Proposed Plan for Radioactive Waste Management Complex Operable Unit 7-13/14

U.S. Department of Energy
Idaho Department of Environmental Quality
U.S. Environmental Protection Agency

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Idaho Cleanup Project at the U.S. Department of Energy Idaho National Laboratory Site

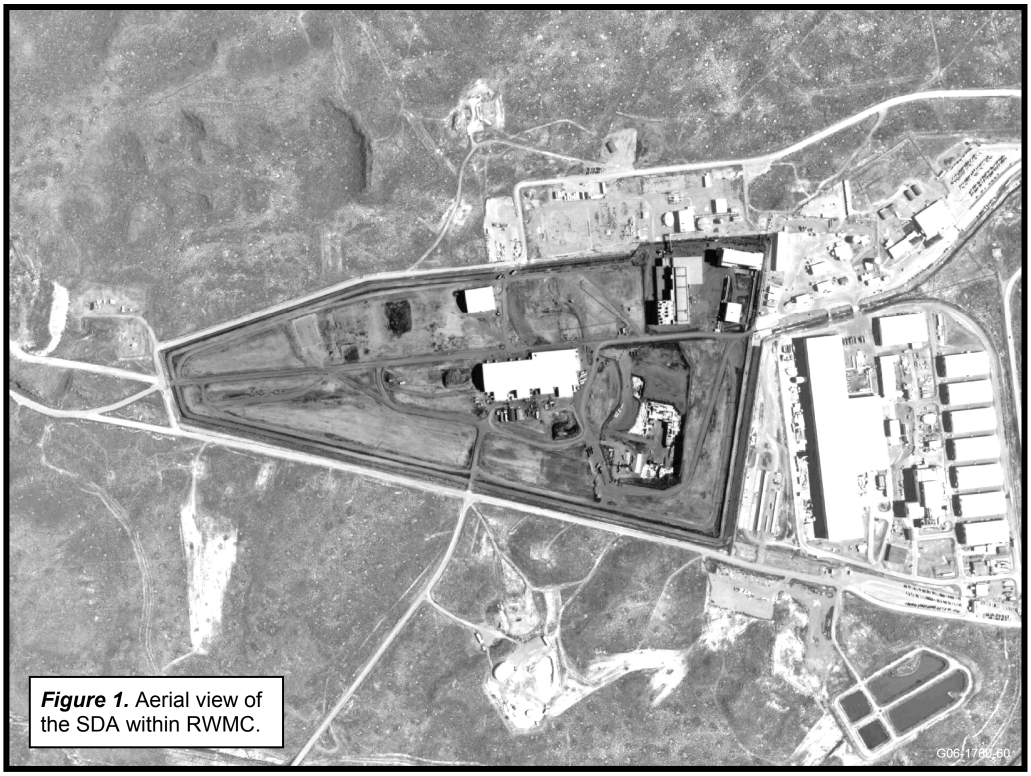

Figure 1. Aerial view of the SDA within RWMC.

INTRODUCTION

The U.S. Department of Energy (DOE) has completed its investigation of Operable Unit (OU) 7-13/14, the comprehensive ***remedial investigation and feasibility study*** (RI/FS) for Waste Area Group 7, the Radioactive Waste Management Complex (RWMC) (see Figure 1) at the Idaho National Laboratory (INL) Site in southeastern Idaho (see Figure 2). This plan highlights key information from RI/FS reports[1, 2] that address RWMC. Analysis focuses on the Subsurface Disposal Area (SDA), a radioactive waste landfill within RWMC (see Figure 3).

The Remedial Investigation[1] concluded that—without remedial action—contaminants in waste buried in the SDA would exceed ***risk threshold values*** for hypothetical residents living adjacent to the landfill in the future and for people or animals intruding into the buried waste. Future contaminant concentrations could exceed allowable ***exposure rates*** at the surface and ***maximum contaminant levels*** (MCLs) in the Snake River Plain Aquifer. The Feasibility Study[2] develops alternatives for remedial action and evaluates how well each alternative would perform.

Public Comment Period
October 22 to November 21, 2007

How You Can Participate

Read this Proposed Plan and review related documents in the Comprehensive Environmental Response, Compensation, and Liability Act Administrative Record for the Idaho Cleanup Project at the Idaho National Laboratory.

Call the U.S. Department of Energy, Idaho Department of Environmental Quality, or U.S. Environmental Protection Agency to get more information.

Attend a public meeting to hear more, ask questions, and tell us what you think.

Comment on this Proposed Plan by using the postage-paid comment card on the back cover.

See page 49 for more information about public involvement and contact information.

Inside this Plan

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risk threshold values

Three values used to define levels of contamination that warrant risk management are carcinogenic (i.e., cancer) risk, toxic effects, and concentrations in the aquifer:

- The threshold value for carcinogenic risk is a chance, ranging from 10^{-6} to 10^{-4} (see chart on page 27), of developing an excess cancer. This range emphasizes using 10^{-6} as the point of departure while allowing adjustments for site-specific and remedy-specific factors, including cumulative risk and future land uses.[a] Typical decisions at the INL Site are based on an ***excess cancer risk*** of 10^{-4}.
- The threshold value for toxic effects is a ***hazard index*** of 1 or more.
- Threshold values for the aquifer are simulated groundwater concentrations that exceed ***maximum contaminant levels***.

excess cancer risk—increased risk (i.e., above the average rate) of developing fatal or non-fatal cancer caused by exposure to contaminants. Risk is expressed as a probability. The average rate in a lifetime is approximately 4,200 in 10,000 people. Remedial decisions are based on the risk of one additional cancer, or a total of 4,20**1** cancers, in 10,000 people.

hazard index—an indicator of potential noncarcinogenic consequences in humans (e.g., damage to organs) caused by exposure to contaminants. The hazard index is a sum of contributions from multiple contaminants.

maximum contaminant level—drinking water standards for contaminants in public drinking water systems.

exposure rate—amount of dose per period of time, typically expressed as millirem (mrem) per year. A millirem is a unit of radiation dose used to measure exposure to humans and assess risk. On average, Americans receive 360 mrem of radiation per year, with 295 mrem from natural sources (e.g., natural radionuclides in the body, rocks, and cosmic rays) and 65 mrem from manmade sources (e.g., medical procedures and consumer products).[b]

NOTE: When technical or administrative terms are first used, they are printed in ***bold italics*** and explained in the sidebar or an information box. Reference callouts in the main text body are indicated by a superscript number. Reference callouts in sidebars and information boxes are indicated by a superscript letter. Referenced documents and acronyms are listed at the end of this Proposed Plan.

remedial investigation and feasibility study—a pair of reports that identifies contaminants present in an area, assesses the risk contaminants pose to human health and the environment if no action is taken, and evaluates possible actions (e.g., cleanup alternatives presented in this Proposed Plan) to address risk.

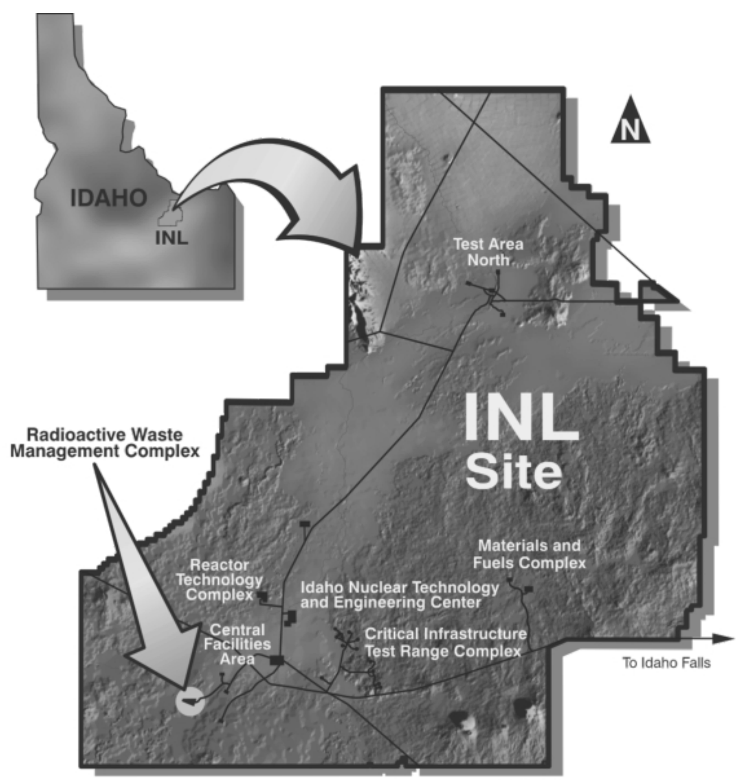


Figure 2. Location of RWMC within the INL Site in the State of Idaho. The INL Site is located in southeastern Idaho and occupies 890 mi^2 in the northeast region of the Snake River Plain. The INL Site extends nearly 39 mi from north to south, is about 36 mi wide at its broadest southern portion, and occupies parts of five southeastern Idaho counties. RWMC is located in the southwestern quadrant of the INL Site.

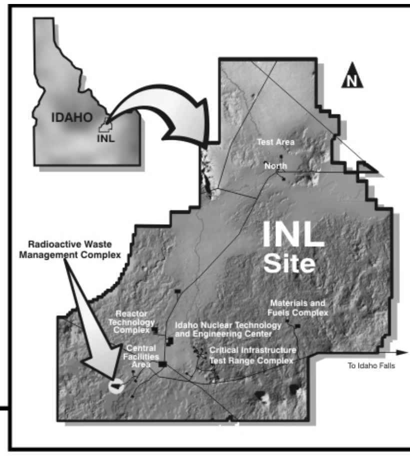
Three government agencies are responsible for cleanup decisions at the INL Site. DOE, as the lead agency and the party responsible for conducting the selected cleanup alternative, is required to issue this Proposed Plan to fulfill public participation requirements under ***CERCLA***[3] and the ***National Contingency Plan***. The State of Idaho Department of Environmental Quality (DEQ) and the U.S. Environmental Protection Agency (EPA) provide regulatory oversight. Together, the three organizations are referred to as the ***Agencies*** in the context of cleanup at the INL Site.

This Proposed Plan identifies the Preferred Alternative for remediating OU 7-13/14, particularly the SDA, and explains reasons for the preference. This Proposed Plan facilitates public review and comment by presenting the alternatives considered and summarizing the Remedial Investigation and Baseline Risk Assessment[1] and Feasibility Study.[2] These two reports and other documents used by

***CERCLA*—**the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the Superfund Act, is the federal law that establishes a program to identify, evaluate, and remediate sites where hazardous substances may have been released (e.g., leaked, spilled, or dumped) to the environment.

***National Contingency Plan*[a]—**the federal government's blueprint for preparing for and responding to oil spills and releases of hazardous substances, pollutants, and contaminants.

***Agencies (DOE, DEQ, and EPA)*—** DOE is responsible for implementing cleanup actions for Idaho Cleanup Project (ICP). DEQ and EPA are responsible for regulatory oversight. The Agencies are issuing this Proposed Plan as part of their public participation responsibilities under CERCLA and the National Contingency Plan.



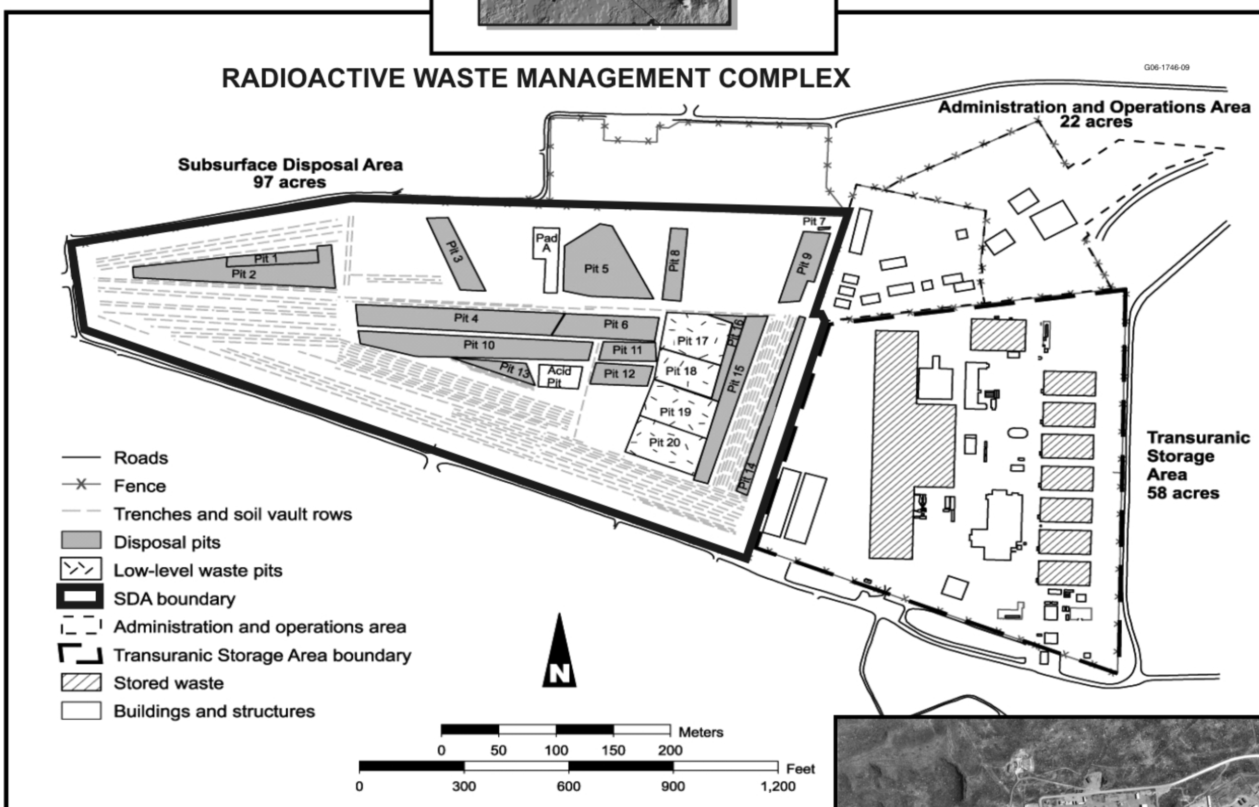


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Figure 3. The SDA is a radioactive waste landfill in RWMC at the INL Site.

