pu-240, Sr-90, cadmium, lead, and nitrates. Details that underlie identification of COCs are presented in the body of this report.

1.1 Purpose

The purpose of the ABRA is to provide the U.S. Department of Energy (DOE), the Idaho Department of Environmental Quality (IDEQ), and the U.S. Environmental Protection Agency (EPA) with a basis for defining scope to complete the OU 7-13/14 comprehensive RI/FS. Information in the RI/FS will support future risk management decisions for WAG 7 under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq.) and the 1991 Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991).

1.2 Schedule and Scope

In the decade since the FFA/CO was finalized, the signing agencies, DOE, IDEQ, and EPA, have modified the scope and schedule for OU 7-13/14 because of the magnitude and duration of the project and to accommodate the modified scope and schedule for the OU 7-10 Interim Action for Pit 9 (DOE-ID 1998a, 1993, 1991; DOE 2002). Scope and schedule for OU 7-13/14 were outlined in the original Scope of Work (SOW) (Huntley and Burns 1995), and details were developed in the original OU 7-13/14 RI/FS Work Plan (Becker et al. 1996). In 1997, DOE, IDEQ, and EPA collaborated to revise

a. During a meeting on July 18, 2002, personnel from DOE-ID, IDEQ, and EPA determined that additional modeling to refine risk estimates for dissolved-phase radioisotopes is not warranted. All three agencies are participating in developing a second revision to the OU 7-13/14 Scope of Work and a second addendum to the Work Plan to formalize this determination and to define scope for completing the OU 7-13/14 comprehensive RI/FS. Because risk estimates developed in this ABRA will be repeated in the future RI/BRA, identifying COCs in this ABRA is appropriate.

the SOW (LMITCO 1997) and to develop an Addendum to the Work Plan (DOE-ID 1998b). According to the revised SOW, the schedule for delivering the draft RI/FS for IDEQ and EPA review under the FFA/CO was modified from September 1997 to March 2002.

The schedule was extended again to accommodate additional changes related to the Pit 9 Interim Action in accordance with the April 16, 2002, Agreement to Resolve Disputes (DOE 2002). As a result of the agreement, the draft RI/BRA for OU 7-13/14 is scheduled for submittal to IDEQ and EPA under the FFA/CO by August 2005, and the associated draft feasibility study is scheduled for submittal by December 2005.

Originally developed in preparation for the submittal of the draft RI/FS in March 2002, the ABRA incorporates relevant information from previous investigations and studies conducted for WAG 7. The evaluation is cumulative and comprehensive, meaning that additive risks for all contaminants and exposure pathways were considered, and that all sources of risk at the SDA were analyzed to evaluate the overall risk potential. The primary elements of the scope of the ABRA are listed below.

- Describe nature and extent of contamination associated with WAG 7.
- Evaluate current and future cumulative and comprehensive risks to human health posed by waste buried in the SDA.
- Perform a limited, screening-level ecological risk assessment to validate the assumption that the SDA poses unacceptable risk to ecological receptors (DOE-ID 1998b).
- Identify contaminants of concern (COCs) within WAG 7. Contaminants of concern are defined as those contaminants likely to require a risk management decision to address potential threats to human health and the environment.

The RWMC comprises the SDA, which contains buried waste; the Transuranic Storage Area (TSA), which contains aboveground waste; and an administration and operations area with various support facilities. Analysis in the ABRA is limited to the buried waste in the SDA.

1.3 Regulatory Background

In January 1986, hazardous waste disposal sites at the INEEL that could pose an unacceptable risk to health, safety, or the environment were identified in an INEEL installation assessment (EG&G 1986). Sites were ranked using either the EPA hazard ranking system for sites with chemical contamination or the DOE-modified hazard ranking system for radioactive-contaminated sites. A score of 28.5 or higher in either category qualified a site for inclusion on the National Priorities List (NPL) (54 FR 48184). Because several sites within the INEEL received scores in excess of 28.5, the entire reservation became a candidate for the NPL. The RWMC received a modified hazard ranking system score of 9.0 and a hazard ranking score of 9.0 based on the large quantities of waste and their radiological, chemical, and physical characteristics.

On July 10, 1987, the U.S. Department of Energy Idaho Operations Office (DOE-ID) entered into a Consent Order and Compliance Agreement with Region 10 of the EPA and the U.S. Geological Survey (USGS) (DOE-ID 1987). The agreement called for implementing an action plan to remediate active and inactive waste disposal sites at the INEEL under authority of the Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.). Generation, transportation, treatment, storage, and disposal of hazardous waste are regulated by RCRA. Sites identified for further evaluation during the INEEL installation assessment, including those located within the RWMC, were covered by the 1987 agreement.

