DOE/NE-ID-11146
April 2004

U.S. Department of Energy
Idaho Operations Office

Engineering Evaluation/Cost Analysis for the Accelerated Retrieval of a Designated Portion of Pit 4

INEEL
Home of Science and Engineering Solutions

DOE/NE-ID-11146
Project No. 23927
Revision 0

Engineering Evaluation/Cost Analysis for the Accelerated Retrieval of a Designated Portion of Pit 4

April 2004

Prepared for the
U.S. Department of Energy
Idaho Operations Office

ABSTRACT

This engineering evaluation/cost analysis report is being prepared for public comment and supports the development of a proposed non-time-critical removal action at the U.S. Department of Energy's Idaho National Engineering and Environmental Laboratory. The focus of the proposed action is the limited excavation and retrieval of selected waste streams from a designated portion of the Subsurface Disposal Area at the Radioactive Waste Management Complex. The selected retrieval area is approximately 1/2 acre in size and is located in the eastern portion of Pit 4. The waste in this area is primarily from the Rocky Flats Plant. The area was selected by the U.S. Department of Energy, State of Idaho Department of Environmental Quality, and U.S. Environmental Protection Agency based on inventory evaluations identifying significant quantities of transuranic and other contaminated waste disposed of in the area. The proposed project is referred to as the Accelerated Retrieval Project.

This document specifies the focused removal action objective and describes and evaluates two options. The recommended option is focused on retrieval of targeted waste from the Rocky Flats Plant that is contaminated with volatile organic compounds, various isotopes of uranium, and transuranic radionuclides.

CONTENTS

ABSTRACT iii

ACRONYMS vii

1. INTRODUCTION 1

   1.1 Purpose and Scope 1

   1.2 Site History 1

      1.2.1 Background of the Idaho National Engineering and Environmental Laboratory 3
      1.2.2 Background of the Subsurface Disposal Area and Operations 4

   1.3 Previous Investigations 4

   1.4 Source, Nature, and Extent of Contamination 5

      1.4.1 Background of Pit 4 within the Subsurface Disposal Area 6

   1.5 Regulatory Background for Response Actions at the Subsurface Disposal Area 8

   1.6 Summarized Risk Evaluation 9

2. REMOVAL ACTION OBJECTIVES AND SCOPE 11

   2.1 Determination of Non-Time-Critical-Removal-Action Schedule 11

3. IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES 12

   3.1 Development of Alternatives 12

      3.1.1 Alternative One—No Action 12
      3.1.2 Alternative Two—Focused Retrieval 12

4. ANALYSIS OF ALTERNATIVES 17

   4.1 Alternative One—No Action 17

      4.1.1 Effectiveness 17
      4.1.2 Implementability 17
      4.1.3 Cost 17

   4.2 Alternative Two—Focused Retrieval 17

      4.2.1 Effectiveness 18
      4.2.2 Implementability 18
      4.2.3 Cost 19

5. COMPARATIVE ANALYSIS OF ALTERNATIVES 20

6. RECOMMENDED ALTERNATIVE 21

7. REFERENCES 22

Appendix A—Applicable or Relevant and Appropriate Requirements for Alternative Two—Focused Retrieval 25

FIGURES

1. This map of the Idaho National Engineering and Environmental Laboratory shows the location of the Radioactive Waste Management Complex and other major facilities 2

2. Layout of the Subsurface Disposal Area at the Radioactive Waste Management Complex 3

3. The Retrieval Enclosure and Storage Enclosure for the Focused Retrieval alternative 13

4. The Retrieval Enclosure will cover the retrieval area during operations 14

5. The Storage Enclosure will be used to store containers 15

TABLES

1. Rocky Flats Plant waste content in the designated retrieval area of Pit 4 within the Subsurface Disposal Area 7

2. Total estimated costs for No Action and Focused Retrieval alternatives 19

3. Summarization of the comparative analysis of alternatives 20

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminant of concern
DOE	U.S. Department of Energy
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
IDEQ	Idaho Department of Environmental Quality
INEEL	Idaho National Engineering and Environmental Laboratory
NCP	National Contingency Plan
NTCRA	non-time-critical removal action
OU	operable unit
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area
TBC	to be considered
TRU	transuranic
VOC	volatile organic compound
WAG	waste area group
WIPP	Waste Isolation Pilot Plant

Engineering Evaluation/Cost Analysis for the Accelerated Retrieval of a Designated Portion of Pit 4

1. INTRODUCTION

This engineering evaluation/cost analysis (EE/CA) report is being prepared for public comment and supports the development of a proposed non-time-critical removal action (NTCRA) at the Idaho National Engineering and Environmental Laboratory (INEEL). The proposed action will retrieve selected Rocky Flats Plant waste streams from a portion of the Radioactive Waste Management Complex (RWMC) Subsurface Disposal Area (SDA) (see Figure 1). The area of focus is approximately 1/2 acre in size and is located in the eastern portion of Pit 4 of the SDA (see Figure 2). Selecting the specific retrieval area required evaluating the shipping and burial records for containerized radioactive materials and sludge from the Rocky Flats Plant and low-level radioactive waste generated at the INEEL. This evaluation considered specific high-density waste target areas within the SDA. The U.S. Department of Energy (DOE) Idaho Operations Office, with agreement from the U.S. Environmental Protection Agency (EPA) and Idaho Department of Environmental Quality (IDEQ), has selected the designated portion of Pit 4 (see Figure 2) as the initial retrieval area. The proposed project is referred to as the Accelerated Retrieval Project.

This document specifies the focused removal action objective and describes and evaluates two options. The recommended option is focused on retrieval of Rocky Flats Plant waste from the Rocky Flats Plant that is contaminated with transuranic radionuclides, volatile organic compounds (VOCs), and various isotopes of uranium.

The recommended retrieval alternative, described further in subsequent sections, is based in part upon lessons learned through the successful completion of the Glovebox Excavator Method Project. Based on those lessons learned, simplification of some retrieval aspects is believed possible resulting in a retrieval alternative that is streamlined and effective.

1.1 Purpose and Scope

Under the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300) (National Contingency Plan [NCP]) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 USC § 9601 et seq., 1980), an EE/CA must be prepared for all NTCRAs. This report fulfills that requirement for an NTCRA.

The scope of the proposed NTCRA in this EE/CA is limited to addressing the designated portion of Pit 4. Implementation of the proposed action, which addresses a portion of the SDA, is one element in the overall strategy for remediating the buried waste at the RWMC SDA under the Operable Unit (OU) 7-13/14 cleanup program. Additional remedial work at the RWMC will be conducted as defined by future CERCLA removal action documentation or the OU 7-13/14 record of decision (ROD).

1.2 Site History

This section provides general background information for the INEEL and the RWMC, including a brief discussion of the operations history and the regulatory background for performing CERCLA cleanup actions (42 USC § 9601 et seq., 1980). Information also is provided regarding the nature of contamination and disposal history associated with Pit 4 within the SDA. Sections 2 and 3 provide details about the proposed removal action objective, alternatives, and associated costs.

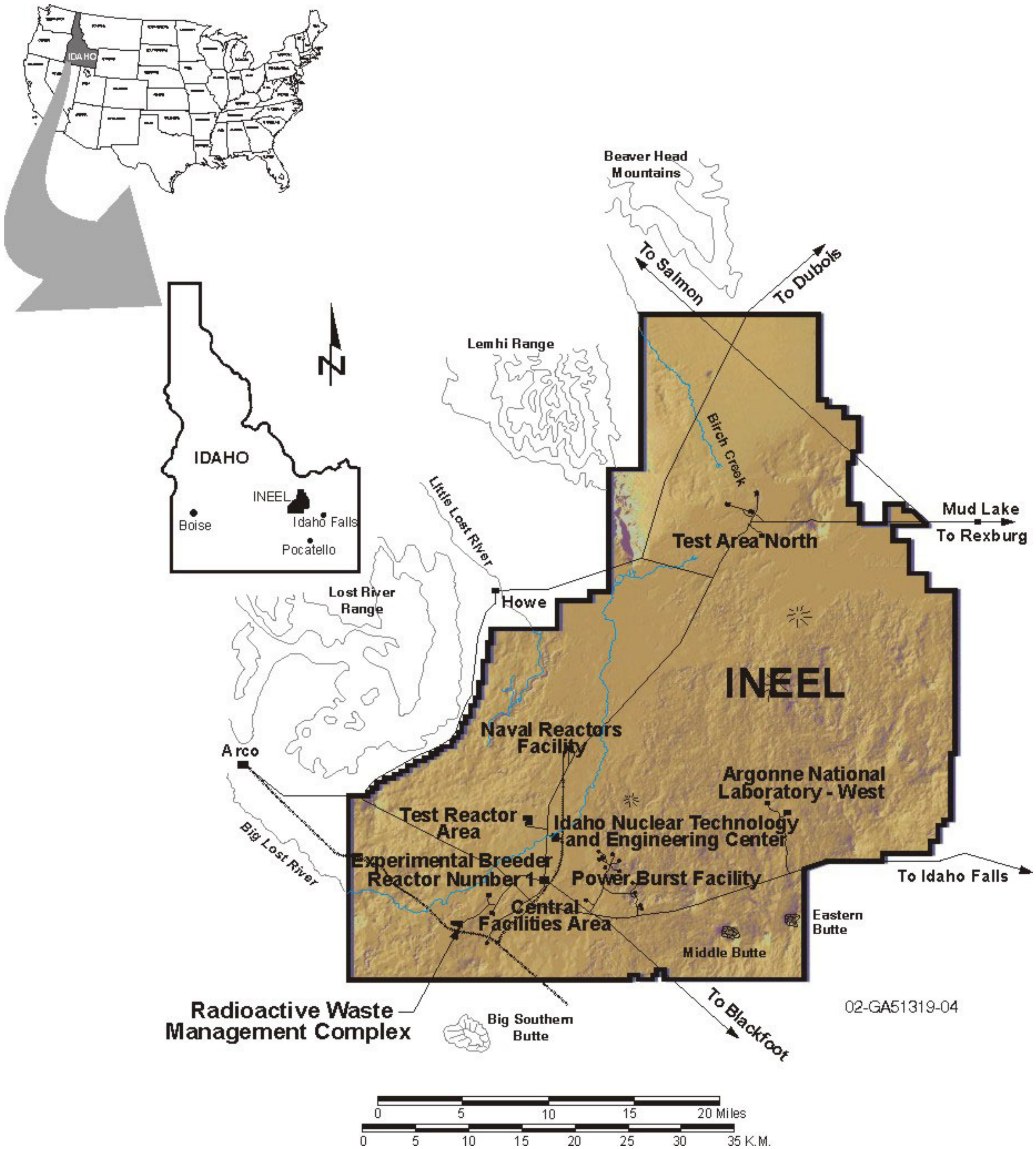

Figure 1. This map of the Idaho National Engineering and Environmental Laboratory shows the location of the Radioactive Waste Management Complex and other major facilities.