***Administrative Record*—**a collection of information, including reports, public comments, and correspondence, used by the Agencies to select a cleanup action. Page 49 lists access locations for the CERCLA Administrative Record for ICP at INL.

***record of decision*—**a legally binding public document that identifies the remedy that will be used at a site and why.

***responsiveness summary*—**a section in the ROD, typically an appendix, that contains public comments on the Proposed Plan and Agency responses to those comments.

***transuranic waste*—**waste material containing any alpha-emitting radionuclide with an atomic number greater than 92, a half-life longer than 20 years, and a concentration greater than 100 nCi/g at the time of assay.[c]

***mixed waste*—**waste that contains both radionuclides and hazardous chemicals, as defined by the Resource Conservation and Recovery Act (RCRA).[d]

***low-level waste*—**radioactive waste that is not identified as high-level waste, spent nuclear fuel, transuranic waste, by-product material, or naturally occurring radioactive material.

***vadose zone*—**the unsaturated region between land surface and the aquifer. Beneath RWMC, the vadose zone is approximately 580 ft from land surface to the top of the aquifer. It is composed of thick layers of fractured basalt separated by thinner layers of sediment (i.e., interbeds).

***interbeds*—**layers of sediment interleaved between layers of basalt in the subsurface. Interbeds tend to retard downward water and contaminant transport to the aquifer and are important features in assessing migration.

the Agencies to develop the Preferred Alternative are contained in the ***Administrative Record***. The Agencies invite the public to review these documents for a more comprehensive understanding.

The public is encouraged to comment on the preferred alternative and other alternatives presented in this Proposed Plan. The Agencies will select a final remedy for OU 7-13/14, including the SDA, after reviewing and considering all information submitted during the 30-day public comment period (October 22 to November 21, 2007). The public can submit comments as described on page 49. Public comments and Agency responses will be published in the ***record of decision*** (ROD) ***responsiveness summary***, scheduled for completion in 2008.

SITE HISTORY

RWMC was created in 1952 for disposal of radioactive waste. Currently, the facility consists of three major areas: the SDA, the Transuranic Storage Area, and an administrative and operations area. The SDA encompasses 97 acres, and waste is buried in approximately 35 of the 97 acres (see Figure 3).

Waste was disposed of in the landfill in unlined pits, trenches, soil vaults, and on Pad A, an abovegrade disposal area (see page 12). Historically, waste containing radioactive and hazardous substances was managed in accordance with laws and disposal practices current at that time. Early practices involved few restrictions. In 1970, burial of ***transuranic waste*** was prohibited. In 1984, disposal practices were modified to eliminate disposal of ***mixed waste***. Since 1984, only ***low-level waste*** has been disposed of in the SDA. Section 3 of the Remedial Investigation and Baseline Risk Assessment[1] provides further details about the operational history of the SDA.

SITE BACKGROUND

The INL Site is located in southeastern Idaho (see Figure 2) and occupies 890 mi^2 in the northeastern region of the Snake River Plain. Regionally, the INL Site is near U.S. Interstate Highways I-15 and I-86. Idaho Falls and Pocatello are the two largest cities in the area. The INL Site extends nearly 39 mi from north to south, is about 36 mi wide at its broadest southern portion, and occupies parts of five southeastern Idaho counties. RWMC is located in the southwestern quadrant of the INL Site.

The INL Site region is classified as arid to semiarid because of its low average rainfall of 8.7 in./year. The Big Lost River, which flows intermittently depending on weather and the amount of water diverted for irrigation, traverses the western part of the INL Site. RWMC has no permanent surface water features, and local surface water conditions are not influenced by the Big Lost River.

The relatively dry region between the surface and the aquifer, referred to as the ***vadose zone***, is a thick sequence of basalt flows and layers of sediment called ***interbeds***. The vadose zone and its interbeds are important features because they tend to filter contaminants and inhibit transport to the underlying aquifer. Seven major interbeds underlie RWMC. The three uppermost interbeds, known as the A-B, B-C, and C-D interbeds, are the best defined. Each interbed contains gaps, though no gaps have been identified in the C-D interbed under RWMC or the immediate vicinity outside RWMC.

Beneath the vadose zone at RWMC, at approximately 580 ft below the surface, the Snake River Plain Aquifer flows generally from northeast to southwest. Like the vadose zone, the aquifer also consists of a series of basalt layers and sediment.

Regionally, the aquifer is bounded on the north and south by the edge of the Snake River Plain, on the west by surface discharge into the Snake River between King Hill and Twin Falls, Idaho, and on the northeast by the Yellowstone basin. Flow paths in the aquifer from beneath the INL Site discharge miles to the west of Twin Falls at the western terminus of the aquifer.

The Remedial Investigation and Baseline Risk Assessment[1] evaluated the ***nature and extent of contamination*** associated with waste buried in the SDA. Tens of thousands of samples of ***perched water***, soil moisture, sediment, aquifer water, and vadose zone vapor have been collected near RWMC over the past three decades, and more than 100,000 analyses have been performed. Figure 4 illustrates an array of monitoring instruments in one location at the SDA. Except for background sites, monitoring locations have been chosen to maximize the likelihood of finding contamination. Despite this bias, detections are generally sparse and sporadic, typically near ***detection limits***, and show few trends. With the exception of volatile organic compounds (e.g., chemicals in solvents), the few trends are limited to specific locations in the shallow vadose zone.

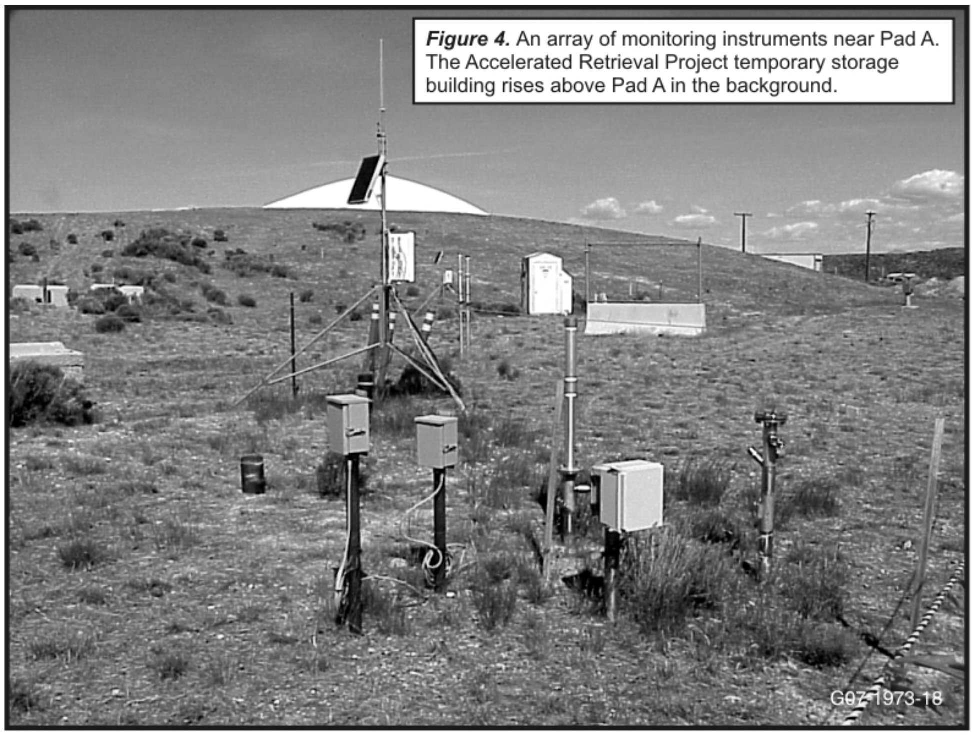

Figure 4. An array of monitoring instruments near Pad A. The Accelerated Retrieval Project temporary storage building rises above Pad A in the background.

Industrial solvents, particularly carbon tetrachloride, are the only widespread contaminants in the environment. Carbon tetrachloride is detected routinely in the vadose zone and aquifer. Aquifer concentrations are slightly above the MCL in four aquifer monitoring wells. Vapor vacuum extraction from the vadose zone by the Organic Contamination in the Vadose Zone (OCVZ) system, started in 1996, is reducing the amount of organic contaminants that reach the aquifer. Vapor extraction consists of drawing soil gas (i.e., vapor) to the surface by applying negative pressure (i.e., vacuuming). Thermal treatment permanently destroys organic contaminants in extracted vapors. Figure 5 illustrates average concentrations of carbon tetrachloride in the vadose zone from 2004 through 2006. Highest concentrations in that timeframe occurred in the region above the B-C interbed, where the average was less than 80 ppmv compared to the more than 1,000-ppmv average in the same region before OCVZ system operations began in 1996.[4]

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At RWMC, the A-B interbed is present only along the north part of the SDA. The B-C interbed (see Figure 5) ranges in thickness from 0 to 40 ft and averages 13 ft. Areas of zero thickness are gaps in the interbed (i.e., areas where the interbed is not present). The C-D interbed ranges in thickness from 5 to 32 ft, averages 17 ft, and has no known gaps beneath RWMC.

nature and extent of contamination—characteristics of contamination at a site including concentrations and degree of migration in the environment where contamination has moved.

perched water—water that accumulates (i.e., perches) above a low-permeability layer (e.g., an interbed) in the vadose zone.

detection limits—the lowest amount of a chemical or radionuclide that can be reliably detected in a sample. Based on statistics, detection limits are calculated values for specific analytical methods. They can vary between sampling events because of background, sample, instrument, analytical, and measurement conditions.

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Except for solvent vapors, current contaminant concentrations in the vadose zone and aquifer are very limited and do not exceed risk thresholds. The Agencies focus on source control to prevent concentrations that exceed risk thresholds from developing in the future.

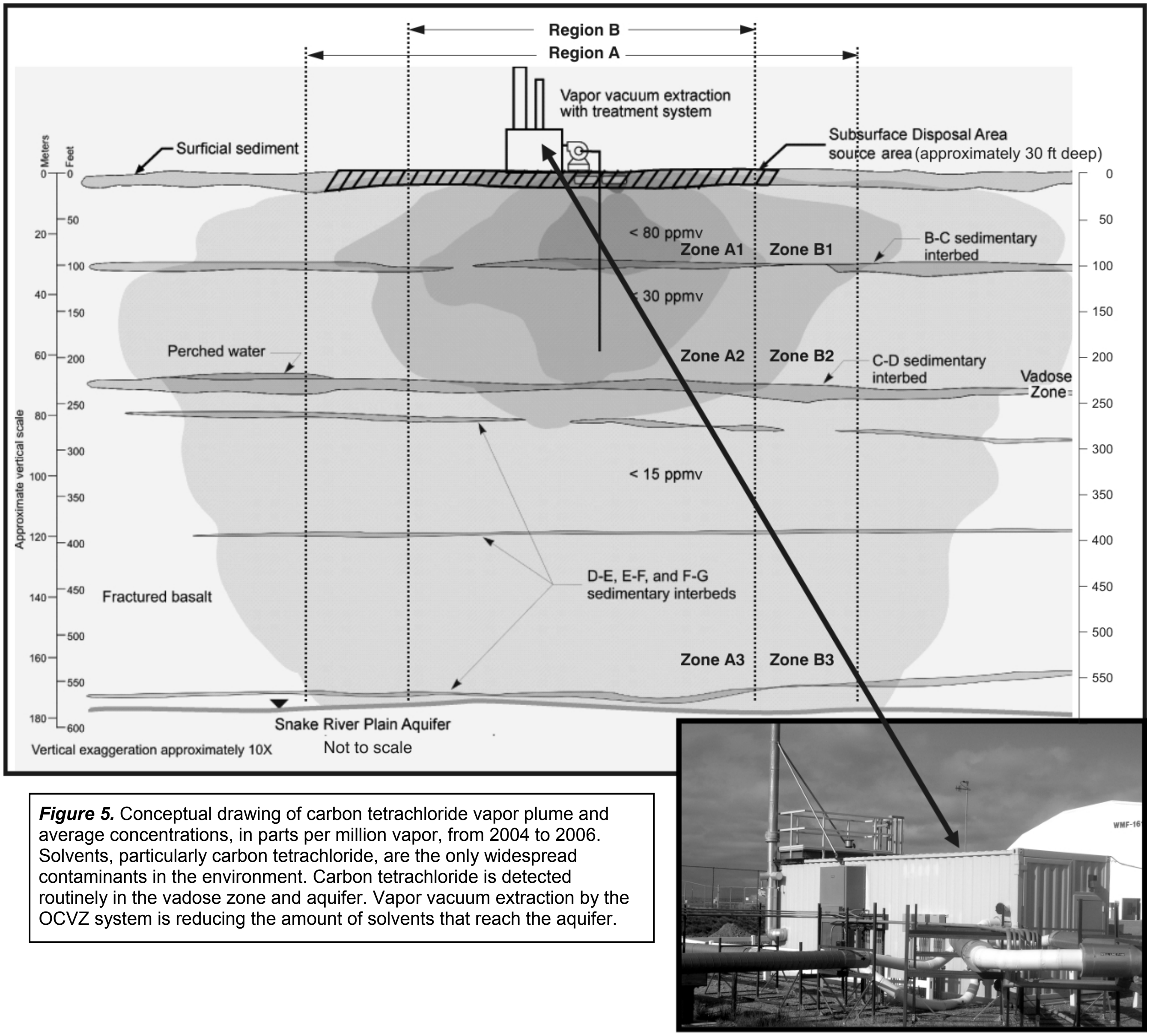

Figure 5. Conceptual drawing of carbon tetrachloride vapor plume and average concentrations, in parts per million vapor, from 2004 to 2006. Solvents, particularly carbon tetrachloride, are the only widespread contaminants in the environment. Carbon tetrachloride is detected routinely in the vadose zone and aquifer. Vapor vacuum extraction by the OCVZ system is reducing the amount of solvents that reach the aquifer.