On November 15, 1989, the EPA added the INEEL to the NPL under CERCLA, also known as the “Superfund.” High-priority sites for investigation and remediation of hazardous materials are identified in the NPL. The decision to add the INEEL to the NPL was based on detection of contaminants in the environment at INEEL sites. A requirement of CERCLA is providing members of the public with opportunities to participate in the decision-making process.

The FFA/CO and its associated Action Plan (DOE-ID 1991) were negotiated and signed by DOE-ID, EPA, and the State of Idaho to implement remediation of the INEEL under CERCLA. Effective December 4, 1991, the FFA/CO superseded the Consent Order and Compliance Agreement. The goals of the FFA/CO are to ensure that (a) potential or actual INEEL releases of hazardous substances to the environment are thoroughly investigated in accordance with the National Contingency Plan (40 CFR 300) and (b) appropriate response actions are taken to protect human health and the environment. The FFA/CO established the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with CERCLA and RCRA legislation and the Idaho Hazardous Waste Management Act (IDAPA 58.01.05). The FFA/CO is consistent with a general approach approved by EPA and DOE in which agreements with states as full partners would allow site investigation and cleanup to proceed using a single “road map” to minimize conflicting requirements and maximize limited remediation resources. For management purposes, the FFA/CO divided the INEEL into 10 WAGs. Waste Area Group 7, comprising the RWMC, is located in the southwest quadrant of the INEEL. The INEEL, the RWMC, and the other facilities and their corresponding WAGs are represented on the relief map in Figure 1-1. A map of the RWMC showing the SDA, the TSA and administration and operations area is provided in Figure 1-2.

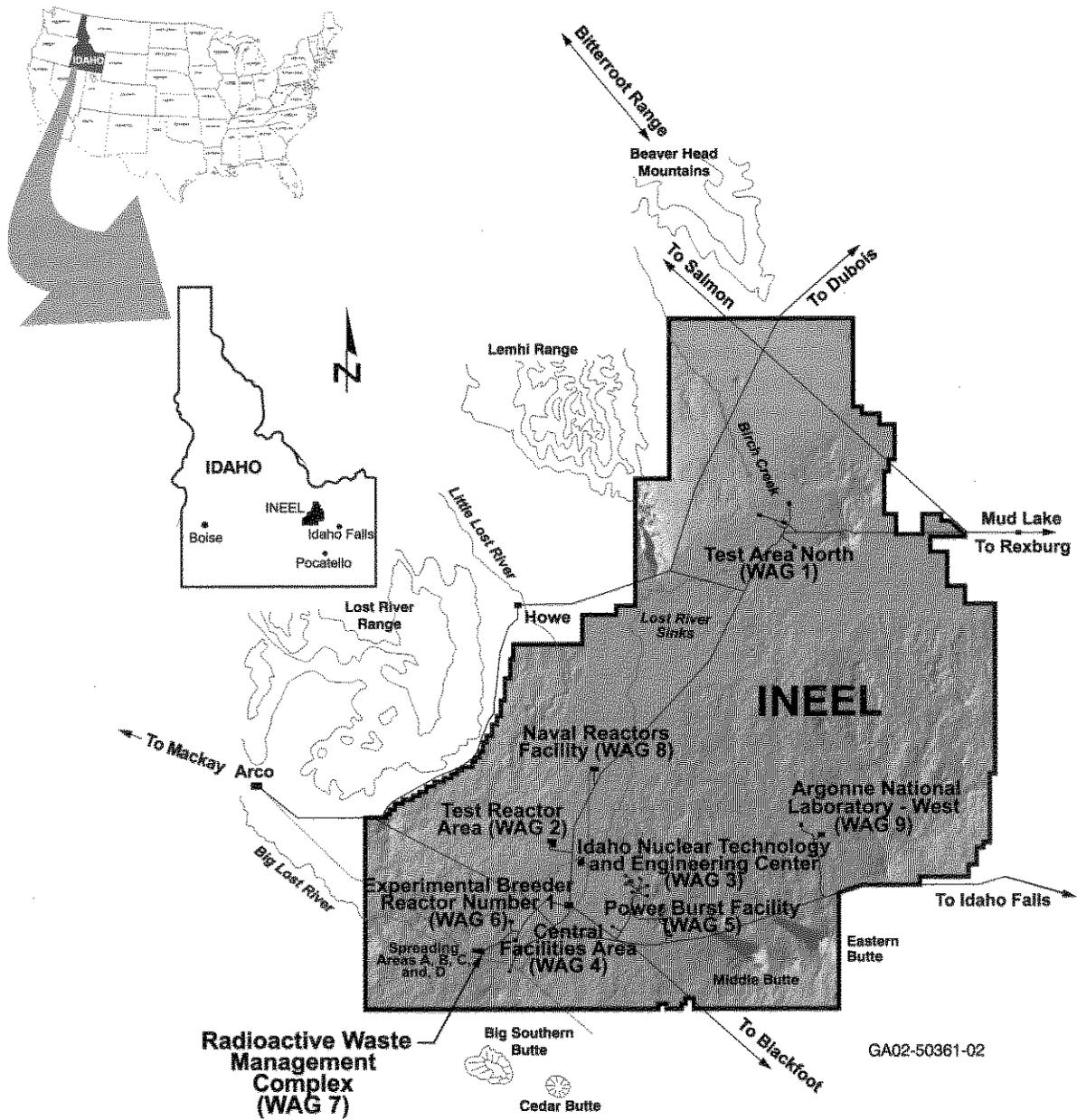
The FFA/CO Action Plan further divided the environmental site investigation at WAG 7 into numerous OUs. In the standard FFA/CO RI/FS process, potential source areas (sites) within each WAG were assigned to an OU for investigation or remedial activities. This process was designed to match the rigor of the assessment process with the complexity of each individual site and to allow for flexibility in determining appropriate further action as an assessment or action is completed. However, in addition to OUs defined as specific release sites, several OUs within WAG 7 were defined as contaminant exposure pathways (e.g., the air pathway and the vadose zone pathway).