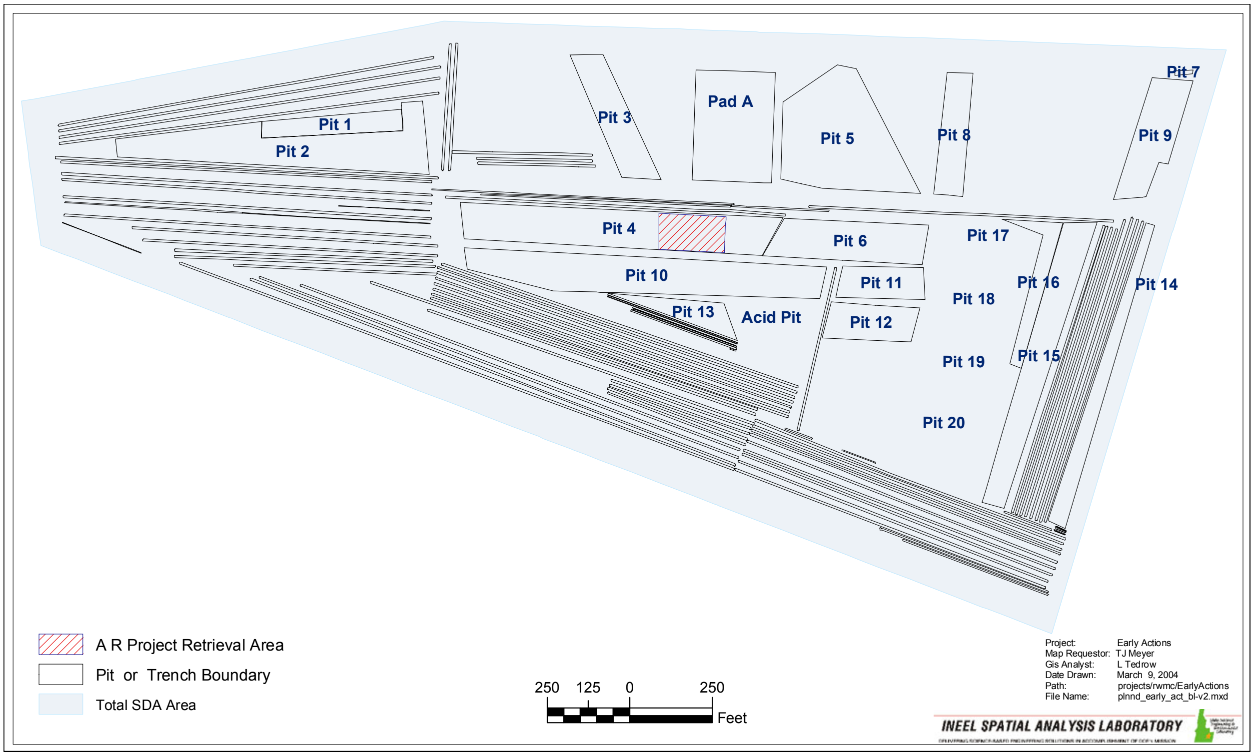

Figure 2. Layout of the Subsurface Disposal Area at the Radioactive Waste Management Complex.

1.2.1 Background of the Idaho National Engineering and Environmental Laboratory

The INEEL is located in southeastern Idaho and occupies 2,305.1 km^2 (890 mi^2) in the northeastern region of the Snake River Plain. Regionally, the INEEL is nearest to the major cities of Idaho Falls and Pocatello and to U.S. Interstate Highways I-15 and I-86. The INEEL Site extends nearly 63 km (39 mi) from north to south, is about 58 km (36 mi) wide in its broadest southern portion, and occupies parts of five southeastern Idaho counties. Public highways (i.e., U.S. 20 and 26 and Idaho 22, 28, and 33) within the INEEL boundary and the Experimental Breeder Reactor I, which is a national historic landmark, are accessible without restriction. Otherwise, access to the INEEL is controlled. Neighboring lands are primarily in the public domain (e.g., national forests and state-owned land), with some used for farming or grazing.

The INEEL provides a variety of programs and support services related to nuclear reactor design and development, nonnuclear energy development, materials testing and evaluation, operational safety, radioactive waste management, and environmental restoration. Challenges addressed by current INEEL Environmental Management activities include hazardous and mixed waste management and minimization; cultural resources preservation; environmental engineering, protection, and remediation; and long-term stewardship. After environmental cleanup is completed, the INEEL Site is expected to have a long-term future mission in nuclear energy research and development. In July 2002, Secretary of Energy Spencer Abraham announced a major mission realignment for the lab, establishing the Site as the nation's lead laboratory for nuclear energy, research, and development. Management of the laboratory was reassigned to the Nuclear Energy, Science, and Technology Office of DOE.

1.2.2 Background of the Subsurface Disposal Area and Operations

Currently, the RWMC covers 71.6 ha (177 acres) in the southwestern quadrant of the INEEL. This includes the administration area of approximately 8.9 ha (22 acres), the SDA, and the Transuranic Storage Area (established in 1970 at 23.3 ha [57.5 acres]). Figure 2 provides a map of the RWMC showing the location of pits, trenches, and soil vaults in the SDA. Pit 4, which includes the designated retrieval area, is located in the approximate center of the SDA. In 1952, the SDA was established at 5.26 ha (13 acres) for disposal of solid radioactive waste. Burial of defense waste with transuranic (TRU) elements from the Rocky Flats Plant began in 1954; by 1957, the original SDA was nearly full. In 1958, the SDA was expanded to 35.6 ha (88 acres), which remained the same until 1988 when the security fence was relocated outside the dike surrounding the SDA and the current size of 39.3 ha (97.1 acres) was established. Approximately 61.5 of the total 97.1 acres are open areas that do not contain waste (e.g., area between pits and trenches and dikes surrounding the pits and trenches).

From 1952 to 1970, radioactive waste was buried in pits, trenches, and soil vault rows excavated into a veneer of surficial sediment. This sediment was underlain by a thick series of basaltic lava intercalated with sedimentary deposits. In 1970, the shallow burial of TRU waste ended, burial of low-level radioactive waste has continued, and TRU waste has been stored on aboveground asphalt pads in retrievable containers. Between 1952 and 1997, approximately 215,000 m^3 (281,209.4 yd^3) of radioactive waste containing about 12.6 million Ci of radioactivity was buried at the SDA (French and Taylor 1998). A 1998 inventory of amounts of 38 radioactive buried contaminants (Becker et al. 1998) was updated in 2002 for 25 radionuclides in the *Ancillary Basis for Risk Analysis of the Subsurface Disposal Area* (Holdren et al. 2002).

Between 1960 and 1963, the RWMC accepted radioactive waste from private sources such as universities, hospitals, and research institutes. This service stopped in September 1963 when commercial burial sites became available for contaminated waste from private industry. When the Transuranic Storage Area became operational, asphalt pads were constructed on which TRU waste was stacked and then covered with plywood, plastic sheeting, and 1 m (3 ft) of soil. From 1975 to 1996, air-support buildings were used to protect recently received waste containers during stacking operations. These support structures were emptied in 1996 and decommissioned in 1998.

Since 1985, waste disposal in the SDA has been limited to low-level radioactive waste from INEEL operations. In the fall of 1988, the INEEL stopped receiving shipments of TRU waste to the RWMC from out-of-state sources.

Contaminants in the SDA radioactive waste landfill include elements resulting from weapons component manufacturing at the Rocky Flats Plant, fission and activation products resulting from on- and off-INEEL reactor operations, and hazardous chemicals associated with all waste sources.

1.3 Previous Investigations

Two previous studies have performed the following:

1. Analyzed the estimated cumulative human health and ecological risks of the SDA (Holdren et al. 2002)

2. Evaluated alternatives to identify and screen potential technologies and process options for remediating the SDA (Zitnik et al. 2002).

The *Ancillary Basis for Risk Analysis* (Holdren et al. 2002) presents an estimate of cumulative human health and ecological risks associated with the SDA. The *Ancillary Basis for Risk Analysis* assesses potential risks associated with OU 7-13/14 at the RWMC. The *Ancillary Basis for Risk Analysis* was prepared in accordance with *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1988a). The *Ancillary Basis for Risk Analysis* represents the latest information available regarding the baseline risks presented by waste within the SDA. In addition, risk assessment work is currently being conducted as part of the OU 7-13/14 program. Primary elements of the *Ancillary Basis for Risk Analysis* include the following:

- Description of the nature and extent of contamination associated with Waste Area Group (WAG) 7.
- Evaluation of current and future cumulative and comprehensive risks to human health posed by waste buried in the SDA.
- Performance of a limited, screening-level ecological risk assessment to validate the assumption that the SDA poses unacceptable risk to ecological receptors (DOE-ID 1998).
- Identification of 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 *Preliminary Evaluation of Remedial Alternatives for the Subsurface Disposal Area* (Zitnik et al. 2002) identifies a range of potential remedial alternatives for effective treatment for contaminated conditions at the SDA. More recent studies provide updated supporting information to identify radionuclides and waste forms that are candidates for early action.

The *Preliminary Evaluation of Remedial Alternatives* (Zitnik et al. 2002) also was prepared in accordance with EPA remedial investigation/feasibility study (RI/FS) guidance (EPA 1988a). The *Preliminary Evaluation of Remedial Alternatives* analysis evaluates remediation options for their ability to (1) protect human health and the environment and (2) meet specific regulatory requirements at WAG 7. The evaluation is based on preliminary evaluations of applicable or relevant and appropriate requirements (ARARs), remedial action objectives, and preliminary remediation goals. During the initial stage of the analysis, existing, demonstrated remedial technologies and process options were compiled, listed, and evaluated for technical applicability. The primary purpose of the initial evaluation or screening was to eliminate alternatives that could not be implemented or would not effectively mitigate risk. Similar to the *Ancillary Basis for Risk Analysis*, the *Preliminary Evaluation of Remedial Alternatives* represents the latest information available for remedial alternatives that might be applied in the SDA, pending completion of the ongoing OU 7-13/14 remedial investigation/baseline risk assessment and feasibility study process.