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Some contaminants of potential concern are detected in low concentrations in the vadose zone at RWMC and aquifer and are likely attributable to waste buried in the SDA. Most vadose zone detections are in the interval above the B-C interbed (see Figure 5). The most frequently detected contaminants in the vadose zone, from most to least, are volatile organic compounds from solvents, uranium isotopes, nitrate, technetium-99, and carbon-14. In addition, strontium-90, chlorine-36, plutonium-238, americium-241, iodine-129, and plutonium-239/240 have been detected sporadically in the vadose zone at concentrations near detection limits.

National Priorities List—the formal list of the nation's hazardous waste sites identified for possible remediation (i.e., cleanup). Sites are included on the list because of their potential risk to human health and the environment.

Federal Facility Agreement and Consent Order—an agreement among the Agencies to evaluate potentially contaminated sites at the INL Site, to determine whether remediation is warranted, and to select and perform remediation, if necessary.

SCOPE AND ROLE OF THE ACTION

The RWMC remedial action is part of the environmental restoration of the INL Site under CERCLA.[3] The INL Site was placed on the ***National Priorities List***[5] of hazardous waste sites in 1989. In 1991, the Agencies signed a ***Federal Facility Agreement and Consent Order***[6] outlining the remedial decision-making process and schedule for cleanup of the INL Site. Under terms of the Federal Facility Agreement and Consent Order, DOE will carry out the cleanup and pay for all costs with tax dollars through the federal budget process. RWMC is identified as Waste Area Group 7, and OU 7-13/14 is the designation for the comprehensive, final investigation planned for RWMC.

Except for continued operation of the vapor vacuum extraction system, initiated under a previous CERCLA decision for OU 7-08 to collect and destroy solvent vapors from the subsurface, the scope of this action focuses on ***source control***. Agency objectives for remedial action at the SDA under the Federal Facility Agreement and Consent Order are to prevent exposure to ***contaminants of concern*** in buried waste by plants, animals, and humans, and to inhibit migration of contaminants of concern (i.e., radionuclides and chemicals) to the Snake River Plain Aquifer.

source control**—**remediation that focuses on preventing continued release of contaminants into the environment to keep widespread environmental contamination from occurring in the future. Source control typically is achieved through containment and can include removal or treatment of selected areas within the source.[e] For OU 7-13/14, the source is defined as buried waste and associated contaminated soil above the first layer of basalt.

contaminant of concern**—**radionuclides and chemicals that exceed risk threshold values (see page 2) in the Baseline Risk Assessment.[f]

OU 7-13/14 also includes waste disposals by the ongoing low-level waste program in Pits 17 through 20 (see Figures 3 and 6). Referred to collectively as the Low-Level Waste Pit, this area is used for disposal of low-level radioactive waste produced by INL Site operations. Projected future disposal was factored into the OU 7-13/14 Baseline Risk Assessment.[1] Disposal operations likely will continue until the facility is full or until it must be closed in preparation for final remediation of the SDA, in approximately 2015.

Figure 6. Aerial photograph of the open portion (i.e., southern half) of the active Low-Level Waste Pit in 2007 (top is north).

OU 7-13/14 is the final operable unit planned for Waste Area Group 7. Evaluations are complete for the first 12 subsets (i.e., operable units). Decisions for OU 7-13/14 will address the collective effects of all operable units at RWMC; thus, the Preferred Alternative presented in this Proposed Plan addresses all operable units in Waste Area Group 7. The following sections summarize previous actions and other decisions for Waste Area Group 7.

non-time-critical removal action—accelerated cleanup, under CERCLA, implemented by an action memorandum (rather than a ROD), that can start later than 6 months after the determination that a response is necessary.

targeted waste—specific Rocky Flats Plant waste forms that are identified and exhumed based on visual observations and methods developed by the Accelerated Retrieval Projects. Targeted waste forms include Series 741 and 743 sludge, graphite, filters, collocated roaster oxides, and other waste streams mutually agreed to by the Agencies, as the result of operational experience or process knowledge, to be routinely transuranic waste. These waste forms contain significant amounts of solvents, transuranic isotopes, and uranium. During the process of excavation, other types of waste could be revealed that are not targeted waste. Nontargeted waste will be removed if the Agencies agree that retrieval is warranted and, as determined through visual inspection or field screening, subject waste meets the following three criteria:

1. Waste poses a potential risk of contamination to the underlying aquifer if left in place
2. Potential risk is sufficient to warrant removal at that time rather than leaving it to be addressed by OU 7-13/14
3. Waste can be managed safely by retrieval, using personnel, facilities, and equipment readily available at the INL Site for retrieval of targeted waste streams.[g, h]

The Agencies will review information collected during ongoing retrieval operations to verify use of visual criteria and instrumentation and to evaluate whether to refine retrieval areas.[h]

Accelerated Retrieval Projects I and II—two non-time-critical removal actions in the SDA focusing on retrieval of targeted waste from portions of Pits 4 and 6. The first removal action covers 0.5 acres, and the second covers 0.3 acres. Together, these two removal actions will retrieve targeted waste from pit areas totaling 0.8 acres.

Non-Time-Critical Removal Actions

DOE, with concurrence from DEQ and EPA, has deployed ***non-time-critical removal actions*** to grout beryllium blocks and retrieve targeted waste from discrete areas of the SDA. The Agencies selected these CERCLA removal actions to expedite the overall remedy for RWMC.

In situ grouting with a paraffin-based grout was safely executed at locations within the SDA to inhibit migration of carbon-14 from buried beryllium blocks into the subsurface and aquifer. Beryllium blocks, used to redirect out-flowing neutrons back into a reactor core, were internal components of several test reactors at the INL Site. Periodically, reflector blocks were replaced. From 1977 to 1993, discarded blocks from INL Site test reactors were managed as low-level waste and buried in the SDA. This waste form was the source of a significant portion of overall carbon-14 being released into the environment. The non-time-critical removal action to grout beryllium blocks was completed[7] and factored into analysis of OU 7-13/14 by modeling reduced release into the environment. Experience from this action was used to evaluate in situ grouting of other waste types in the SDA.

Ongoing ***targeted waste*** retrievals are being implemented under action memoranda, signed by the Agencies, for ***Accelerated Retrieval Projects I and II***. These non-time-critical removal actions currently are exhuming targeted waste from specified areas in Pits 4 and 6 for disposal at the Waste Isolation Pilot Plant in New Mexico or other appropriate facility. Scope for OU 7-13/14 was established when Accelerated Retrieval Project I was in its early stages, and that removal action was scheduled to be completed before the OU 7-13/14 Proposed Plan and ROD were finalized. Therefore, OU 7-13/14 analysis was predicated on the assumption that targeted waste retrieval ongoing under the Accelerated Retrieval Project I non-time-critical removal action would be completed outside actions evaluated in the Feasibility Study.[2] However, Accelerated Retrieval Project I is still operational (see Figure 7), and an additional removal action, Accelerated Retrieval Project II, has been constructed and also is operational.

Figure 7. Waste is retrieved using an excavator (center). Targeted waste is processed through glove boxes (right) and prepared for shipment to the Waste Isolation Pilot Plant. Nontargeted waste is left in the pit. To facilitate retrieval, some nontargeted waste is set aside in soil sacks (top) and returned to the pit later.

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To avoid confusion, the Preferred Alternative presented later in this Proposed Plan identifies retrieval of targeted waste from 4.8 acres of pit areas, currently proposed by DOE (see State Acceptance on page 40), including some portion of Pit 9 and the 0.8 acres addressed by Accelerated Retrieval Projects I and II (i.e., 0.5 and 0.3 acres, respectively). To maintain an uninterrupted targeted waste retrieval schedule within the constraints of prolonged lead times for ordering and receiving equipment, a third removal action will be provided for public comment, separate from this Proposed Plan, and implemented as a non-time-critical removal action. The removal action addresses additional retrievals within the 4.8 acres of pit areas, as currently proposed by DOE (see State Acceptance on page 40), and is scheduled to commence in spring 2008. The OU 7-13/14 ROD will incorporate Accelerated Retrieval Projects I and II and all removal actions. When issued in 2008, the ROD will identify all retrieval locations included in the final remedy.

Actions for Operable Units 7-01, 7-02, 7-03, 7-04, 7-05, 7-06, and 7-07

The Agencies concluded that seven operable units in Waste Area Group 7 (see Table 1) should be evaluated in an RI/FS. The Administrative Record documents those conclusions, and the seven operable units are included in the OU 7-13/14 analysis.

Table 1. Operable units with previous decisions for further evaluation in the OU 7-13/14 remedial investigation and feasibility study.

Operable Unit	Description	Administrative Record Document Number[a]
7-01	Soil Vault Rows 1-13	10034[8]
7-02	Acid Pit	5055[9]
7-03	Nontransuranic pits and trenches	5592[10]
7-04	Air pathway	10017[11]
7-05	Surface water pathways and surficial sediments	5864[12]
7-06	Groundwater pathway	5868[13]
7-07	Vadose zone radionuclides and metals	10004[14]

a. Accessing documents in the Administrative Record is explained on page 49.

No Action for Operable Units 7-09 and 7-11

OU 7-09, Transuranic Storage Area Releases, was identified to address historical releases that may have occurred within the 58-acre Transuranic Storage Area (see Figure 3). The OU 7-13/14 Remedial Investigation[1] and Feasibility Study[2] excluded all operations within the Transuranic Storage Area (e.g., the ***Advanced Mixed Waste Treatment Project*** and the ***Intermediate-Level Transuranic Storage Facility***). Though the existing conclusion for OU 7-09[15] specifies analysis in the OU 7-13/14 RI/FS, the Agencies agree, based on current programs, that this conclusion is no longer valid. When their missions are complete, facilities within the Transuranic Storage Area will be formally closed under their respective programs and then deactivated, decontaminated, and decommissioned.

OU 7-11 comprises three septic tank systems at RWMC. The Agencies concluded that no action is required because hazardous or radioactive contaminants in the systems were not detected above regulatory limits.[16]

Advanced Mixed Waste Treatment Project—an ongoing task, managed by Bechtel BWXT Idaho, LLC, to retrieve, characterize, and prepare waste from the Transuranic Storage Area for shipment to the Waste Isolation Pilot Plant. For more information, see http://amwtp.inl.gov/.

Intermediate Level Transuranic Storage Facility—two sets of inactive belowgrade vaults in the southwest corner of the Transuranic Storage Area used historically to store remote-handled transuranic waste.

Existing Records of Decision for Operable Units 7-08, 7-10, and 7-12

The OU 7-13/14 ROD, as the comprehensive remedial decision for the entire RWMC, will address three existing RODs for portions of RWMC: OU 7-08, OCVZ;[17] OU 7-12, Pad A;[18] and the interim action ROD for OU 7-10, Pit 9.[19] Portions of these RODs are proposed to be integrated within the selected alternative in the OU 7-13/14 ROD. Requirements of these RODs will remain in force until the OU 7-13/14 ROD is finalized. This Proposed Plan, the Remedial Investigation,[1] the Feasibility Study,[2] and other supporting analyses in the OU 7-13/14 Administrative Record incorporate contaminants and risks posed by these subsets of RWMC. To the extent that this Proposed Plan differs from specific provisions of these previous RODs, public review and comment on this Proposed Plan also support those modifications in accordance with the National Contingency Plan.[20] Specific modifications for these previous RODs are described in the following paragraphs.