The RI/FS for OU 7-13 transuranic (TRU) pits and trenches was established to investigate only those portions of the SDA containing buried TRU radionuclides. The OU 7-14 comprehensive RI/FS was designated as the final, cumulative investigation of WAG 7. Subsequently, however, OU 7-13 and OU 7-14 were combined into a single OU 7-13/14, and now the comprehensive RI/FS for WAG 7 includes the TRU pits and trenches (Huntley and Burns 1995).

1.4 Report Organization

The ABRA contains eight sections. Individual sections conclude with references cited in that section, and a master reference list comprises the last section in the report. In addition, numerous supporting documents are available in the Administrative Record.^b The report format is adapted from the outline suggested by the EPA (1988) for remedial investigations. A summary of each section follows:

b. The Administrative Record is a collection of project documents and is maintained in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act. The official Administrative Record is located at the Idaho National Engineering and Environmental Laboratory (INEEL) Technical Library in Idaho Falls, Idaho. Copies of documents in the Administrative Record are located in Idaho information repositories in the Boise INEEL Office, the Marshall Public Library in Pocatello, the Shoshone-Bannock Library in Fort Hall, and online at <http://ar.inel.gov>.



WAG 10 includes all sites, disposal areas, and portions of the Snake River Plain Aquifer that either are outside the boundaries of WAGs 1 through 9 or are not included within the other WAGs.

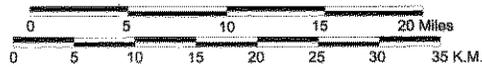


Figure 1-1. Relief map of the Idaho National Engineering and Environmental Laboratory showing locations of the Radioactive Waste Management Complex, other facilities, and corresponding waste area groups.