Any technology or process option not applicable to the SDA was removed from further consideration. The remaining remedial technologies and process options form the pool from which assembled alternatives can be developed. The *Preliminary Evaluation of Remedial Alternatives* also presents a preliminary set of assembled remedial alternatives.

1.4 Source, Nature, and Extent of Contamination

The following sections describe the general disposal practices in the SDA and the waste in Pit 4. See Figure 2 for the layout of the pits and trenches in the SDA. Subsequent sections present a summary of the nature and extent of contamination detected in the subsurface of the SDA from OU 7-13/14 monitoring efforts to date.

1.4.1 Background of Pit 4 within the Subsurface Disposal Area

The SDA is a radioactive waste landfill with shallow subsurface disposal units consisting of pits, trenches, and soil vaults. The buried Rocky Flats Plant TRU waste is located primarily in disposal Pits 1–6, Pits 9–12, and Trenches 1–10. Trenches 11–15 also may contain Rocky Flats Plant waste. Contaminants in the SDA including chemicals, contact and remote-handled fission and activation products, and transuranic radionuclides are discussed in greater detail in the next section.

Pit 4 was open to receive waste from January 1963 through September 1967. Based on the disposal practices at the time, containerized waste, primarily from Rocky Flats Plant in Colorado, was initially stacked in the pit. In November 1963, this practice was changed, and containers were dumped into the pits rather than stacked to reduce labor costs and personnel exposures. Based on this operational change and the timeframe of disposal, it is expected that the Rocky Flats Plant waste within the designated retrieval area was dumped rather than stacked. Additional waste from INEEL waste generators and some waste from off-Site generators also were disposed of in the pit.

The disposal process in the 1960s involved excavating an area in the SDA with tractor-drawn scrapers to the outcroppings of the underlying basalt, followed by backfilling and leveling the newly constructed pit floor with a layer of native soil approximately 0.6 m (2 ft) thick on which the waste would be placed. Waste in drums; cardboard, wood, and metal boxes; and other containers were disposed of. After waste was emplaced, pits were backfilled and initially covered with about 1 m (3 ft) of soil, commonly referred to as overburden soil. The estimated overburden thickness in Pit 4 ranges from 1.2 to 2.1 m (4 to 7 ft). The additional soil thickness resulted from maintenance activities that added soil cover to the SDA in the 1970s and 1980s (Holdren et al. 2002; EG&G 1985). After approximately 40 years of burial, the original disposal containers, including the carbon steel drums, are expected to be significantly corroded and degraded similar to the drums removed in early 2004 as part of the Glovebox Excavator Method Project activities.

The pits were excavated to various sizes. Pit 4, shown on Figure 2, is located in the approximate center of the SDA and shares a common eastern boundary with Pit 6. Pit 4 has a surface area of 9,948.2 m^2 (107,082 ft^2). The total volume of Pit 4 is estimated at 45,307 m^3 (1,600,000 ft^3) (Holdren et al. 2002). The retrieval area of focus comprises approximately 21% of the overall area of Pit 4 with approximate dimensions of 33.5 × 61.6 m (110 × 202 ft). As discussed in Section 1, the designated portion of Pit 4 was selected because it contains high concentrations of TRU waste and also contains significant volumes of other targeted waste forms, including VOCs and uranium. The approximate 1/2-acre size was selected based on the existing distribution of waste in the pit and other engineering factors (e.g., economies of scale associated with retrieval).

1.4.1.1 Estimated Waste Inventory in the Designated Retrieval Area of Pit 4 within the Subsurface Disposal Area. The OU 7-13/14 program has developed extensive information defining the waste inventories disposed of in the pits, trenches, and soil vault rows in the SDA. Disposal records and corresponding trailer load list information from Rocky Flats Plant are the ultimate source for the available information for the disposal locations and waste type designations. The OU 7-13/14 programs have developed a number of databases and supporting geographical information system applications to document waste inventory type, quantity, and location information. Based on this information, an engineering design file has been developed, "Waste Inventory of Area G in Pit 4 for the Accelerated Retrieval Project within the Radioactive Waste Management Complex" (EDF-4478). The engineering design file summarizes the information on the volumes and types of waste that were disposed of in the designated portion of Pit 4. Table 1 provides a summary of information contained in the EDF.

Table 1. Rocky Flats Plant waste content in the designated retrieval area of Pit 4 within the Subsurface Disposal Area.

Waste Stream	Summary Characteristics	Packaging	Estimated Container Number
Series 741 first-stage sludge	Salt precipitate containing plutonium and americium oxides, depleted uranium, metal oxides, and organic constituents.	18.1 to 22.7 kg (40 to 50 lb) of Portland cement added to top and bottom of drum to absorb any free liquids. Two plastic bags.	886 drums
Series 742 second-stage sludge	Salt precipitate containing plutonium and americium oxides, metal oxides, and organic constituents.	18.1 to 22.7 kg (40 to 50 lb) of Portland cement added in layers to absorb any free liquids. Two plastic bags.	770 drums
Series 743 sludge organic setups	Organic liquid waste solidified using calcium silicate (pastelike or greaselike).	113.6 L (30 gal) of organic waste mixed with 45.4 kg (100 lb) calcium silicate. Small quantities (4.5 to 9.1 kg [10 to 20 lb]) of Oil-Dri added to top and bottom, if necessary. Two plastic bags.	634 drums
Series 744 sludge special setups	Complexing chemicals (liquids) including Versenes, organic acids, and alcohols solidified with cement.	86.2 kg (190 lb) of Portland cement and 22.7 kg (50 lb) of magnesia cement in drum followed by the addition of 99.9 L (26.4 gal) of liquid waste. Additional cement top and bottom. Two plastic bags.	81 drums
Combustible, noncombustible, and mixed debris	Solid radioactively contaminated combustible debris items such as paper, rags, cardboard, and wood. Noncombustible debris varies widely including pipe, empty drums, glass, and sand. Some waste is contaminated with beryllium metal.	Varies by process line generating the waste. Waste may have been wrapped in plastic or placed directly into the waste container.	5,024 drums, boxes, and dumpster loads
Roaster oxide waste	Incinerated depleted uranium. Primary chemical form is uranium oxide with some metal possible.	Packaged in metal drums with inner plastic bag packaging.	109 drums
Graphite	Graphite mold pieces after excess plutonium removal. Molds are broken into large pieces before packaging. Graphite fines (e.g., scarfings) packaged in small bottles.	Drums lined with polyethylene bags and, most likely, a cardboard liner. Bottles of graphite fines were individually wrapped in plastic bags.	490 drums
Filters	Discarded high-efficiency particulate air filters.	Packaged in cardboard cartons and boxes depending on the timeframe of disposal.	681 boxes and cartons

The Rocky Flats Plant waste forms contain various radiological and nonradiological contaminants. The material shipped to Pit 4 from Rocky Flats Plant included plutonium and uranium isotopes. Plutonium isotopes included Pu-238, Pu-239, Pu-240, Pu-241, and Pu-242. Uranium isotopes (i.e., U-234, U-235, U-236, and U-238) were shipped to the RWMC in the form of depleted uranium oxides. Also included in the waste shipments were Am-241 and trace quantities of Np-237. The isotopes Am-241 and Np-237 are daughter products resulting from the radioactive decay of Pu-241. In addition to the Am-241 produced by the decay of the Pu-241, Am-241 removed from plutonium during processing at the Rocky Flats Plant also was disposed of in Pit 4. This extra Am-241 is a significant contributor to the total radioactivity located in Pit 4. A number of radionuclides (e.g., Co-60, Cs-137, Sr-90, Y-90, and Ba-137), primarily from INEEL waste generators, are also expected to be encountered in the project area. The non-Rocky Flats Plant waste streams include radioactively contaminated sewage sludge and a number of combustible and noncombustible debris waste forms.

The primary organic chemicals known to be in Pit 4 include carbon tetrachloride, trichloroethene, 1,1,1-trichloroethane, tetrachloroethene, lubricating oils, Freon-113, alcohols, organic acids, and Versenes (ethylenediaminetetraacetic acid). Examples of inorganic chemicals known to be in the waste include hydrated iron, zirconium, beryllium, lead, sodium nitrate, potassium nitrate, cadmium, dichromates, potassium phosphate, potassium sulfate, silver, asbestos, and calcium silicate. Table 1 describes and summarizes the major waste streams located in the designated retrieval area from Rocky Flats Plant. As the table shows, the major waste streams consist of containerized (e.g., boxes and drums) sludge, combustible and noncombustible debris, graphite materials, and discarded filter media.

Waste management activities will be based on information from the various inventory documents identified in the preceding paragraphs and additional acceptable knowledge documentation being prepared to support the NTCRA. In addition, analytical data collected during project activities will be used to determine appropriate management of primary waste streams.

Buried waste in Pit 4 contains TRU and low-level waste. The transuranic radionuclides in Pit 4 are believed to be primarily contained in the drummed sludge and other Rocky Flats Plant waste (e.g., graphite). Waste definitions are provided below for purposes of clarification:

- **Transuranic radionuclides**—alpha-emitting radionuclides with an atomic number greater than 92 (DOE O 435.1).

- **TRU waste**—without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides (atomic number greater than 92) with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay. The primary radionuclides associated with SDA Rocky Flats Plant TRU waste are Pu-238, Pu-239, Pu-240, and Pu-242 and Am-241.

- **Low-level waste**—waste that is not high-level radioactive waste, spent nuclear fuel, TRU waste, by-product material (as defined in Section 11e[2] of "Atomic Energy Act of 1954" [42 USC § 2011-2259, 1954]), or naturally occurring radioactive material (DOE O 435.1).

1.5 Regulatory Background for Response Actions at the Subsurface Disposal Area

The responsibility to perform response actions under CERCLA Section 104 (42 USC § 9601 et seq., 1980) on DOE facilities was delegated by Presidential Executive Order 12580 (DOE 1987) to DOE. CERCLA response actions include both remedial actions (which involve extensive analysis, documentation, planning, and execution with the goal of complete and final response to all releases of hazardous substances into the environment at the Site) and removal actions (which are discrete, positive steps—not necessarily physical removal—addressing hazardous substance releases, which can be undertaken without the extensive analysis involved in remedial actions and therefore can be initiated more expeditiously).