OU 7-08 Organic Contamination in the Vadose Zone Remedial Investigation and Feasibility Study—The OU 7–08 ROD[17] specified extracting organic vapors (solvents) from the vadose zone until remediation goals are met. Solvent vapors within the vadose zone are moving toward the Snake River Plain Aquifer. In several aquifer monitoring wells, carbon tetrachloride has slightly exceeded its MCL of 5 μg/L. In addition to a no action alternative, the OU 7-08 RI/FS examined three alternatives in detail: containment (with a surface barrier), extraction with treatment by vapor vacuum extraction, and extraction with treatment with enhanced vapor vacuum extraction. Based on results of a treatability study and evaluation against CERCLA criteria, the Agencies selected Alternative 2—Extraction with Treatment by Vapor Vacuum Extraction.[17]

The OCVZ system was constructed and became operational in 1996. Figure 8 is a photograph of pipelines and one of the treatment units in the system. Approximately 220,000 lb of solvent has been extracted from the vadose zone and destroyed. The Preferred Alternative for RWMC remediation incorporates continued operation of the OCVZ system and integrates it into the OU 7-13/14 remedial action. The Preferred Alternative adopts the following minor changes:

- Duration of operations will be determined based on the overall remedy for OU 7-13/14; operating timeframes would vary, depending on the final remedy that is selected for the entire SDA (e.g., how much solvent waste is removed during retrievals)
- Remediation goals will be as specified for OU 7-13/14 (e.g., vapor concentrations in the vadose zone), as described on page 16.

OU 7-10 Pit 9 Process Demonstration Interim Action—The OU 7-10 interim action ROD[19] specified a combination of chemical extraction, physical separation, and stabilization technologies to recover contaminants and reduce the source of contamination. Major components of the remedy included removing all waste containing transuranic concentrations greater than 10 nCi/g from the 1-acre Pit 9, treating the waste to remove radionuclides and hazardous constituents, reducing volume of treated waste by 90%, temporarily storing concentrated waste residuals onsite pending final disposal (e.g., Waste Isolation Pilot Plant), and returning treated materials to Pit 9 (treated materials would contain less than or equal to 10 nCi/g transuranic elements and meet regulatory standards for hazardous substances). The interim action was intended to test and demonstrate the feasibility of retrieving buried transuranic waste from the SDA. However, the interim action described in the OU 7-10 ROD was not performed.

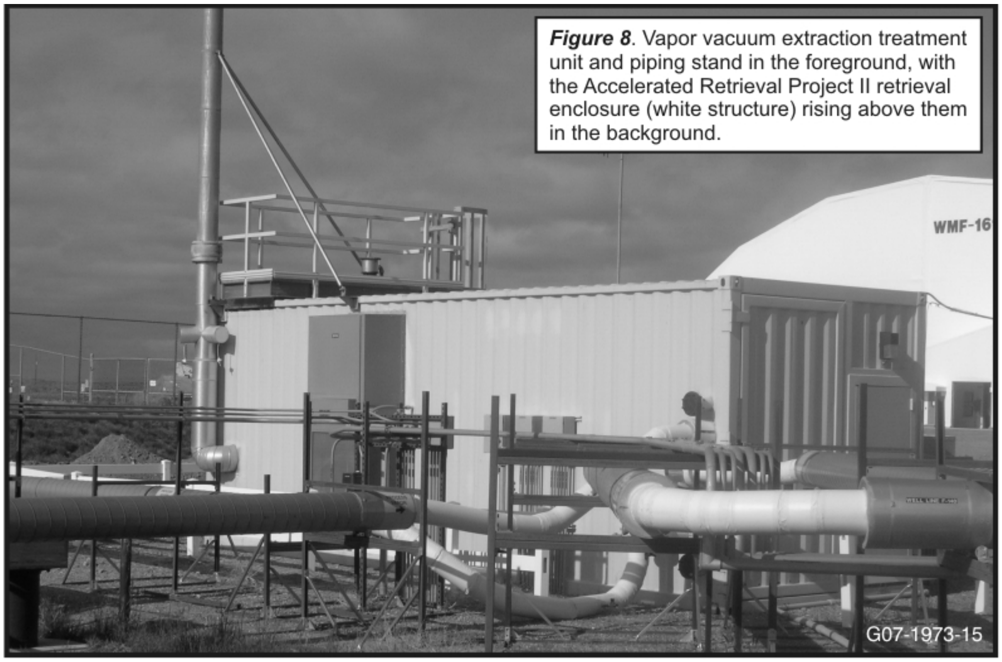

Figure 8. Vapor vacuum extraction treatment unit and piping stand in the foreground, with the Accelerated Retrieval Project II retrieval enclosure (white structure) rising above them in the background.

Thus, the Agencies modified the Pit 9 ROD in the 1998 Explanation of Significant Differences,[21] which implemented a three-stage strategy. The first two stages were satisfactorily completed,[22] and the third stage (i.e., full-scale retrieval and treatment of Pit 9) was subsequently deferred.[22] Stages I and II consisted of siting and implementing a retrieval demonstration in Pit 9. The OU 7-10 Glovebox Excavator Method Project (see Figure 9) successfully demonstrated retrieval and provided information that allowed the Agencies to adopt the targeted waste retrieval approach, a less complicated and less costly strategy for retrieval of buried transuranic waste.

Figure 9. Excavator retrieving waste during the OU 7-10 Glovebox Excavator Method Project in Pit 9 at the SDA.

The Preferred Alternative for RWMC remediation includes retrieval of targeted waste. A portion of Pit 9 would be included in the selected acreage. Therefore, the Agencies conclude that the OU 7-10 Interim Action ROD[19] will be integrated with the OU 7-13/14 ROD.

OU 7-12 Pad A Remedial Investigation and Feasibility Study—The OU 7-12 ROD[18] specified enhancing the soil cover over the waste on ***Pad A*** and maintaining that cover as long as necessary. Pad A (see Figure 10) is a unique abovegrade asphalt pad used for disposal of waste from 1972 to 1978. In addition to a no action alternative, the OU 7-12 RI/FS[23] examined two alternatives in detail: (1) containment by construction of a composite surface barrier and (2) limited action combining maintenance of the existing cover with monitoring. Because Pad A does not exceed risk threshold values, the Agencies selected Alternative 2—Limited Action.[18] Subsequently, the existing soil cover over Pad A waste was enhanced with additional soil and vegetation. Rock armor was added to the south-facing side to reduce wind erosion. Over time, maintaining vegetation proved impractical and was discontinued. Routine maintenance includes repairing damage from subsidence.

Pad A—an abovegrade disposal area about one-half acre in size and approximately 30 ft high. Waste on Pad A is mostly evaporator salt (i.e., nitrate) and roaster oxide (i.e., uranium) received from the Rocky Flats Plant. Though risk exceeding threshold values was not identified in the Pad A RI/FS [i] (i.e., OU 7-12), nitrate was identified as a contaminant of concern and a basis for limited action.

The Preferred Alternative for OU 7-13/14 includes additional action at Pad A to integrate it into the comprehensive remedy. Additional action under OU 7-13/14 is significantly different from the Limited Action selected in the Pad A ROD because measures to address subsidence of Pad A waste will be included in the Preferred Alternative. The waste pile will be stabilized, using methods to be determined during remedial design, to provide a stable foundation for the overlying SDA evapotranspiration surface barrier. After stabilizing the waste pile, additional cover material will be included to incorporate Pad A and its cover into the larger surface barrier that will be constructed over the entire SDA. Therefore, the OU 7-12 ROD will be superseded in its entirety by the OU 7-13/14 ROD. The established monitoring program for the Pad A cover[24] will continue until the final remedy is completed.

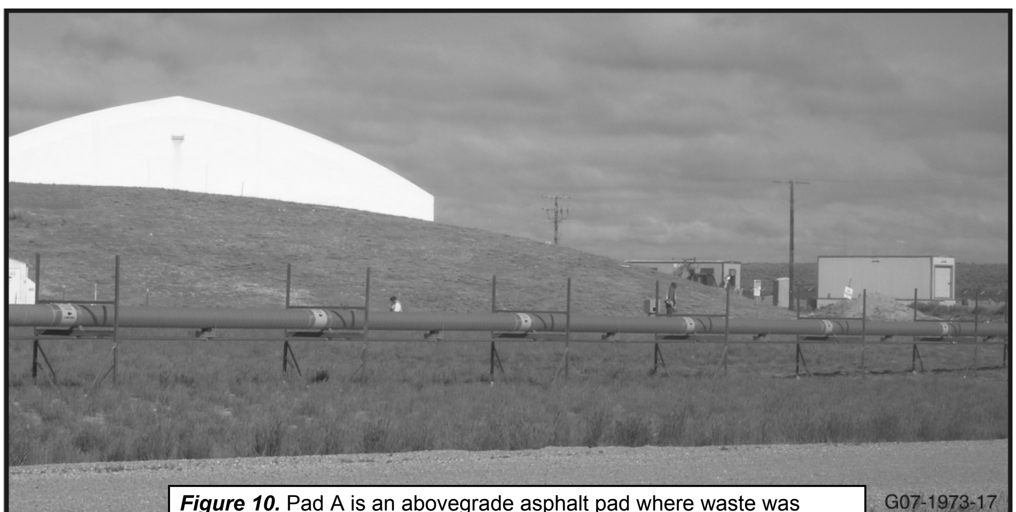

Figure 10. Pad A is an abovegrade asphalt pad where waste was stacked and covered with soil from 1973 to 1978. The soil cover over Pad A waste was enhanced with additional soil and vegetation, then rock armor was added to the south-facing side to reduce wind erosion. A vapor vacuum extraction pipe stands in the foreground, and the Accelerated Retrieval Project temporary storage building rises (white) in the background.

SITE RISKS

The ***baseline risk assessment*** evaluated risk to human health and the environment in the absence of any remedial action to reduce exposures. Land use is projected to remain industrial. Residential development near RWMC in the future is not expected, and the Agencies agree that it is reasonable to assume that the federal government will maintain control and restrict access in the future. However, to provide a protective basis for decision-making, the ***conservative assumption*** was adopted that a hypothetical future resident could be located immediately adjacent to the landfill 100 years in the future.

In addition to the ***future residential scenario***, the baseline risk assessment evaluates occupational scenarios and ecological risk. Risk to a potential inadvertent intruder (i.e., an agricultural well-driller) was evaluated. Risk estimates are higher for potential future residents than for workers and well-drillers, and the same measures that address residential risk also would mitigate occupational and ecological risk. Estimated ***cumulative risk*** at the end of the hypothetical 100-year institutional control period for the future residential scenario (i.e., when a resident could live adjacent to the SDA) for surface exposure pathways is 70 in 10,000; estimated groundwater ingestion risk is 9 in 10,000.

Computer models were used to predict future concentrations of contaminants that could affect soil, air, and groundwater.[25, 26] Analysis concluded that risk from OU 7-13/14 could exceed threshold values. Residential exposure pathways that pose human health risks greater than threshold values are external exposure to radiation, soil ingestion, crop ingestion, inhalation of dust, inhalation of volatiles, dermal exposure, and groundwater ingestion. Figure 11 illustrates how people and the environment could be exposed to contaminants.

Primary contaminants of concern include ***radionuclides*** and chemicals that could migrate to the surface or to the aquifer in concentrations that exceed risk thresholds within 1,000 years in accordance with guidance for cumulative risk assessment at the INL Site.[27] Contaminants of concern were identified by modeling. Many other constituents were evaluated in the risk assessment and were eliminated from further consideration. Details are available in the Remedial Investigation and Baseline Risk Assessment.[1]

Tables 2, 3, and 4 list primary contaminants of concern that must be addressed through remedial action and risk management at Waste Area Group 7. Tables 2 and 3 provide the following information:

- Radionuclides and chemicals that could pose risk that exceeds threshold values
- Peak (i.e., highest) risk estimates and hazard indexes
- Years the peaks are predicted to occur
- Types of exposure that pose the most risk.

In addition to risk estimates and hazard indexes, the potential to exceed MCLs in groundwater was evaluated and used to identify contaminants of concern. Modeling shows that iodine-129 and all six chemical contaminants of concern could exceed MCLs. Table 4 lists these contaminants of concern, peak simulated groundwater concentrations, years the peak concentrations are predicted to occur, and MCLs.

baseline risk assessment—the part of a remedial investigation that estimates potential current and future threats to human health or the environment if no remedial action is taken.

conservative assumptions—assumptions that tend to overestimate risk; these are developed by the Agencies, based on available information, experience, and professional judgment.

future residential scenario—a hypothetical situation in which people live immediately adjacent to the SDA 100 years from now. For the baseline risk assessment (i.e., risk if no action is taken), this exposure scenario simulates contaminants brought to the surface by plants and animals (i.e., biotic transport) and moved outside the SDA by wind. Crops then are grown in contaminated soil adjacent to the SDA and irrigated with contaminated groundwater. Residents also inhale and ingest contaminated soil, inhale vapor in the air, and incur external radiation exposure. Surface pathways pose the highest risk.