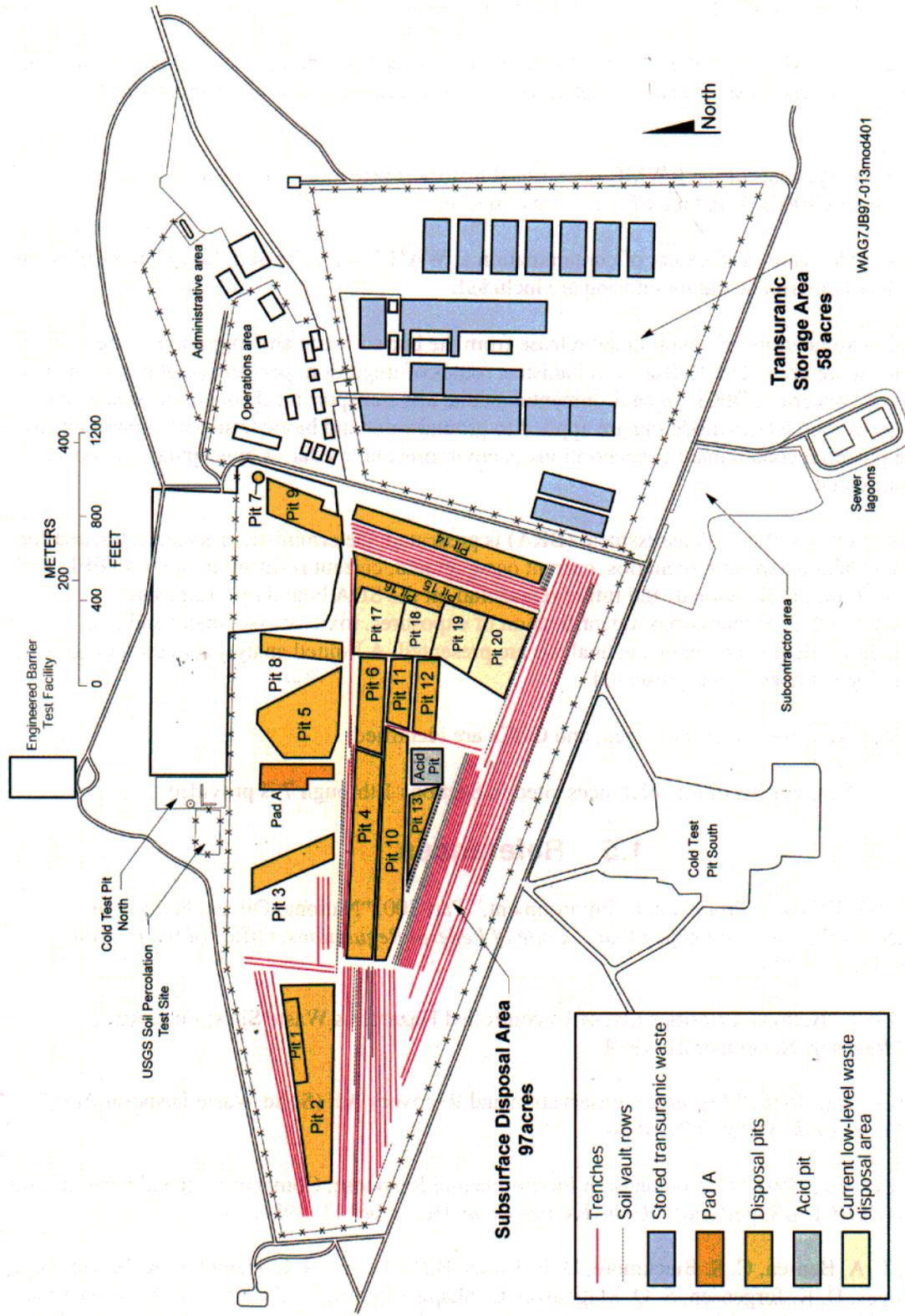


Figure 1-2. Map of the Radioactive Waste Management Complex.

- Section 1—Introductory information for the ABRA is presented.
- Section 2—The INEEL and the RWMC are described, including general historical background and physical characteristics such as topography, meteorology, geology, hydrology, demography, and ecology.
- Section 3—A synopsis of the RWMC operational history is provided. Studies used to assess WAG 7 under CERCLA and the FFA/CO are described.
- Section 4—The nature and extent of contamination at WAG 7 are addressed. Descriptions of waste and results of environmental monitoring are included.
- Section 5—Simulations of contaminant release from the buried waste and migration in the environment are presented. Release mechanisms, routes of migration, persistence of contaminants of potential concern (COPCs) in environmental media, and transport mechanisms are discussed. Results from source term modeling are applied to groundwater and biotic transport simulations to estimate potential contaminant concentrations in environmental media. A conceptual site model also is presented.
- Section 6—The baseline risk assessment (BRA) is presented. Deterministic risks are estimated for four human health exposure scenarios: current occupational, current residential (at the INEEL boundary), future occupational, and future residential (at the SDA boundary). Exposure assessment, media concentrations, quantification of exposures, toxicity assessment and risk characterization, and uncertainties in analysis are presented. A limited analysis of current and future ecological risks also is presented.
- Section 7—The ABRA is summarized, and COCs are identified.
- Section 8—A master list of the references cited in Sections 1 through 7 is provided.

1.5 References

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