Remedial actions at federal facilities such as the INEEL must be conducted consistent with CERCLA Section 120 (42 USC § 9601 et seq., 1980), which requires that, at federal facilities placed by the EPA onto the CERCLA National Priorities List, those remedial actions must have concurrence from the EPA. By agreement between the EPA and DOE, a federal facility agreement is established for each DOE facility on the National Priorities List, which establishes a process for implementing the respective authorities and duties of each federal agency. The federal facility agreement for the INEEL also fulfills the requirement in the "Resource Conservation and Recovery Act of 1976 (Solid Waste Disposal Act)" (42 USC § 6901 et seq., 1976), as amended by the Hazardous and Solid Waste Amendments of 1984, for a corrective action plan to address all solid waste management units within a facility containing hazardous waste treatment, storage, or disposal units that are permitted under the Resource Conservation and Recovery Act (RCRA) in cooperation with the IDEQ, which has been authorized by EPA to administer RCRA in Idaho. The federal facility agreement, therefore, has been designated a consent order for purposes of the "Hazardous Waste Management Act of 1983" (Idaho Code § 39-4401 et seq., 1983) and is referred to as the *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory* (DOE-ID 1991).

The Federal Facility Agreement and Consent Order (DOE-ID 1991) action plan designated the SDA as WAG 7.[a] The overall remediation of WAG 7 is being evaluated through a CERCLA RI/FS under OU 7-13/14. Ultimately the RI/FS will lead to risk management decisions and selection of a final comprehensive remedial approach through development of a CERCLA ROD and follow-on remedial design and activities.

To the extent practicable, removal actions should be consistent with foreseeable future remedial actions for the same release and seek to attain ARARs identified for the release in accordance with CERCLA Section 121 (42 USC § 9601 et seq., 1980). The EPA and IDEQ will be provided full and timely information on the preparation and performance of this removal action, and their comments and concurrence will be obtained. The DOE will also seek the comments of the public in accordance with the public participation requirements of the NCP for NTCRAs.

The DOE has determined that the removal action proposed in this EE/CA shall, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action with respect to the release concerned. Specifically, the proposed removal action, in addition to addressing a material portion of the hazardous substances in the SDA, will provide characterization, and technical and cost information from full-scale waste retrieval activities that will support the RI/FS for OU 7-13/14. It also will establish process details for certification and transfer of formerly buried TRU waste to the Waste Isolation Pilot Plant (WIPP) in New Mexico.

1.6 Summarized Risk Evaluation

The *Ancillary Basis for Risk Analysis* (Holdren et al. 2002) estimated potential risk to human health from contaminants buried in the SDA. Based on EPA and INEEL guidance (EPA 1988a; LMITCO 1995), WAG 7 was considered in a comprehensive manner by evaluating cumulative, simultaneous risk for all complete exposure pathways for all contaminants of potential concern (DOE-ID 1998). The risk assessment included exposure and toxicity assessments, risk characterization, and limited analysis of sensitivity and uncertainty.

Risk evaluation specific to Pit 4 or the waste inventory located in the designated retrieval area has not been calculated. The risk information existing for the SDA pits and trenches as documented in the *Ancillary Basis for Risk Analysis*, which includes Pit 4 as part of the assessment, is summarized in the following paragraphs. Final risk characterization for the SDA will be evaluated as part of the OU 7-13/14 comprehensive RI/FS process and will accommodate changes to risk assessment process details (e.g., possible exposure scenario changes) as well as changes introduced as a result of any intermediate activities, such as the proposed NTCRA described in this EE/CA.

---

a. The Federal Facility Agreement and Consent Order (DOE-ID 1991) lists 10 WAGs for the INEEL. Each WAG is subdivided into OUs. The RWMC is identified as WAG 7 and originally contained 14 OUs. Operable Unit 7-13 (TRU pits and trenches RI/FS) and OU 7-14 (Wag 7 comprehensive RI/FS) were ultimately combined.

Twenty COCs have been identified for the SDA. Seventeen were identified through risk assessment. Three plutonium isotopes were identified as special-case 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.

The remaining contaminants were eliminated from further quantitative analysis in the future OU 7-13/14 remedial investigation/baseline risk assessment.

The Rocky Flats Plant waste located in the designated retrieval area within Pit 4 is contaminated with the Am-241, Np-237, Pu-238, Pu-239, Pu-240, uranium isotopes, and VOCs. Based on existing records, the retrieval area of focus does not contain significant quantities of waste containing other COCs such as nitrates (i.e., Series 745 sludge). As discussed in the next section, the focused scope of the proposed NTCRA evaluated in this EE/CA involves the removal of a targeted group of Rocky Flats Plant waste streams located in the designated portion of Pit 4. Removal of the targeted waste streams will mitigate future potential risk by removing from the retrieval area the Rocky Flats Plant waste streams that contain significant concentrations of the COCs identified in the OU 7-13/14 risk assessment work that has been completed to date. Potential risk associated with the COCs not addressed through the proposed NTCRA (i.e., in other locations within the SDA) ultimately will be addressed through the selected remedial alternative to be documented in the OU 7-13/14 comprehensive ROD.

2. REMOVAL ACTION OBJECTIVES AND SCOPE

The focused objective of the NTCRA is to perform a targeted retrieval of certain Rocky Flats Plant waste streams that are highly contaminated with transuranic radionuclides, VOCs, and various isotopes of uranium. In order to achieve this objective, the NTCRA would primarily focus on removal of the following Rocky Flats Plant waste streams (See Table 1): Series 741 and 743 sludge; graphite; filters; and roaster oxide waste. Details supporting the implementation of the NTCRA retrieval alternative are presented in the following sections.

It is possible that, during the process of excavation, other waste will be revealed that is not within these targeted waste streams. This nontargeted waste will also be removed from the excavation during this removal action if the DOE remedial project manager and the EPA and IDEQ WAG 7 remedial project managers agree that retrieval is warranted because the information concerning the nontargeted waste that is available from visual inspection (such as package labeling or distinctive packaging) identifies the nontargeted waste as being of a nature that (1) it poses a potential risk of contamination to the underlying aquifer if left in place, (2) the potential risk is sufficient to warrant removal at that time rather than leaving it to be addressed by the OU 7-13/14 final remedial action for WAG 7, and (3) the waste can safely be managed by retrieval using the personnel, facilities, and equipment readily available onsite for retrieval of the targeted waste streams.

Based on review of the factors in the NCP (40 CFR 300) for determining if it is appropriate to perform a removal action, it has been concluded that performance of the proposed activity as an NTCRA is appropriate and consistent with the relevant NCP criteria considering that the area of focus contains "hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release" (40 CFR 300.415[b][2][iii]).

Selecting the specific retrieval area required evaluating the shipping and burial records for containerized radioactive materials and sludge from Rocky Flats Plant and low-level radioactive waste generated at the INEEL. The DOE Idaho Operations Office, with agreement from the EPA and IDEQ, has selected the designated portion of Pit 4 (see Figure 2) as the targeted retrieval area based on its high content of transuranic radionuclides, VOCs, and uranium.

2.1 Determination of Non-Time-Critical-Removal-Action Schedule

The NTCRA schedule for Alternative Two (see below) involves performance of design and facility construction in Fiscal Year 2004 to support commencement of retrieval operations by October 1, 2004. The planned retrieval operational period for the project is approximately 12 months long, followed by a 6-month deactivation, decontamination, and decommissioning phase. Performance of WIPP-related processing and certification activities will be a fundamental element of proposed NTCRA activities and is expected to require several years to complete, although a final schedule is not available at this time.

3. IDENTIFICATION AND ANALYSIS OF REMOVAL ACTION ALTERNATIVES

Because of the focused objective of the proposed NTCRA, a decision was made to limit the removal action alternatives considered in this EE/CA to the No Action alternative and the Focused Retrieval alternative. Evaluation of alternatives that rely on means other than retrieval to remediate the waste, such as in-situ treatment options, is not consistent with the general objective of the NTCRA to remove highly contaminated waste from a portion of the SDA. Evaluation of an appropriate range of remedial alternatives for application to the SDA will be included within the OU 7-13/14 RI/FS and is beyond the scope of this proposed NTCRA.

3.1 Development of Alternatives

The following subsections briefly describe the proposed NTCRA alternatives—No Action and Focused Retrieval.

3.1.1 Alternative One—No Action

The No Action alternative provides a baseline against which impacts of the proposed action can be compared. Under the No Action alternative, no removal action would be taken at the SDA beyond the current Sitewide monitoring of environmental media. Buried waste, institutional controls, and monitoring at the SDA would remain as they currently are until an appropriate remedy is selected through the OU 7-13/14 ROD. The key element of the No Action alternative evaluated in this EE/CA is implementation of an enhanced monitoring system from 2004 to 2020. This monitoring system would be an interim measure until the final long-term monitoring program is implemented after 2020. The Year 2020 was identified as the approximate time when a long-term monitoring action would be implemented through the OU 7-13/14 ROD process. The 2020 date is assumed in order to have a basis for calculating a total cost for the No Action alternative. The No Action alternative includes only monitoring and requires no direct action to treat, stabilize, or remove contaminants. Costs for this alternative include monitoring of air, vadose zone soil moisture, and the aquifer for 15 years. The existing monitoring system for the SDA will proceed regardless of either action.

This comparatively inexpensive alternative is easily implemented, incurring only costs associated with monitoring. However, the No Action alternative offers no reduction in toxicity, mobility, or volume of contaminants within the SDA.

3.1.2 Alternative Two—Focused Retrieval

Alternative Two provides an efficient method of retrieving and managing waste material, while maintaining protection of the workers, public health, and the environment. The basic concept comprises waste retrieval in a Retrieval Enclosure, transfer of waste into containers at clean drum-packaging stations, assay of the waste containers after release from the Retrieval Enclosure, and interim storage in a Storage Enclosure located within the SDA. Other processes necessary for safe handling and processing of waste and waste containers will be performed as determined necessary by the project.

Performance of the alternative will, to the extent practical, result in the removal of the targeted Rocky Flats Plant waste streams from the retrieval area. Removal of these waste streams will result in a significant reduction of the curies of transuranic radionuclides and uranium isotopes within the retrieval area. In addition, removal of the Series 743 sludge will deplete the source of VOCs that remain in waste containers that are located in the retrieval area. Based on observations made during Glovebox Excavator

Method Project operations, the Series 743 sludge drums themselves have degraded significantly over the years. However, the inner plastic bags that the sludge was packaged in remained in fairly good condition. Consequently, it is anticipated that a significant percentage of the original VOC inventory remains in the original packaging and therefore is available for retrieval. The following section describes the proposed alternative in greater detail.