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A primary function of a surface barrier is to interrupt surface exposure pathways by inhibiting transport to the surface by plants and animals. A surface barrier would prevent unacceptable exposure to biota from soil. Coupled with institutional controls, a surface barrier also would reduce risk to inadvertent intruders.

cumulative risk—combined risks from multiple contaminants and exposure pathways (e.g., inhalation and ingestion).

primary contaminants of concern—radionuclides and chemicals with risk estimates that exceed threshold values (see page 2) within 1,000 years. These contaminants are the basis for identifying remedial action objectives and evaluating remedial alternatives.

radionuclide—an unstable atom that gives off excess energy (i.e., decays) in the form of radioactivity (i.e., rays or particles). Depending on the type and amount of decay, prolonged exposure may be harmful.

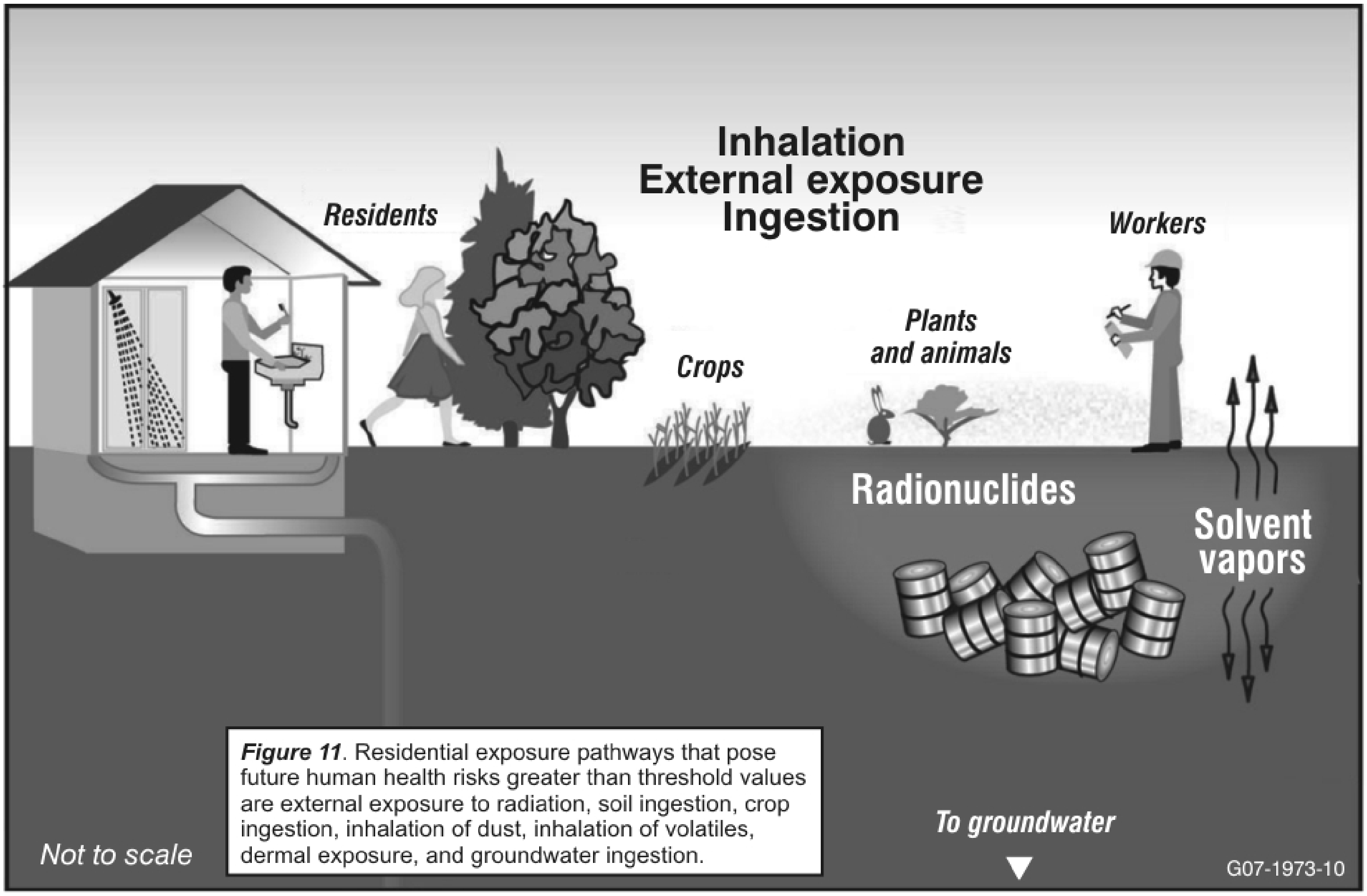

Figure 11. Residential exposure pathways that pose future human health risks greater than threshold values are external exposure to radiation, soil ingestion, crop ingestion, inhalation of dust, inhalation of volatiles, dermal exposure, and groundwater ingestion.

secondary contaminants of concern—radionuclides with risk estimates that exceed threshold values (see page 2) *after* 1,000 years. Though these contaminants are not used to identify candidate remedial alternatives, the Feasibility Study[j] evaluates long-term effectiveness in reducing risk from them.

To address uncertainties associated with groundwater modeling for those radionuclides that did not reach their peak concentrations within 1,000-year simulations, the Agencies extended modeling simulations to 10,000 years. As a result, the following long-lived radionuclides were identified as ***secondary contaminants of concern*** based on risk screening: actinium-227, neptunium-237, protactinium-231, uranium-233, uranium-234, uranium-235, uranium-236, and uranium-238. Modeling the period from 1,000 to 10,000 years also indicated that concentrations of neptunium-237 and uranium-238 could exceed MCLs thousands of years in the future.

Two types of waste are associated with risk: waste received from Rocky Flats Plant weapons production and waste received from INL Site reactor research and operation. Primary contaminants of concern for surface exposure to radioactivity are mostly from Rocky Flats Plant waste, while radiological groundwater contaminants of concern (i.e., iodine-129 and technetium-99) are from waste generated at the INL Site (see Table 2). Almost all chemical contaminants of concern (see Table 3) came from the Rocky Flats Plant. Secondary contaminants of concern, all of which are radioactive, also came mostly from the Rocky Flats Plant. In general, contaminants of concern from INL Site reactor operations are located in trenches and soil vaults, while most contaminants of concern from the Rocky Flats Plant were disposed of in pits.

The Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in this Proposed Plan, is necessary to protect public health and welfare and the environment from actual or threatened releases of hazardous substances into the environment.

Table 2. Radionuclide contaminants of concern based on 1,000-year future residential scenario peak risk estimates outside the boundary of the SDA in the absence of remedial action. (See risk threshold values on page 2.)

Radionuclide	Peak Risk[a]	Year	Primary Exposure Pathways[a]
Americium-241	30 in 10,000	2594	External exposure, soil ingestion, and inhalation
Carbon-14	0.1 in 10,000	2110	Groundwater ingestion and inhalation of volatiles (at the surface)
Cesium-137	20 in 10,000	2110	External exposure and crop ingestion
Lead-210	0.3 in 10,000	3010	Crop and soil ingestion
Plutonium-239	30 in 10,000	3010	Soil ingestion, crop ingestion, and inhalation
Plutonium-240	6 in 10,000	3010	Soil ingestion, crop ingestion, and inhalation
Radium-226	7 in 10,000	3010	External exposure and crop ingestion
Radium-228	0.3 in 10,000	3010	External exposure
Strontium-90	10 in 10,000	2110	Crop ingestion, external exposure, and soil ingestion
Technetium-99	0.5 in 10,000	2858	Groundwater ingestion and crop ingestion (crops irrigated with contaminated groundwater)

a. All exposure pathways that could pose risk are assessed in the Remedial Investigation and Baseline Risk Assessment;[1] those contributing most to risk are listed as primary exposure pathways.

Table 3. Chemical contaminants of concern based on 1,000-year future residential scenario peak risk estimates outside the boundary of the SDA in the absence of remedial action. (See risk threshold values on page 2.)

Chemical	Peak Risk[a]	Year	Peak Hazard Index	Year	Primary Exposure Pathways[a]
Carbon tetrachloride[b]	4 in 10,000	2117	10	2119	Inhalation of volatiles (at the surface) and groundwater ingestion
1,4-Dioxane[b]	0.2 in 10,000	2110	NA	NA	Groundwater ingestion
Tetrachloroethylene[b]	4 in 10,000	2136	<1	2136	Groundwater ingestion and dermal exposure
Trichloroethylene[b]	0.2 in 10,000	2141	NA	NA	Groundwater ingestion

a. All exposure pathways that could pose risk are assessed in the Remedial Investigation and Baseline Risk Assessment;[1] those contributing most to risk are listed as primary exposure pathways.

b. Chemicals contained in solvents.

NA =- not applicable

Table 4. Contaminants of concern based on simulated peak groundwater concentrations that exceed MCLs within 1,000 years outside the boundary of the SDA in the absence of remedial action. (See risk threshold values on page 2.)

Contaminant of Concern	Peak Groundwater Concentration	Year	Maximum Contaminant Level
Iodine-129	2.9 pCi/L	2870	1 pCi/L
Carbon tetrachloride	0.28 mg/L	2133	0.005 mg/L
1,4-Dioxane	0.17 mg/L	2120	0.003 mg/L[a]
Methylene chloride	0.058 mg/L	2245	0.005 mg/L
Nitrate	49 mg/L	2295	10 mg/L
Tetrachloroethylene	0.067 mg/L	2145	0.005 mg/L
Trichloroethylene	0.12 mg/L	2145	0.005 mg/L

a. MCL is not established, but a health advisory level is available.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives describe what site cleanup must accomplish. Remedial action objectives for the SDA are listed below:

- Limit cumulative human health cancer risk for all exposure pathways to 10^{-6} to 10^{-4}
- Limit noncancer risk for all exposure pathways to a cumulative hazard index of less than 1 for current and future workers and future residents
- Inhibit migration of contaminants of concern into the vadose zone and the underlying aquifer
- Prevent unacceptable exposure to biota from soil
- Inhibit transport of contaminants of concern to the surface by plants and animals.

preliminary remediation goal—a measurable level of contamination that is safe for human health and the environment. Preliminary remediation goals are established during the Feasibility Study[j] based on scientific information. Alternatives are developed and evaluated based on how well they meet the goals. Final remediation goals are set in the ROD.

Preliminary remediation goals are measurable quantities used to demonstrate that remedial action objectives are satisfied. Because candidate remedial actions for the SDA focus primarily on source control,[28] the following performance objectives, rather than contaminant-specific concentrations, are defined as preliminary remediation goals:

- Reduce carcinogenic risk at the surface to less than 10^{-6} to 10^{-4} by maintaining an effective dose equivalent rate at the surface of less than 15 mrem/year[29] as a measurable performance objective
- Reduce infiltration such that concentrations of contaminants of concern in the aquifer are less than MCLs.

In addition, OU 7-08 goals for two regions in the vadose zone (i.e., Zones A1 and A2) (see Figure 12) are identified as preliminary remediation goals for OU 7-13/14. Operational experience shows that the OCVZ system is effectively removing vapor from current extraction Zones A1 and A2. Retaining goals for Zones A1 and A2, in addition to MCLs in the aquifer, is protective. Preliminary remediation goals to reduce transport of solvents to the aquifer are as follows:

- Maintain concentrations of carbon tetrachloride in vadose zone soil vapor above the B-C interbed (i.e., Zone A1 approximately the 30 to 100-ft depth interval) to less than 190 ppmv
- Maintain concentrations of carbon tetrachloride in vadose zone soil vapor between the B-C and C-D interbeds (i.e., Zone A2, approximately the 100 to 240-ft depth interval) to less than 39 ppmv.