3.1.2.1 Site Location. The project retrieval site is located at the approximate center of the SDA within Pit 4 (refer to Figure 2 in Section 1). The storage site will be located in the SDA, north of the retrieval area between Pad A and Pit 3 (see Figure 3).

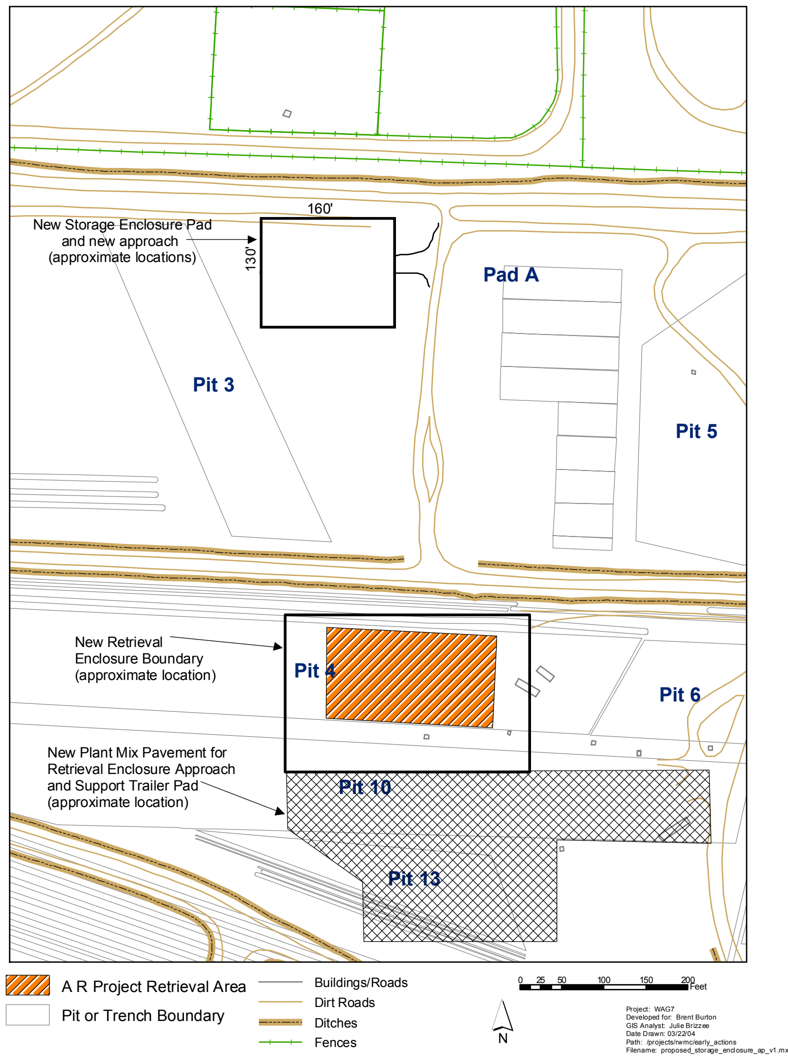

Figure 3. The Retrieval Enclosure and Storage Enclosure for the Focused Retrieval alternative.

A new road will provide access between the retrieval operations and storage site. A paved area (i.e., 0.2-ft-thick asphalt) will be included as a retrieval area approach and to provide parking for a number of support trailers. The designated retrieveal area comprises an approximately 61.6 × 33.5-m (202 × 110-ft) area within Pit 4. Pit 4 is bound on all sides by waste pits (Pit 6 to the east and Pit 10 to the south) or trenches to the north. Based on probing data, the depth to basalt in the area is anticipated to range from 4.9 to 8.5 m (16 to 28 ft). An existing treatment unit with three wells belonging to the Organic Contamination in the Vadose Zone Project is located to the east.

3.1.2.2 Retrieval and Storage Facilities. To provide protection from the weather and control the spread of contamination, a Retrieval Enclosure and airlock (see Figure 4) will cover the retrieval area during all retrieval operations.

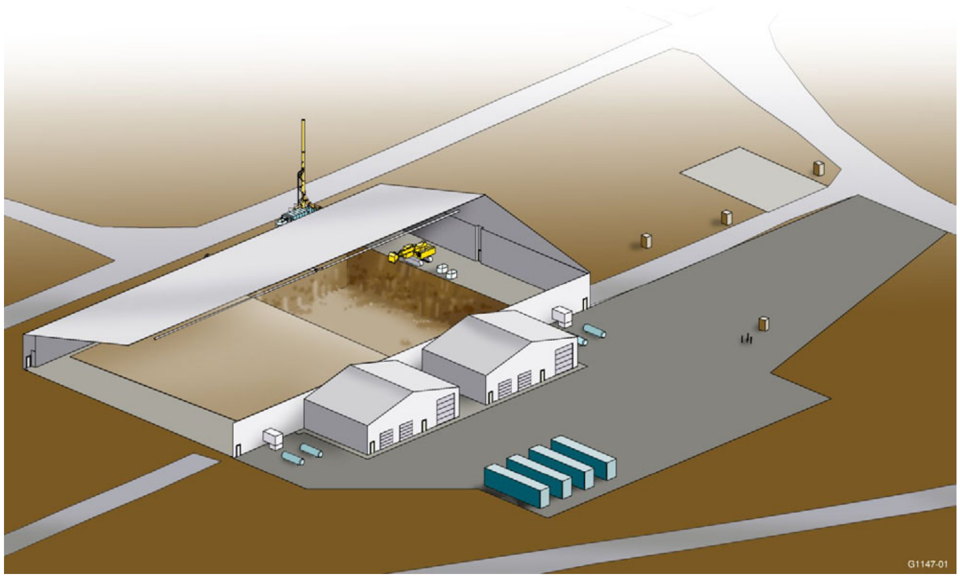

Figure 4. The Retrieval Enclosure will cover the retrieval area during operations.

The Retrieval Enclosure is a temporary, relocatable structure that will house excavation, packaging, sampling, package decontamination, and personnel and equipment ingress and egress activities. The Retrieval Enclosure provides weather protection and supports year-round operations for these activities. The Retrieval Enclosure is a commercially available, standard, fabric-tensioned structure, approximately 51.8 m (170 ft) wide by 87.8 m (288 ft) long with a 6.1-m-minimum (20-ft-minimum) interior clearance at the eaves. The perimeter foundation frame will sit on the ground surface. Two attached structures, 21.3 × 15.2 m (70 × 50 ft) in size, house airlock operations such as waste examination and drum repackaging.

Ventilation is provided by a high-efficiency-particulate-air-filtered exhaust system. The exhaust stack is designed to minimize local worker exposure and permit proper radiological emissions monitoring configuration. The ventilation system is equipped with an emissions monitoring system to sample and record possible releases of radioactive substances.

The Storage Enclosure is a temporary structure that provides indoor storage and staging of packaged waste until it is processed for transfer to WIPP (see Figure 5). The Storage Enclosure is a commercially available, standard fabric-tensioned structure, approximately 39.6 m (130 ft) wide by 48.8 m (160 ft) long with 6.1-m-minimum (20-ft-minimum) interior clearance at the eaves. The interior floor is reinforced concrete. The Storage Enclosure is not heated but may be ventilated to minimize accumulation of VOCs if required. As Figure 5 illustrates, the project plans to implement a modified dense pack drum storage configuration similar to that employed at RWMC in the RCRA-permitted, Type II storage buildings. The modified dense pack storage configuration involves a drum-stacking arrangement that is four drums wide by five drums high. The depth of the drum stack is limited by the size of the building and the necessary aisle space to accommodate access to the drums and access of emergency response equipment. The aisle space in the center of the building will be a minimum of 20 ft, with a minimum aisle space of 3 ft between the rows and the perimeter of the building.

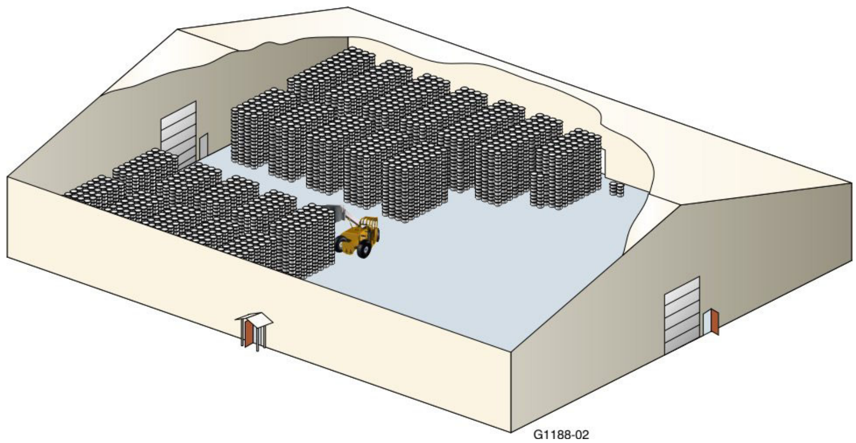

Figure 5. The Storage Enclosure will be used to store containers.

3.1.2.3 Retrieval and Handling Operations. Initially, 0.6–1.5 m (2–5 ft) of clean overburden soil will be removed as part of construction before starting the NTCRA operational activities. The remaining 0.6 m (2 ft) of overburden will be removed as the first phase of operations and will be piled or returned directly to the pit. This layer of soil is expected to be non-TRU and will provide a stable working surface for retrieval operations.

The waste-zone material will be retrieved using excavators. Operators in personal protective equipment will operate one or two Gradall XL-5200 excavators to retrieve and place material from Pit 4 into trays for subsequent examination in the airlock enclosures. The excavator and forklift cabs will be provided with a blower, high-efficiency-particulate-air-filtered, forced-air system to provide additional protection for the operator. Personnel access to the Retrieval Enclosure will be limited during excavation activities, but there may be other individuals in personal protective equipment allowed inside, such as radiological control technicians. The excavator will operate primarily above grade. The pit is expected to be approximately 5.2–6.1 m (17–20 ft) deep, and the walls will be sloped to maintain an angle of repose of approximately one to one.