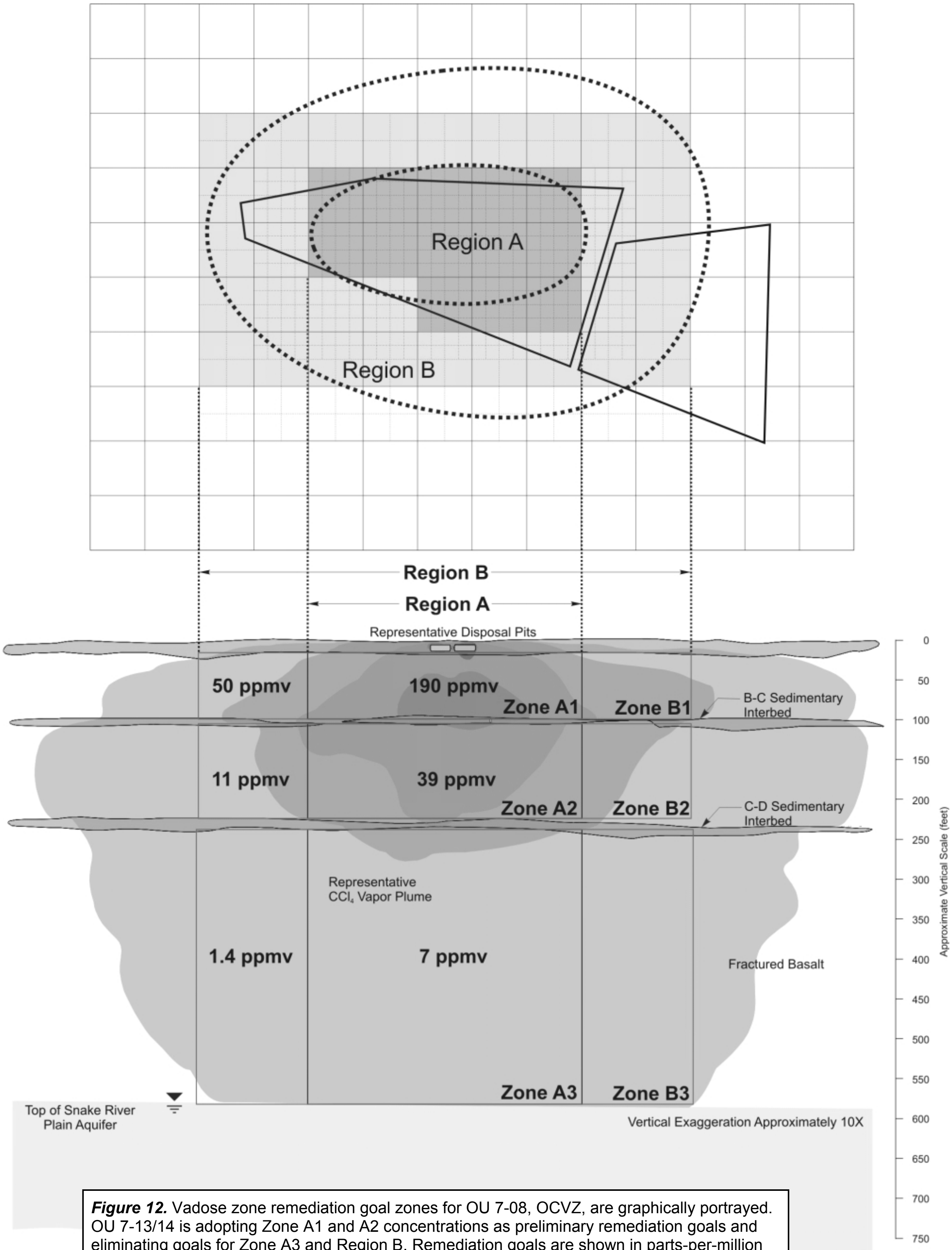

Figure 12. Vadose zone remediation goal zones for OU 7-08, OCVZ, are graphically portrayed. OU 7-13/14 is adopting Zone A1 and A2 concentrations as preliminary remediation goals and eliminating goals for Zone A3 and Region B. Remediation goals are shown in parts-per-million vapor concentrations for carbon tetrachloride.

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CERCLA Evaluation Criteria

Threshold Criteria → **Balancing Criteria** → **Modifying Criteria**

Threshold Criteria

- ***Overall protection of human health and the environment***

  Does the alternative protect human health and the environment in both the short and long term by eliminating, reducing, or controlling risk?

- ***Compliance with ARARs***

  Does the alternative comply with environmental laws?

Balancing Criteria

- ***Long-term effectiveness and permanence***

  How certain is it that the alternative will be successful? Once cleanup goals have been met, will protection be maintained? What risks do untreated waste or post-treatment residuals pose? How adequate or reliable are controls, such as institutional controls, used to manage treatment residuals and untreated waste?

- ***Reduction of toxicity, mobility, or volume through treatment***

  How much contamination will be treated? What will treatment accomplish? Is treatment permanent? How much and what type of residuals will remain after treatment?

- ***Short-term effectiveness***

  Does the alternative pose any risk to the community, workers, or the environment during implementation? How soon will protection be achieved?

- ***Implementability***

  Is the proposed technology feasible and reliable? Can its effectiveness be monitored? Are necessary materials, equipment, specialists, and services available?

- ***Cost***

  What are the estimates for capital costs and for operating and maintenance costs? Are costs in proportion to the overall effectiveness of the alternative?

Modifying Criteria

- ***State acceptance***

  Does the state concur with the preferred alternative?

- ***Community acceptance***

  Which aspects of the alternatives do the public support or oppose?

applicable or relevant and appropriate requirements—the body of federal, state, and local environmental laws, regulations, and standards with which the selected cleanup alternative must comply.

To evaluate potential treatment technologies under the five CERCLA balancing criteria, the Agencies examined more than 20 factors specified in EPA guidance,[e] including:

- Availability of storage and disposal facilities
- Reliability of the alternative
- Ability to construct and operate
- Monitoring
- Administrative feasibility
- Time to completion
- Worker protection
- Irreversibility of treatment
- Treatment residuals.

CERCLA EVALUATION PROCESS

Several cleanup alternatives are available to meet remedial action objectives at most sites. An evaluation process that applies criteria defined by CERCLA is used to identify the Preferred Alternative. The Agencies consider relative trade-offs among alternatives when identifying their Preferred Alternative. During evaluation, each alternative is first assessed individually against the criteria. A comparative analysis then assesses overall performance of each alternative relative to the others.

The first two evaluation criteria are threshold criteria: (1) overall protection of human health and the environment and (2) compliance with ***applicable or relevant and appropriate requirements*** (ARARs). An alternative must meet threshold criteria, or it cannot be selected. The next five criteria are balancing criteria used to weigh major trade-offs among alternatives. These criteria are (1) long-term effectiveness and permanence; (2) reduction of toxicity, mobility, and volume through treatment; (3) short-term effectiveness; (4) implementability; and (5) cost. Each alternative is ranked in terms of how well it satisfies these criteria (high, medium, or low). The final two criteria are modifying criteria that factor in state and community acceptance.

The Agencies identified five assembled alternatives composed of various combinations of remedial methods, but many other combinations are possible. To facilitate identifying a preferred alternative that might not exactly match an alternative in the Feasibility Study,[2] major remedial elements were developed as ***modules*** that can be recombined—mixed and matched—to optimize the remedy selection process. Modules also simplify and facilitate cost estimating. Feasibility Study[2] modules address subsidence in pits, Pad A, sizes of retrieval areas, buildup of solvent vapors, types of surface barrier, and other variations. The next section summarizes the evaluation of alternatives presented in the Feasibility Study[2] and the Preferred Alternative. The Preferred Alternative is an optimized combination of modules.

DESCRIPTION AND EVALUATION OF ALTERNATIVES

The Feasibility Study[2] screens remedial technologies and formulates alternatives that could meet remedial action objectives. Alternatives then are evaluated in detail to assess how well they meet CERCLA criteria, and their relative advantages and disadvantages are examined. The Preferred Alternative identified in this Proposed Plan recombines modules from alternatives in the Feasibility Study.[2] Feasibility Study[2] alternatives are summarized, and a supplemental analysis of the Preferred Alternative is provided in the following subsection.

DESCRIPTION OF ALTERNATIVES

Technologies that potentially may meet remedial action objectives were identified and screened with respect to their potential effectiveness and technical feasibility. Representative technologies were selected from those retained after screening, and the retained technologies were combined into assembled alternatives, ranging from No Action to Full Retrieval of all waste from the SDA.

The Feasibility Study[2] focuses on remedial alternatives that reduce transport of contaminants from the landfill into the environment. The Agencies concluded[28] early in the study of the SDA that an engineered surface barrier will be a component of every alternative evaluated in the Feasibility Study.[2] Therefore, each alternative developed for the SDA, except No Action, includes a surface barrier. Several additional ***common elements*** are necessary to ensure that the selected remedial action protects human health and the environment. Elements common to all action alternatives, including the Preferred Alternative, are:

- **Engineered surface barrier—**Each alternative includes a surface barrier to inhibit contaminant transport to the surface by plants and animals and to inhibit infiltration and subsequent transport of contaminants to the vadose zone. Overall thickness of the barrier, coupled with long-term institutional controls, would preclude inadvertent human intrusion.
- **Vapor vacuum extraction and treatment—**Continued operation of the OCVZ system established under OU 7-08 is a primary component in each action alternative. The OCVZ system extracts and treats solvent vapors from the vadose zone.
- **Long-term stewardship—**Analysis for OU 7-13/14 includes 100 years of postremediation long-term stewardship as a basis for modeling and cost estimating. However, these activities would not be limited to 100 years. Long-term stewardship would continue indefinitely, until eliminated through the 5-year review process, in accordance with CERCLA. Long-term stewardship activities include surveillance, maintenance, monitoring, and ***institutional controls***.

modules—major elements of remediation developed as stand-alone parts that can be combined in a variety of ways to assemble complete alternatives. Separate cost estimates were developed for each module.

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The Agencies concluded early in the investigation of Waste Area Group 7 that a surface barrier would be a component of all alternatives evaluated in the Feasibility Study.[j] The surface barrier would mitigate residual risk by reducing infiltration and inhibiting contaminant transport to the surface by plants and animals. Overall thickness of the surface barrier, coupled with long-term institutional controls, would preclude inadvertent intrusion by people.

common elements—each action alternative includes a surface barrier, continued operation of the existing vapor vacuum extraction system to remove solvent vapors from the vadose zone, and long-term surveillance, maintenance, monitoring, and institutional controls.

institutional controls—administrative and engineering measures to protect human health and the environment from exposure to contamination. Institutional controls are maintained until requirements are achieved for safe, unrestricted land use. Active controls include site surveillance, maintenance, monitoring, site surveys, access restrictions, and other measures that involve routine or periodic human presence at the site. Passive controls are administrative measures that do not require routine human presence (e.g., deed restrictions and land-use restrictions).

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The INL Site is expected to remain under government management and control for at least the next 100 years. After that time, the federal government is obligated to continue to manage and control areas that pose a significant health or safety risk until risk diminishes to less than threshold values. For RWMC, the 100-year scenario was modeled as starting in 2010.

net present value—predicted cost of an action if current year dollars are invested through the projected time period and discounted for inflation. Discount rates[k] used to calculate net present value are:

- Years 1–4 0.025
- Years 5–6 0.026
- Years 7–9 0.027
- Years 10–19 0.028
- Years 20+ 0.030.

Net present value is the amount of money that must be invested now in order to have the desired amount of money at a future date. Net present value accounts both for money gained from interest and for projected increase in cost because of inflation. For example, if item X was needed in 2011, currently costs (i.e., in 2007) $3 million, and is projected to cost $3.04 million in 2011, a sum of $2.7 million must be invested in 2007 (see the following table) to have $3.04 million in 2011. The sum of $2.7 million is called the net present value.

Year	Deposit ($M)	Interest ($K)	Deposit +Interest ($M)	Inflated Cost ($M)
	2.7			3.00
2007–2008		85	2.79	3.01
2008–2009		85	2.87	3.02
2009–2010		85	2.96	3.03
2010–2011		85	3.04	3.04

Alternative 1 Summary

- Environmental monitoring
- Construction timeframe: not applicable
- Net present value costs:
  - Capital cost: none
  - Operating, maintenance, and periodic cost: $16 million
  - Total: $16 million.

Three particular attributes of the SDA can be addressed by a variety of remedial methods. Each action alternative includes modules to address these elements:

- **Pretreatment for subsidence control—**Each alternative includes one of three modules evaluating process options to address subsidence to provide a stable foundation for the surface barrier.
- **Pad A—**Each alternative incorporates one of six modules to address Pad A—a unique abovegrade disposal area with an existing ROD[18]—into the comprehensive remedy.
- **Near-surface, released solvent vapors—**Each alternative incorporates one of three modules to preclude buildup of solvent vapors immediately beneath or within the surface barrier. These options minimize solvent vapors trapped in the subsurface by the surface barrier and are in addition to continued operation of the existing OCVZ system to extract and treat solvent vapors from the vadose zone. Solvent vapors trapped in the subsurface could increase concentrations reaching the aquifer.

Alternatives developed in the Feasibility Study[2] are (1) No Action; (2) Surface Barrier; (3) In Situ Grouting; (4) Partial Retrieval, Treatment, and Disposal; and (5) Full Retrieval, Treatment, and Disposal. The Preferred Alternative is Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls. Each alternative is summarized below. Summaries include costs and the common elements for a period of 100 years following completion of the engineered surface barrier described above. Both current value and ***net present value*** cost estimates are provided.

Alternative 1—No Action

Alternative 1 consists of environmental monitoring with no remediation to reduce risk. Alternative 1 cannot be selected because it does not meet threshold criteria. Therefore, it is not evaluated further as a potential remedy, but is developed as required under CERCLA and used as a basis for comparison of action alternatives.

Alternative 2—Surface Barrier

Alternative 2 would protect human health and the environment. Coupled with vadose zone vapor extraction and institutional controls, the surface barrier would be effective for all contaminants. Under this alternative, a surface barrier would be constructed to reduce infiltration through buried waste and inhibit contaminant migration to the vadose zone and aquifer. The surface barrier also would inhibit contaminant transport to the surface by plants and animals. Overall thickness of the surface barrier, coupled with long-term institutional controls, would preclude inadvertent human intrusion and prevent unacceptable exposure to plants and animals from soil.

Many surface barrier designs were examined for the SDA. Two designs were retained for evaluation: Alternative 2a—Modified RCRA Type C Surface Barrier (see Figure 13) and Alternative 2b—Evapotranspiration Surface Barrier (see Figure 14). The surface barrier would be up to 20 ft thick. Each sub-alternative includes the common elements described above. The primary difference between these alternatives is design of the surface barrier. The two sub-alternatives also incorporate differing approaches to control subsidence, address Pad A, and prevent buildup of vapors beneath the surface barrier.

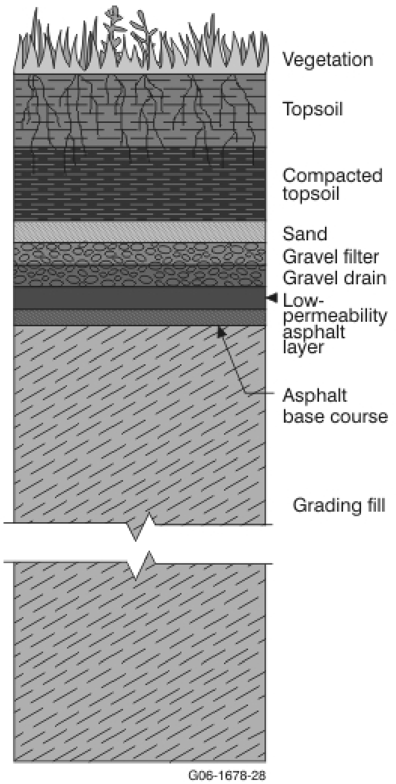

Figure 13. Cross section of a modified RCRA Type C surface barrier (Alternative 2a).

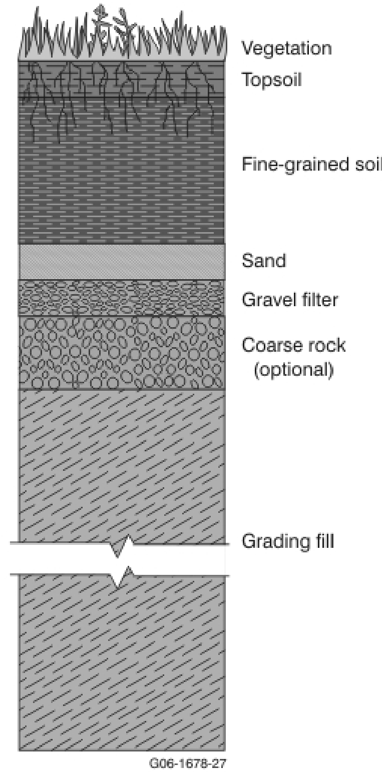

Figure 14. Cross section of a typical evapotranspiration surface barrier (Alternative 2b).

Alternative 2a—Modified RCRA Type C Surface Barrier

Alternative 2a includes construction of a modified RCRA Type C surface barrier. The surface barrier would be constructed of multiple thin and thick layers of asphalt and natural materials and covered with vegetation (see Figure 13). The design is similar to a standard RCRA[30] surface barrier used at Subtitle C-licensed disposal facilities across the country, but it incorporates a sloped, low-permeability asphalt layer near the base of the barrier to divert infiltrating water to the edges. Because the asphalt layer would be particularly susceptible to damage from subsidence, pits would be pretreated to provide a stable foundation. Pad A would be left in its current configuration, and the surface barrier would be designed to address the elevation difference. Several near-surface vapor vacuum extraction wells would be installed near high concentrations of organic waste to mitigate buildup of vapors beneath the asphalt layer. Common elements, described on page 19, are critical components included to ensure long-term performance of this alternative.

Alternative 2b—Evapotranspiration Surface Barrier

Alternative 2b includes construction of an evapotranspiration surface barrier. The surface barrier would be constructed of several layers of natural materials and covered with vegetation (see Figure 14). Unlike the modified RCRA Type C surface barrier, an evapotranspiration barrier is designed to store excess moisture until it evaporates or is absorbed by plants and transpired to the atmosphere. The evapotranspiration barrier would be less susceptible to damage from subsidence, though steps to minimize subsidence in pit areas would be included to reduce surface barrier maintenance. Waste would be removed from Pad A and transferred to the Low-Level Waste Pit (i.e., Pits 17 through 20 in Figure 3) to facilitate construction of

Alternative 2a Summary

- Incorporate Pad A as-is into the surface barrier
- Mitigate potential subsidence in pits
- Construct a modified RCRA Type C surface barrier
- Install near-surface extraction wells
- Operate the OCVZ system (~58½ years after construction) to extract and treat solvent vapors from the vadose zone.
- Establish long-term surveillance, maintenance, monitoring, and institutional controls
- Construction timeframe: 7 years
- Net present value costs:
  - Capital cost: $112 million
  - Operating, maintenance, and periodic cost: $64 million
  - Total: $176 million.

Alternative 2b Summary

- Relocate Pad A waste to the Low-Level Waste Pit
- Mitigate potential subsidence in pits
- Construct an evapotranspiration surface barrier with an active gas-collection layer
- Operate the OCVZ system (~35 years after construction) to extract and treat solvent vapors from the vadose zone
- Establish long-term surveillance, maintenance, monitoring, and institutional controls
- Construction timeframe: 10 years
- Net present value costs:
  - Capital cost: $122 million
  - Operating, maintenance, and periodic cost: $57 million
  - Total: $179 million.

the surface barrier. The surface barrier would include a layer that inhibits biotic intrusion and collects vapors. An active gas-collection system would be integrated into the evapotranspiration barrier to prevent buildup of vapors. Common elements, described on page 19, are critical components included to ensure long-term performance of this alternative.

Alternative 3 Summary

- In situ grout specified soil vaults and trench areas totaling 0.2 acres
- Retrieve Pad A waste, treat ex situ, and transfer to the Low-Level Waste Pit
- Mitigate potential subsidence in pits
- Construct an evapotranspiration surface barrier with a passive gas-collection layer
- Operate the OCVZ system (~35 years after construction) to extract and treat solvent vapors from the vadose zone
- Establish long-term surveillance, maintenance, monitoring, and institutional controls
- Construction timeframe: 10 years
- Net present value costs:
  - Capital cost: $166 million
  - Operating, maintenance, and periodic cost: $57 million
  - Total: $223 million.

Alternative 3—In Situ Grouting

Primary features of Alternative 3 are in situ grouting (see Figure 15), removing solvent vapors from the vadose zone, and controlling potential exposure to contaminants of concern through containment (i.e., source control) with an evapotranspiration surface barrier and institutional controls. Waste forms containing mobile technetium-99 and iodine-129 would be grouted in place using highly impermeable grout to reduce transport caused by infiltrating moisture. Specified soil vaults and trench areas totaling approximately 0.2 acres would be grouted. This alternative includes removing Pad A waste, stabilizing it by ex situ grouting, and disposing of it below grade within the SDA. The surface barrier would include a layer that inhibits biotic intrusion and collects vapor. Passive venting would prevent buildup of vapors beneath the surface barrier. Common elements, described on page 19, are critical components included to ensure long-term performance of this alternative.

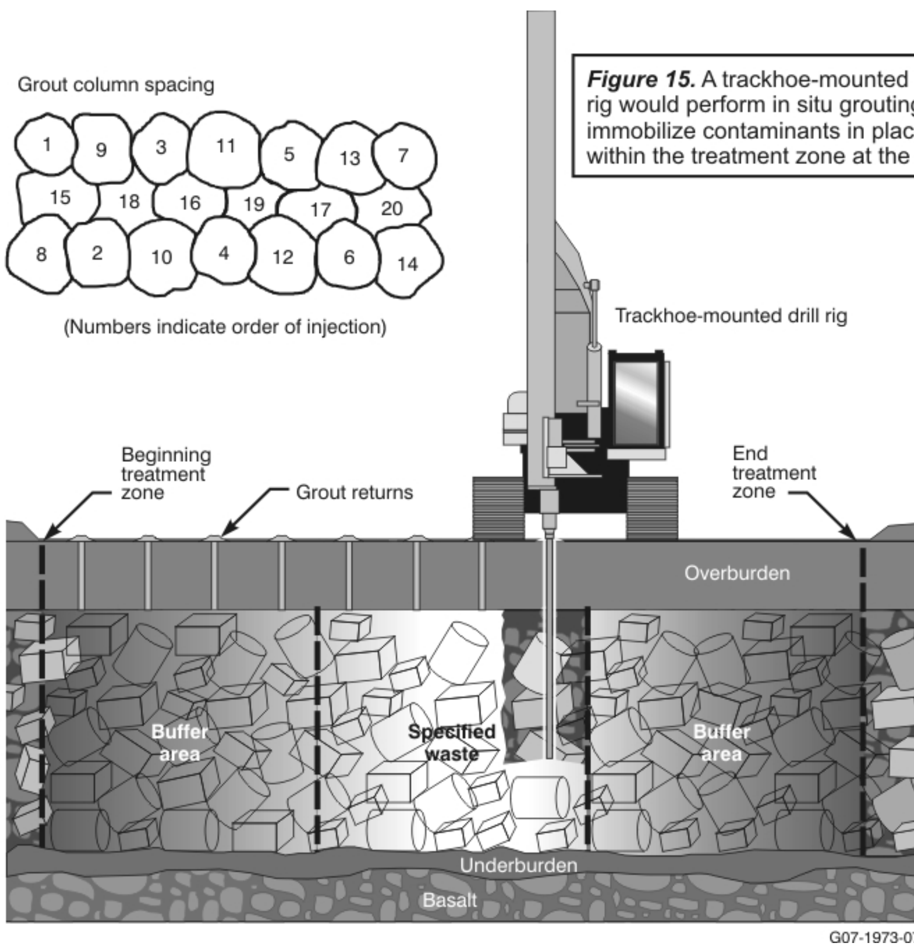

Figure 15. A trackhoe-mounted drill rig would perform in situ grouting to immobilize contaminants in place within the treatment zone at the SDA.

Alternative 4—Partial Retrieval, Treatment, and Disposal

Alternative 4 comprises two sub-alternatives: Alternative 4a—4-Acre Retrieval, Treatment, and Disposal; and Alternative 4b—2-Acre Retrieval, Treatment, and Disposal. In addition to removing solvent vapors from the vadose zone and controlling potential exposure to contaminants of concern through containment (i.e., source control) with an evapotranspiration surface barrier and institutional controls, both sub-alternatives evaluate retrieval using the targeted waste (see page 8) approach defined for the Accelerated Retrieval Projects. Targeted retrieval involves removing specified Rocky Flats Plant waste types. Retrieved transuranic waste would be processed for shipment to the Waste Isolation Pilot Plant (see Figure 16), while retrieved nontransuranic waste would be sent to an authorized facility for treatment, as necessary, and disposal at an appropriate facility in accordance with waste acceptance criteria. The primary difference between these sub-alternatives is the cumulative sizes of the pit areas that would be retrieved. Other variables between the two sub-alternatives are options for controlling subsidence in pits and addressing Pad A. In combination, the two sub-alternatives facilitate scaling up or down to various retrieval area sizes, including or excluding Pad A.

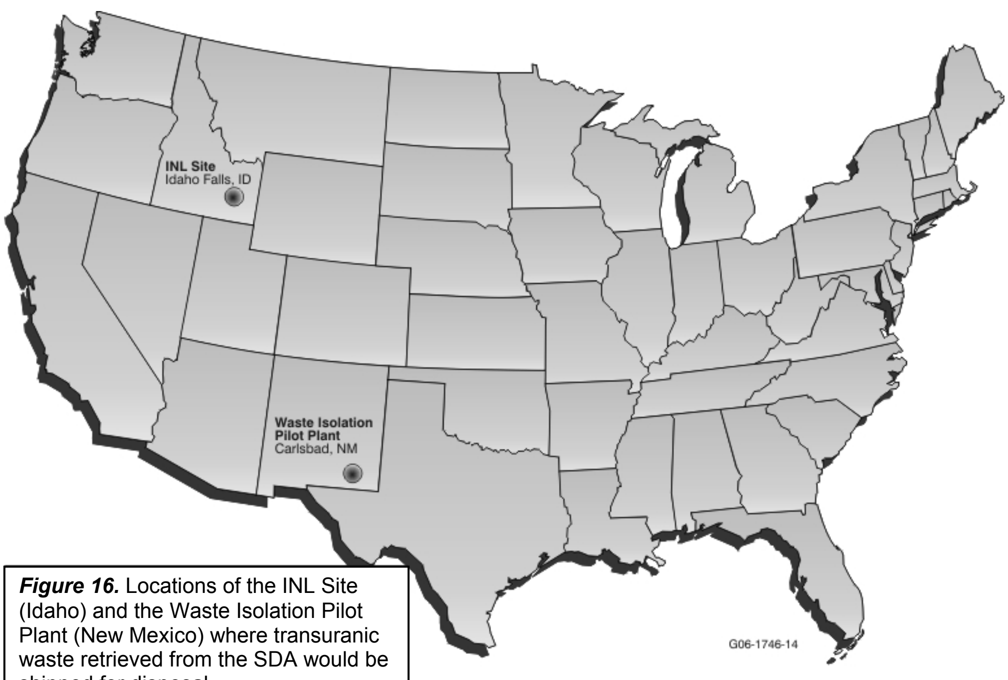

Figure 16. Locations of the INL Site (Idaho) and the Waste Isolation Pilot Plant (New Mexico) where transuranic waste retrieved from the SDA would be shipped for disposal.