At the digface, excavators will retrieve targeted waste (e.g., graphites, filters, Series 741 and 743 sludge, and uranium roaster oxides) and place the waste in a tray that has been lined with a plastic bulk storage bag. The targeted and nontargeted determination will be made by an operator assisting the excavator operator by way of closed-circuit television cameras at the digface and mounted on the excavator. Nontargeted waste (e.g., debris and soil) will be placed on the opposite face of the open pit. The trays of targeted waste will be transported to a drum loadout area by forklift. At the drumout area, operators will perform functions supporting transfer of the waste to WIPP (e.g., removal of prohibited items if observed) and sample the waste as necessary. The plastic tray liner is hoisted and loaded into a drum. The drum is then removed from the drum port, closed, and transferred from the area. This area also may be designed to accommodate boxes, if necessary.

The newly packaged waste materials will be evaluated for potential transfer to WIPP. Payload containers (e.g., individual drums, standard waste boxes, and 10-drum overpacks) will be assembled for transfer to WIPP in TRUPACT-II containers. Payload containers that are certified to meet the WIPP waste acceptance criteria will be transported to WIPP for final disposition.

Retrieved waste materials that do not satisfy the WIPP waste acceptance criteria (e.g., non-TRU waste streams) will be characterized and evaluated for alternate disposal. Depending upon waste stream characteristics, treatment of these materials may be required to support achieving appropriate disposal standards required by ARARs and other health-based or facility-specific waste acceptance criteria. Other waste streams, which are not TRU waste, such as uranium roaster oxides, may require further analysis and treatment before disposal. In particular, it is expected that some portion of the materials will require treatment to reduce the VOC concentrations of the materials before returning materials to the pit or other alternate disposal. Further discussion of the anticipated treatment process is included in the next section. These materials will be located in the CERCLA storage facility within the SDA pending final evaluation for treatment and disposal.

3.1.2.4 Treatment. The TRU material that does not pass WIPP-related acceptance criteria (e.g., gas-generation testing) may require treatment for constituents such as VOCs. Thermal desorption processes for treatment of VOCs are being evaluated to support this function. In general, thermal desorption processes entail heating the waste materials to desorb organic materials from the waste. The resulting organic vapor stream typically would then be condensed, collected in tanks, and transferred offsite for further treatment or disposal. Any resulting noncondensible fraction typically would be removed using activated carbon. Details of the potential VOC or other treatment processes will be fully developed during the design process if the NTCRA is implemented.

3.1.2.5 Interim Closure. Final closure of the excavated area will not occur as part of the NTCRA but will occur for the overall SDA area as specified in the OU 7-13/14 ROD. The final closure of the SDA is assumed to include an engineered, multilayer cover that will encompass Pit 4. Interim closure steps will be implemented as part of Alternative Two, including covering the pit with a layer of soil from the remaining overburden material or other native soil from the INEEL. The cover layer will be compacted and graded consistent with an overall SDA grading and drainage plan.

4. ANALYSIS OF ALTERNATIVES

This section presents the analysis of two alternatives: No Action and Focused Retrieval. As is appropriate for an NTCRA, the alternatives are evaluated against the required CERCLA criteria of effectiveness, implementability, and cost (EPA 1993). Effectiveness is evaluated in terms of protectiveness of the environment, protectiveness of workers during NTCRA implementation, and the ability of the alternative to achieve removal action objectives. Implementability evaluates the technical and administrative feasibility of the alternative and the availability of necessary resources to support implementation. A cost analysis is presented based on defined project work scope.

4.1 Alternative One—No Action

The No Action alternative serves as the baseline for comparison against the Focused Retrieval alternative. This alternative would include only monitoring and require no direct action to treat, stabilize, or remove contaminants. It is assumed for this alternative that monitoring would be conducted on groundwater, vadose zone moisture, and air for a period of 15 years until a modified monitoring program is implemented through the OU 7-13/14 RI/FS.

4.1.1 Effectiveness

The No Action alternative offers no reduction in contaminated waste inventory. The No Action alternative does not fulfill the stated NTCRA objective for removal of contaminant source term from the SDA. Selection of No Action for the proposed NTCRA does not provide information for retrieval of TRU waste in support of the overall SDA remedial decision process nor does it provide an increased level of protection of human health and the environment.

4.1.2 Implementability

The No Action alternative is implementable because it requires no immediate expenditure of time or resources, and technically, no engineering or development is necessary. However, in the interim, maintenance and implementation of a temporary monitoring system will require an expenditure of resources.

4.1.3 Cost

Activities for the No Action alternative (e.g., engineering implementation) would incur no cost. The primary part of the No Action alternative that is costed in this analysis is monitoring operations. Management and oversight costs also are included. Although monitoring is a continual activity at the INEEL, a long-term monitoring program (greater than 100 years) will not be in place until after implementation of the recommended actions in the OU 7-13/14 ROD. The No Action alternative would involve monitoring at the SDA from 2005 until implementation of the final remedy, around 2020. For these reasons, a 15-year monitoring duration is used. The estimated cost for the No Action alternative is $3 million, as presented in Table 2.

4.2 Alternative Two—Focused Retrieval

Alternative Two is assessed in the following section against the CERCLA criteria of effectiveness, implementability, and cost as is required by EPA guidance.

4.2.1 Effectiveness

Based on the focused nature of the proposed NTCRA, Alternative Two is designed to satisfy the removal action objective identified in Section 3. The selected retrieval location contains TRU waste (primarily plutonium isotopes and Am-241), VOCs, and uranium that would be subject to removal through the action. As discussed in Section 3, performance of the alternative will, to the extent practical, result in the removal of the targeted Rocky Flats Plant waste streams from the retrieval area. Removal of these waste streams will result in a significant reduction of the curies of transuranic radionuclides and uranium isotopes within the retrieval area. In addition, removal of the Series 743 series sludge will deplete the source of VOCs that remain in waste containers that are located in the retrieval area, reducing the migration of this contaminant.

The ARARs identified for Alternative Two are included in Appendix A. Based on the presence of RCRA (42 USC § 6901 et seq., 1976) constituents in the waste, a number of substantive hazardous waste management ARARs will require implementation including requirements for performance of hazardous waste determinations and container storage requirements. Other significant ARARs involve required implementation of National Emission Standards for Emissions of Radionuclides that limits radionuclide emissions for the project and leads to implementation of required stack monitoring systems. Details of ARARs identification and implementation are presented in Appendix A. It is concluded that the project will include design and operational features necessary to support appropriate implementation and compliance with ARARs.

Evaluation of effectiveness also involves assessment of short-term effectiveness (i.e., the extent to which the alternative is protective of human health and the environment during actual implementation of the NTCRA). Alternative Two is associated with short-term risk of exposures to facility radiation workers during retrieval operations and subsequent waste management and characterization activities. In addition, hazardous chemical exposure risks and other industrial safety risks are inherent hazards associated with the TRU waste retrieval activities that require careful management during design and project implementation phases.

The project design approach includes engineering and administrative features that will effectively isolate workers and the public from radiological and chemical exposures. Major design features that contribute to minimizing the potential for radiological contaminant releases include the fabric enclosure constructed over the retrieval area, misting and dust suppressant application at the digface during retrieval, and containerization of materials immediately following retrieval. The project design involves minimal material handling to limit the air suspension of source radionuclide contamination. Personnel involved in the project perform all work activities in accordance with specific operational procedures and are required to wear properly selected personal protective equipment. Facility air emissions are high-efficiency particulate air filtered before release to the environment. Treatment of air emissions for chemical releases (e.g., through activated carbon treatment) will be implemented if determined to be necessary during the detailed design phase of the project, although this is not anticipated to be necessary based on currently available information.

4.2.2 Implementability

Operational experience retrieving TRU waste from the SDA and similar experience elsewhere are available, but limited; however, a review of information regarding related retrieval activities leads to the conclusion that Alternative Two is implementable. Retrieval operations recently have been completed within the SDA at the Glovebox Excavator Method Project facility. Transuranic contaminated soil retrieval also is occurring at Rocky Flats Plant in Colorado. Lessons learned information from these and other projects are part of the evaluation and design process associated with Alternative Two.

Simplification of the Glovebox Excavator Method Project retrieval approaches, including the approaches to facility confinement structure design and material handling, is fundamental to the design approach envisioned for Alternative Two. Based on this experience and design simplification, it is concluded that Alternative Two is implementable.

Administratively, a TRU retrieval alternative of the type discussed in this document is achievable from a management, cost, schedule, and programmatic point of view. The largest uncertainties relate to the work scope involving characterization, transfer, and disposal of waste at WIPP. Retrieved buried waste is anticipated to satisfy WIPP waste acceptance criteria. Preliminary project implementation planning includes significant work scope to ensure WIPP integration and interface issues are addressed early in the project life cycle to ensure this work scope is implementable.

4.2.3 Cost

This section provides an analysis of costs for the two alternatives. As stated in Section 4.1.3, the No Action alternative primarily involves costs for monitoring and associated management and oversight. A 15-year monitoring duration is assumed.

The costs for the TRU retrieval option are presented for the entire project life cycle (Fiscal Year 2004–2007), including management and oversight, engineering, construction, procurement, retrieval operations, and transfer of waste materials to WIPP in New Mexico. Table 2 summarizes the initial cost estimate for the No Action and the Focused Retrieval alternative. The existing monitoring system for the SDA will proceed regardless of either action. Consequently, the $3 million in monitoring costs is included as a cost element for each alternative in Table 2.

Table 2. Total estimated costs for No Action and Focused Retrieval alternatives.

Cost Element	No Action Alternative[a] ($M)	Focused Retrieval Alternative[b] ($M)
Engineering	—	6.6
Procurement	—	19.0
Management and oversight	—	13.6
Construction	—	4.2
Operation and maintenance support	—	76.4
Waste Isolation Pilot Plant certification and support	—	85.7
Surveillance and monitoring installation	3.0	3.0
Total	3.0	208.5

a. Lopez, Steve L. and Vivian G. Schultz, 2004, *Engineering Evaluation/Cost Analysis for the OU 7-13/14 Early Actions Beryllium Project*, DOE/NE-ID-11144, Rev. 0, U.S. Department of Energy Idaho Operations Office.

b. S. N. Wasley, Idaho National Engineering and Environmental Laboratory, Memorandum to D. E. Wilkins, Idaho National Engineering and Environmental Laboratory, "AR Project (EE/CA Life Cycle) (Draft)," March 23, 2004.

5. COMPARATIVE ANALYSIS OF ALTERNATIVES

Table 3 shows the results of analyzing the Focused Retrieval and No Action alternatives for effectiveness, implementability, and cost. Because of the limited range of alternatives included for the NTCRA, the comparative analysis simply summarizes the comparison of the Focused Retrieval alternative against the No Action baseline option. Based on the comparison, the No Action alternative is not the recommended alternative because it does not satisfy the objective of the removal action.

Table 3. Summarization of the comparative analysis of alternatives.

Criteria	No Action Alternative	Focused Retrieval
Effectiveness	Does not address proposed non-time-critical-removal-action objective. Does not increase protectiveness of human health and the environment. Poses less risk to workers and the public in the short term.	Addresses objective to perform targeted retrieval of waste. Compliant with applicable or relevant and appropriate requirements. Design and operational features provide protection of workers and the public in the short term.
Implementability	Easily implemented.	Relevant retrieval experience indicates the alternative is both technically and administratively feasible. Waste Isolation Pilot Plant certification process for buried waste is considered implementable but administratively complex.
Cost	Total cost – $3 million over the course of 15 years.	Total life-cycle cost of approximately $208.5 million dollars for design; construction; operations; deactivation, decontamination, and decommissioning and Waste Isolation Pilot Plant certification; and disposal.

6. RECOMMENDED ALTERNATIVE

Based on the present state of knowledge, the agencies have determined that the implementation of Alternative Two, Focused Retrieval, as described in the EE/CA, represents an appropriate step forward in the process to achieve a comprehensive remedial solution for the SDA.

The proposed approach for use in Alternative Two would provide an effective method for retrieving and managing the targeted waste, while maintaining protection of workers, public health, and the environment. Alternative Two would be designed to provide a cradle-to-grave disposal solution for the excavated TRU waste through transfer of materials to the WIPP facility in New Mexico.

Performance of the action will:

- Satisfy the NTCRA objective for removal of targeted waste streams and associated contaminants from a portion of the SDA
- Reduce the overall TRU, VOC, and uranium inventory buried within the SDA
- Establish the administrative process for certifying and transferring the resulting retrieved TRU waste streams to WIPP in New Mexico.
- Provide information to support remedial work at the RWMC as defined by future CERCLA removal action documentation or the OU 7-13/14 ROD.

7. REFERENCES

40 CFR 61, 2004, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*, Office of the Federal Register.

40 CFR 262, 2004, "Standards Applicable to Generators of Hazardous Waste," *Code of Federal Regulations*, Office of the Federal Register.

40 CFR 264, 2002, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, Office of the Federal Register.

40 CFR 300, 2004, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, Office of the Federal Register.

40 CFR 761, 2003, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," *Code of Federal Regulations*, Office of the Federal Register.

16 USC § 470 et seq., 2002, "National Historic Preservation Act," *United States Code*.

42 USC § 2011-2259, 1954, "Atomic Energy Act of 1954," *United States Code*.

42 USC § 6901 et seq., 1976, "Resource Conservation and Recovery Act of 1976 (Solid Waste Disposal Act)," *United States Code*.

42 USC § 9601 et seq., 1980, "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code*.

Becker, B. H., J. D. Burgess, K. J. Holdren, D. K. Jorgensen, S. O. Magnuson, and A. J. Sondrup, 1998, *Interim Risk Assessment and Contaminant Screening for the Waste Area Group 7 Remedial Investigation*, DOE/ID-10569, Rev. 0, U.S. Department of Energy Idaho Operations Office.

DOE M 435.1, 2001, "Radioactive Waste Management Manual," Change 1, U.S. Department of Energy.

DOE O 435.1, 2001, "Radioactive Waste Management," Change 1, U.S. Department of Energy.

DOE O 5400.5, 1993, "Radiation Protection of the Public and the Environment," Change 2, U.S. Department of Energy.

DOE, 1987, "Superfund Implementation," Executive Order 12580, U.S. Department of Energy.

DOE-ID, 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, Administrative Docket No. 1088-06-29-120, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; and Idaho Department of Health and Welfare.

DOE-ID, 1998, *Addendum to the Work Plan for the Operable Unit 7-13/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study*, DOE/ID-10622, Rev. 0, U.S. Department of Energy Idaho Operations Office.

EDF-4478, 2004, "Waste Inventory of Area G in Pit 4 for the Accelerated Retrieval Project within the Radioactive Waste Management Complex," Rev. 1, Idaho National Engineering and Environmental Laboratory.

EG&G, 1985, *A History of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory,* WM-F1-81-003, Rev. 3, Idaho National Engineering and Environmental Laboratory.

EPA, 1988a, *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA*, Interim Final, EPA/540/G-89/004, U.S. Environmental Protection Agency.

EPA, 1988b, *CERCLA Compliance with Other Laws Manual: Interim Final*, EPA/540/G-89/006, U.S. Environmental Protection Agency.

EPA, 1993, *Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA*, EPA/540-R-93-057, Publication 9360.0-32, U.S. Environmental Protection Agency.

French, D. L. and K. A. Taylor, 1998, *Radioactive Waste Information For 1997 And Record-To-Date*, DOE/ID-10054(97), Idaho National Engineering and Environmental Laboratory.

Holdren, K. Jean, Bruce H. Becker, Nancy L. Hampton, L. Don Koeppen, Swen O. Magnuson, T. J. Meyer, Gail L. Olson, and A. Jeffrey Sondrup, 2002, *Ancillary Basis for Risk Analysis of the Subsurface Disposal Area*, INEEL/EXT-02-01125, Rev. 0, Idaho National Engineering and Environmental Laboratory.

Idaho Code § 39-4401 et seq., 1983, "Hazardous Waste Management Act of 1983," State of Idaho.

IDAPA 58.01.01, 2003, "Air Pollution Control," Idaho Administrative Procedures Act, Idaho Department of Environmental Quality.

IDAPA 58.01.05, 2003, "Hazardous Waste," Idaho Administrative Procedures Act, Idaho Department of Environmental Quality.

IDAPA 58.01.11, 2004, "Ground Water Quality Rule," Idaho Administrative Procedures Act, Idaho Department of Environmental Quality.

LMITCO, 1995, *Guidance Protocol for the Performance of Cumulative Risk Assessments at the INEL*, INEL-95/131, Idaho National Engineering and Environmental Laboratory, Lockheed Martin Idaho Technologies Company.

Zitnik, James F., Aran T. Armstrong, Brian K. Corb, Mark H. Edens, Douglas B. Holsten, Patricia M. O'Flaherty, Janet Rodriguez, Tamara N. Thomas, Russell L. Treat, Wayne Schofield, and Kira L. Sykes, 2002, *Preliminary Evaluation of Remedial Alternatives for the Subsurface Disposal Area,* INEEL/EXT-02-01258, prepared by CH2MHILL for the Idaho National Engineering and Environmental Laboratory.

Appendix A

Applicable or Relevant and Appropriate Requirements for Alternative Two—Focused Retrieval

Appendix A

Applicable or Relevant and Appropriate Requirements for Alternative Two—Focused Retrieval

This appendix provides identification of ARARs for the Accelerated Retrieval Project NTCRA, Alternative Two—Focused Retrieval, described in the EE/CA. As is appropriate for a CERCLA action, only the substantive provisions of the cited ARARs require implementation for the project. Specific ARAR citations and implementation information are provided in Table A-1.

The ARARs implementation for a CERCLA removal action is prescribed by the NCP (40 CFR 300). Removal actions must "to the extent practicable considering the exigencies of the situation, attain ARARs under federal environmental or state environmental or facility siting laws." (40 CFR 300.415[j]). The same subsection of the NCP further states, "In determining whether compliance with ARARs is practicable, the lead agency may consider appropriate factors, including (1) The urgency of the situation; and (2) The scope of the removal action to be conducted." Consideration of these factors is discussed in the following sections relative to the identification of appropriate ARARs for this NTCRA.

Chemical-Specific Applicable or Relevant and Appropriate Requirements

The chemical-specific ARARs identified in Table A-1 for this NTCRA are primarily limited to ARARs controlling air emissions from the site. Examples of chemical-specific ARARs that will be attained through the NTCRA include the requirements of Idaho's toxic air pollutant standards for releases of carcinogenic and other hazardous chemicals to the ambient air. For radionuclide emissions, the requirements of "National Emission Standards for Emissions of Radionuclides Other Than Radon from Department of Energy Facilities" (40 CFR 61, Subpart H) will apply. The provisions of Subpart H limit the effective dose equivalent from all DOE INEEL facilities to a level of 10 mrem/year.

It is noted that the chemical-specific ARARs of the Idaho groundwater quality rules and associated maximum contaminant levels (IDAPA 58.01.11) are anticipated to be ARARs for the comprehensive OU 7-13/14 remedy but are not relevant and appropriate to the limited scope of this NTCRA. This conclusion is based on the limited scope of the proposed NTCRA in the context of the overall OU 7-13/14 program. As stated in the *CERCLA Compliance with Other Laws Manual: Interim Final*, "…a removal action may be conducted to remove a large number of leaking drums and associated contaminated soil. In this situation, because the removal focuses only on partial control, chemical-specific ARARs for groundwater restoration would not be considered" (EPA 1988b). Other chemical-specific ARARs are presented in Table A-1.

Location-Specific Applicable or Relevant and Appropriate Requirements

Location-specific requirements that may apply to the action relate to cultural resource requirements such as those from the National Historic Preservation Act. Although the SDA is a disturbed area with prior clearance, the associated regulations are considered ARARs, and substantive provisions must be addressed in the event that archaeological remains are encountered during excavation of overburden soil.

Action-Specific Applicable or Relevant and Appropriate Requirements

Substantive RCRA generator requirements for hazardous waste identification and management would be applicable to waste that is retrieved and generated as part of the action. Generally, it is assumed that the waste forms from Rocky Flats Plant will be associated with various listed and characteristic hazardous waste numbers based on similarity to the RWMC Rocky Flats Plant stored waste. The requirements for storage (40 CFR 264, Subpart I) are identified as ARARs to address the interim storage of containerized waste within the project area of contamination. The storage duration likely will exceed 1 year. The planned storage facility will satisfy the substantive Subpart I requirements for storage of solid waste forms. In the event that liquid containing waste requires storage, the project will need to implement appropriate containment provisions such as the use of spill pallets. The need to implement RCRA ARARs will be based on the hazardous waste determination that will be completed before implementation of the action alternative.

The RCRA land disposal restrictions prohibit the placement of restricted RCRA hazardous waste in land-based units such as landfills, surface impoundments, and waste piles until treated to standards considered protective for disposal. Specific treatment standards are included in requirements. These requirements are applicable to the treatment and disposal of RCRA hazardous waste if placement of restricted waste occurs. The land disposal restrictions do not apply to materials disposed of at WIPP based on WIPP Land Withdrawal Act exemption. The land disposal restrictions generally will apply to treated waste, secondary waste streams, other waste that is RCRA listed, or characteristic waste that is disposed of at off-Site treatment, storage, and disposal facilities.

The RCRA closure requirements for landfills are not considered ARARs for the limited scope of the removal action. As referenced above, the limited scope of the removal action can be considered in determining whether an ARAR is practicable for implementation in a removal action context. In the case of the proposed Alternative Two—Focused Retrieval, DOE has determined that implementation of closure ARARs is not practicable. Implementation of closure requirements and associated monitoring provisions is not meaningful considering the limited portion of the overall landfill (i.e., SDA) being retrieved and considering that final closure ARARs for the facility will be satisfied through the OU 7-13/14 ROD. It is not possible to construct a meaningful closure scenario for the retrieved area considering the scope of the retrieval being proposed and the magnitude of surrounding existing waste forms that are not addressed by the action.

The thermal treatment process to be potentially employed for treatment of VOCs would be subject to substantive ARARs as a miscellaneous unit under RCRA. As part of Subpart X implementation, additional substantive ARAR provisions deemed necessary to protect human health and the environment will be identified through consultation among DOE, IDEQ, and EPA representatives as part of the removal action treatment design process. Additional ARARs for consideration include provisions of Subparts I through O and Subparts AA through CC of this part, Part 270, Part 63 Subpart EEE, and Part 146 of this chapter that are appropriate for the miscellaneous unit (i.e., thermal treatment unit) and the site-specific circumstances of the CERCLA action.

The Toxic Substances Control Act regulations of "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" (40 CFR Part 761) governing management, characterization, storage, treatment, and disposal requirements for polychlorinated biphenyl (PCB) remediation waste are applicable. Inventory information indicates that there is a potential for PCB contamination in the Pit 4 waste inventory at concentrations above the Toxic Substances Control Act regulatory threshold for PCBs (i.e., 50 ppm or greater). The Toxic Substances Control Act storage ARARs will need to be satisfied for any portion of the waste population identified to contain PCBs at 50 ppm or greater. This may be accomplished through a risk-based storage approval process as is allowed by "PCB Remediation Waste" (40 CFR 761.61[c]). In the event that excavated waste-zone materials are identified to contain PCBs $\geq$ 50 ppm, the materials will not be eligible for return to pit, absent supporting risk-based disposal approval. Disposal of these potential materials will be addressed in future documentation.

The State of Idaho regulations for fugitive dust emissions are applicable to fugitive dust generated during remediation or construction activities. In addition, State of Idaho visible emission standards are identified as ARARs. The requirements prohibit discharge of any air pollutant into the atmosphere from any point of emission for a period or periods aggregating more than 3 minutes in any 60-minute period that is greater than 20% opacity.

Relevant substantive requirements of "Radiation Protection of the Public and the Environment" (DOE O 5400.5) and "Radioactive Waste Management" (DOE O 435.1), which specify DOE radiation protection and management requirements, would be met as to-be-considered (TBC) requirements.

Table A-1. Applicable or relevant and appropriate requirements evaluation summary for the Focused Retrieval alternative.

Applicable or Relevant and Appropriate Requirements or To-Be-Considered Requirements	Type	Relevancy[a]	Implementation Comments
Idaho toxic air pollutants (IDAPA 58.01.01.585; IDAPA 58.01.01.586)	Chemical	A	The requirements of Idaho's toxic air pollutants have been determined to be applicable because carcinogenic and noncarcinogenic air contaminants may be present. The release of carcinogenic and noncarcinogenic contaminants into the air must be estimated and controlled if necessary based on estimated emissions.
Idaho ambient air quality standards for specific air pollutants (IDAPA 58.01.01.577)	Chemical	A	These standards establish ambient air quality standards for particulate matter, sulfur oxides, ozone, nitrogen dioxide, fluorides and lead. Project air emissions estimates must provide a basis for assessing compliance with the standards.
National emission standards for emissions of radionuclides other than radon from DOE facilities (40 CFR 61.92–.94, Subpart H)	Chemical	A	Emission of radionuclides to the ambient air from DOE facilities will not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/year (40 CFR 61.92). Project air emissions estimates must provide a basis for assessing compliance with the substantive standards.
National Historic Preservation Act of 1966 (16 USC § 470 et seq., 2002)	Location	RA	The National Historic Preservation Act covers a variety of historic properties such as buildings, structures, archaeological sites, Native American resources, and significant artifacts. The law requires that properties of this type be identified before disturbance by any federal undertaking, including cleanup activities under CERCLA. Implementation of associated substantive requirements will be coordinated with the INEEL cultural resources office personnel in the event that archaeological remains or other artifacts are encountered during overburden removal activities.
Idaho control of fugitive dust emissions (IDAPA 58.01.01.650; IDAPA 58.01.01.651)	Action	A	The fugitive dust requirements are applicable if fugitive dust is generated during remediation or construction activities.
Idaho visible emissions (IDAPA 58.01.01.625)	Action	A	Discharge of any air pollutant into the atmosphere from any point of emission for a period or periods aggregating more than 3 minutes in any 60-minute period, which is greater than 20% opacity, is prohibited.

Table A-1. (continued).

Applicable or Relevant and Appropriate Requirements or To-Be-Considered Requirements	Type	Relevancy[a]	Implementation Comments
Hazardous waste determination (IDAPA 58.01.05.006 [40 CFR 262.11])	Action	A	Performance of an appropriate hazardous waste determination is required for waste that is newly generated.
Standards for owners and operators of treatment, storage, and disposal facilities—use and management of containers (IDAPA 58.01.05 [40 CFR 264, Subpart I])	Action	A	Container storage areas for containers of hazardous waste will be managed in compliance with Subpart I requirements. A modified dense pack storage arrangement will be implemented. Container inspection provisions appropriate for the modified dense pack arrangement will be implemented.
Subpart B—General facility standards General waste analysis—(IDAPA 58.01.05 [40 CFR 264.13(a)(1),(2)]) General inspection requirements—(IDAPA 58.01.05 [40 CFR 264.15 (a), (c)]) General requirements for ignitable, reactive, or incompatible waste—(IDAPA 58.01.05 [40 CFR 264.17 (a),(b)])	Action	A	Substantive provisions of the Resource Conservation and Recovery Act general facility standards will be implemented as ARARs for the CERCLA storage facility. Waste analysis requirements will be implemented through generation of a CERCLA field sampling plan defining required characterization for management of the CERCLA waste retrieved during project activities as well as through available acceptable knowledge documentation. Substantive inspection requirements will be implemented as appropriate for the CERCLA storage facility. Inspection areas and frequencies will be documented in subsequent removal action documentation (i.e., removal action work plan).
Subpart C—Preparedness and pevention (IDAPA 58.01.05 [40 CFR 264.31–35])	Action	A	Substantive requirements of Subpart C will be implemented for the CERCLA storage facility as is appropriate for the CERCLA waste being managed at the site. Appropriate emergency equipment and communications systems will be provided to support the facility. Aisle space requirements will be implemented consistent with those for the modified dense pack storage configuration used in the Resource Conservation and Recovery Act-permitted, Type II storage buildings located in the Radioactive Waste Management Complex Transuranic Storage Area. Definition of required equipment and procedures for implementation of Subpart C will be documented in the subsequent removal action documentation (i.e., removal action work plan).

Table A-1. (continued).

Applicable or Relevant and Appropriate Requirements or To-Be-Considered Requirements	Type	Relevancy[a]	Implementation Comments
Subpart X—Miscellaneous units (40 CFR 264.600–.603)	Action	A	Subpart X is identified as an ARAR for the thermal treatment system. As part of Subpart X implementation, additional substantive ARAR provisions deemed necessary to protect human health and the environment will be identified through consultation among DOE, Idaho Department of Environmental Quality, and U.S. Environmental Protection Agency representatives as part of the removal action treatment design process. Additional ARARs for consideration include provisions of Subparts I through O and Subparts AA through CC of this part, Part 270, Part 63 Subpart EEE, and Part 146 of this chapter that are appropriate for the miscellaneous unit (i.e., thermal treatment unit) and the site-specific circumstances of the CERCLA action.
Land disposal restrictions (40 CFR 268.40, 268.44, 268.45, 268.48, and 268.49)	Action	A	These requirements are applicable to the treatment and disposal of Resource Conservation and Recovery Act hazardous waste if placement of restricted waste occurs.
Polychlorinated biphenyls storage and disposal (40 CFR 761)	Action	A	The Toxic Substances Control Act regulations governing management, characterization, storage, treatment, and disposal requirements for PCB remediation waste are applicable. Inventory information indicates that there is a potential for PCB contamination in the Pit 4 waste inventory at concentrations above the Toxic Substances Control Act regulatory threshold for PCBs (i.e., 50 ppm or greater).

Table A-1. (continued).

Applicable or Relevant and Appropriate Requirements or To-Be-Considered Requirements	Type	Relevancy[a]	Implementation Comments
Radioactive waste management (DOE O 435.1)	Action	TBC	The objective of “Radioactive Waste Management” (DOE O 435.1) is to ensure that all DOE radioactive waste is managed in a manner that is protective of the worker, public health and safety, and the environment. The “Radioactive Waste Management Manual” (DOE M 435.1-1) establishes specific responsibilities for implementing radioactive waste management practices for DOE’s high-level waste, transuranic waste, low-level waste, and the radioactive component of mixed waste. Pit 4 is a past disposal site rather than a new radioactive waste disposal facility. Therefore, the substantive low-level waste disposal requirements contained in that order and manual do not apply to the pit. The substantive requirements in the DOE order, other than the disposal requirements (e.g., storage requirements), will apply and require implementation to relevant radioactive waste management activities.
Radiation protection of the public and the environment (DOE O 5400.5)	Action and Chemical	TBC	This DOE order establishes standards for DOE operations with respect to protection of the public and the environment against undue risk to radiation. This order sets limits for the annual effective dose equivalent for relevant pathways of exposure.

a. Relevancy refers to the type of requirement: A = applicable, RA = relevant and appropriate, or TBC = to-be-considered guidance

ARAR = applicable or relevant and appropriate requirement
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
DOE = U.S. Department of Energy
PCB = polychlorinated biphenyl