Alternative 4a—4-Acre Retrieval, Treatment, and Disposal

Alternative 4a identifies pit areas totaling 4 acres for targeted waste retrieval. The Pad A option under Alternative 4a involves transferring Pad A waste to the Idaho CERCLA Disposal Facility for treatment and disposal. A layer in the surface barrier would inhibit biotic intrusion and collect vapors. Passive venting would prevent buildup of vapors beneath the surface barrier. Common elements, described on page 19, are critical components included to ensure long-term performance of this alternative.

Alternative 4a Summary

- Retrieve targeted waste from pit areas totaling 4 acres
- Retrieve Pad A waste and transfer to the Idaho CERCLA Disposal Facility for disposal
- Mitigate potential subsidence in pits
- Construct an evapotranspiration surface barrier with a passive gas-collection layer
- Operate the OCVZ system (~19 years after construction) to extract and treat solvent vapors from the vadose zone
- Establish long-term surveillance, maintenance, monitoring, and institutional controls
- Construction timeframe: 16 years
- Net present value costs:
  - Capital cost: $706 million
  - Operating, maintenance, and periodic cost: $49 million
  - Total: $756 million.

Alternative 4b Summary

- Retrieve targeted waste from pit areas totaling 2 acres
- Mitigate potential subsidence in pits and on Pad A
- Construct an evapotranspiration surface barrier with a passive gas-collection layer
- Operate the OCVZ system (~23 years after construction) to extract and treat solvent vapors from the vadose zone
- Establish long-term surveillance, maintenance, monitoring, and institutional controls
- Construction timeframe: 12 years
- Net present value costs:
  - Capital cost: $435 million
  - Operating, maintenance, and periodic cost: $51 million
  - Total: $486 million.

Alternative 5 Summary

- Retrieve all waste from the SDA
- Construct a simplified evapotranspiration surface barrier
- Establish long-term surveillance, maintenance, monitoring, and institutional controls
- Construction timeframe: 30 years (operate the OCVZ system during construction to extract and treat solvent vapors from the vadose zone)
- Net present value costs:
  - Capital cost: $8,397 million ($8.4 billion)
  - Operating, maintenance, and periodic cost: $37 million
  - Total: $8,434 million ($8.4 billion).

Alternative 4b—2-Acre Retrieval, Treatment, and Disposal

Alternative 4b identifies pit areas totaling 2 acres for targeted waste retrieval. These 2 acres could be a subset of areas totaling 4 acres, described in Alternative 4a, because experience from the Accelerated Retrieval Project indicates that targeted waste can be successfully located with an improved level of confidence and precision. The surface barrier would include a layer that inhibits biotic intrusion and collects vapors. Passive venting would prevent buildup of vapors beneath the surface barrier. Common elements, described on page 19, are critical components included to ensure long-term performance of this alternative.

Alternative 5—Full Retrieval, Treatment, and Disposal

For Alternative 5, all waste within the SDA (approximately 35 acres) would be retrieved and shipped elsewhere. Additional features include removing solvent vapors from the vadose zone and controlling potential exposure to contaminants of concern through containment with a simplified evapotranspiration surface barrier and institutional controls. Transuranic waste would be processed for shipment to the Waste Isolation Pilot Plant (see Figure 17), while nontransuranic waste would be sent to an authorized facility for treatment, as necessary, and disposed of in accordance with waste acceptance criteria. Some of the waste would require remote-handling techniques because of high exposure rates. Waste with no current disposal path would be stored temporarily in a new facility near the SDA for up to 20 years, pending development of an appropriate disposal facility. Additional actions would include backfilling and compacting excavated areas and finishing with a graded layer of topsoil. Topsoil, grading fill, backfill, and underlying basalt would restore characteristics of undisturbed soil, which is the purpose of an evapotranspiration surface barrier. The surface barrier would reduce infiltration, thus inhibiting further transport of remaining contaminants that may have migrated to the vadose zone. A biotic barrier and gas-venting layer would not be required because all waste would be removed, though operation of the vadose zone vapor vacuum extraction system would continue until remediation goals were achieved. Common elements, described on page 19, are critical components included to ensure long-term performance of this alternative.

Figure 17. Transporting waste to the Waste Isolation Pilot Plant.

☑ Supplemental Analysis: Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls

The Preferred Alternative combines targeted waste retrieval from 4.8 acres of pit areas, as currently proposed by DOE (see State Acceptance on page 40), with in situ grouting, vadose zone vapor vacuum extraction and treatment, evapotranspiration surface barrier, and long-term institutional controls (see Figure 18). As currently proposed by DOE (see State Acceptance on page 40), 4.8 acres of pit areas would include some portion of Pit 9 and the 0.8 acres addressed by Accelerated Retrieval Projects I and II. Retrieval of targeted waste from 4.8 acres of pit areas within RWMC optimizes removal of source material with high solvent and transuranic content for off-INL Site disposal. The Preferred Alternative strikes a balance between waste retrieval, expediting installation of a surface barrier, worker safety, and cost. EPA supports taking this balanced approach on cleanup.

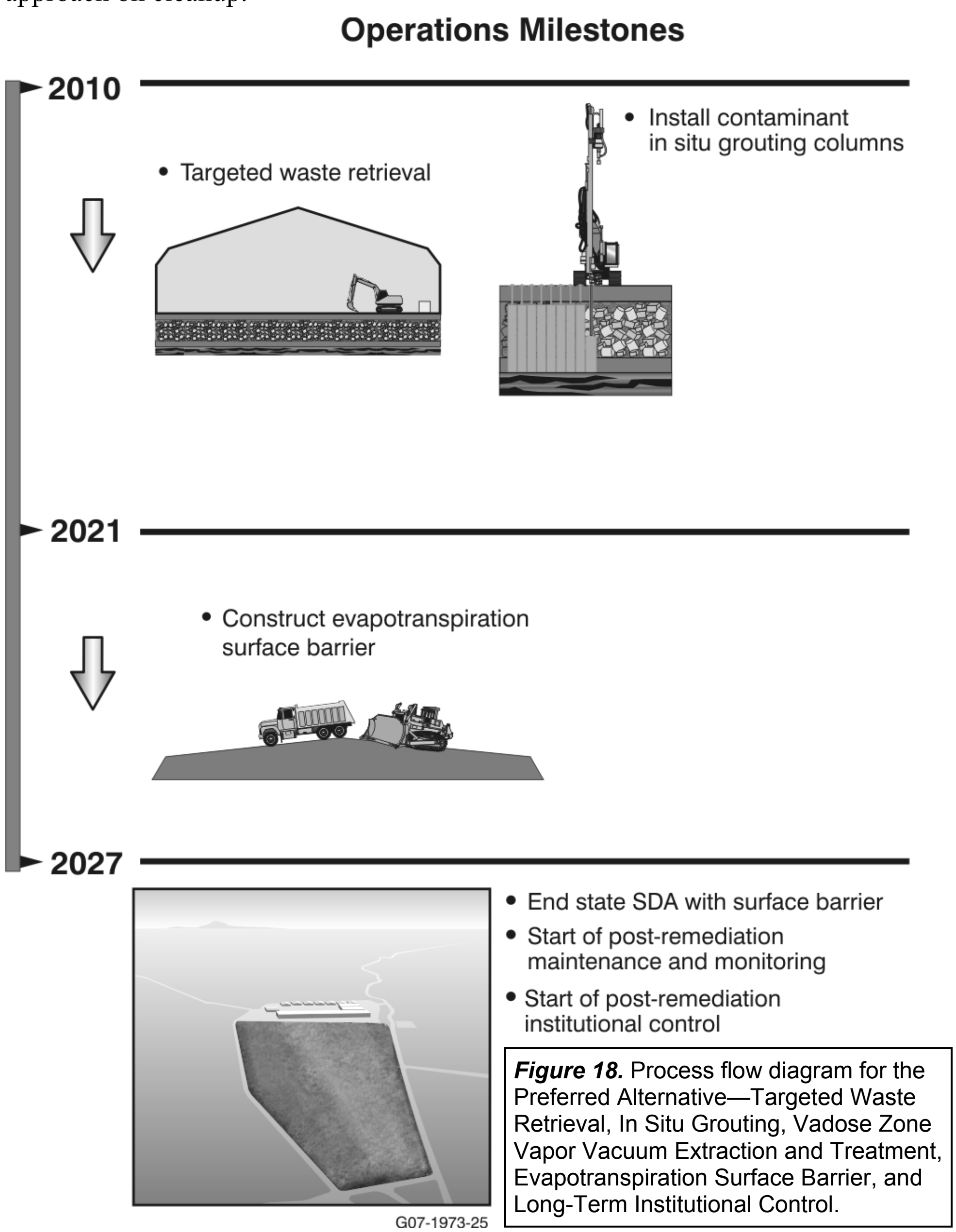

Figure 18. Process flow diagram for the Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Control.

☑ Preferred Alternative Summary

- Retrieve targeted waste from 4.8 acres of pit areas, as currently proposed by DOE (see State Acceptance on page 40), including a portion of Pit 9 and 0.8 acres addressed by Accelerated Retrieval Projects I and II
- In situ grout specified soil vaults and trench areas totaling 0.2 acres
- Mitigate potential subsidence of pits and Pad A using a combination of methods to be determined during remedial design
- Construct an evapotranspiration surface barrier with a passive gas-collection layer
- Operate the OCVZ system (~19 years after construction) to extract and treat solvent vapors from the vadose zone
- Establish and maintain long-term surveillance, maintenance, monitoring, and institutional controls
- Construction timeframe: 18 years
- Net present value costs:
  - Capital cost: $686 million
  - Operating, maintenance, and periodic cost: $48 million
  - Total: $734 million.

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Though Pad A contains uranium, based on the Remedial Investigation and Baseline Risk Assessment,[f] the Agencies conclude that uranium on Pad A is not a worthwhile stand-alone target for retrieval. Targeted waste retrieval is based on maximizing removal of solvents and transuranic waste, though the Agencies are taking the opportunity to remove uranium that is collocated with these waste forms to address uncertainty in the risk assessment. Therefore, roaster oxide (uranium) was identified as targeted waste in the pits, but is not identified for retrieval on Pad A.

The same targeted waste retrieval module analyzed for Alternative 4, scaled for the amount of acreage, would be used to retrieve and manage targeted waste for the Preferred Alternative. The in situ grouting module analyzed for Alternative 3 is included in the Preferred Alternative to immobilize technetium-99 and iodine-129. Specified soil vaults and trench areas totaling approximately 0.2 acres would be grouted. Waste on Pad A would be left in place. Potential subsidence of pits and Pad A would be addressed—before constructing an evapotranspiration surface barrier—using a combination of methods to be determined during remedial design. A layer in the surface barrier would inhibit biotic intrusion and collect vapor. Passive venting would prevent buildup of vapors beneath the surface barrier. Common elements, described on page 19, are critical components included to ensure long-term performance of this alternative.

The Preferred Alternative is an optimized combination of modules that were fully evaluated in the Feasibility Study.[2] The Preferred Alternative does not introduce new elements. The following discussion supplements the Feasibility Study[2] with analysis of the specific combination of modules in the Preferred Alternative.

Overall Protection of Human Health and the Environment—The Preferred Alternative would be fully protective of human health and the environment. Upon completion of the surface barrier in the year 2027, this alternative would achieve all remedial action objectives, primarily by continued operation of the OCVZ system to extract and treat solvent vapors from the vadose zone, an evapotranspiration surface barrier, and long-term surveillance, maintenance, monitoring, and institutional controls. Overall thickness of the surface barrier, coupled with long-term institutional controls, would preclude inadvertent human intrusion. Targeted waste retrieval from 4.8 acres of pit areas, as currently proposed by DOE (see State Acceptance on page 40), including some portion of Pit 9 and the 0.8 acres addressed by Accelerated Retrieval Projects I and II, and encapsulating specified waste in soil vault and trench areas totaling 0.2 acres would provide additional protection.

Compliance with Applicable or Relevant and Appropriate Requirements—The Preferred Alternative would comply with associated ARARs and is, therefore, eligible for selection based on this threshold criterion. It addresses ARARs relating to radiation protection, airborne concentrations, groundwater quality, MCLs, archeological artifacts, and other chemical-, action-, and location-specific regulations.

Long-Term Effectiveness and Permanence—Combined elements of the Preferred Alternative (e.g., targeted waste removal, in situ grouting, continued operation of the OCVZ system, an evapotranspiration surface barrier, and long-term surveillance, maintenance, monitoring, and institutional controls) would inhibit exposure of humans, plants, and animals to contaminants at the surface and would reduce infiltration to inhibit contaminant migration into the vadose zone and aquifer.

Targeted waste retrieval would provide additional protection by removing contaminants of concern. Targeted waste contains both surface exposure contaminants of concern (e.g., transuranics) and groundwater contaminants of concern (e.g., carbon tetrachloride, tetrachloroethylene, and trichloroethylene).

In situ grouting would enhance protection by immobilizing releasable iodine-129 and technetium-99 in soil vault and trench areas totaling 0.2 acres. This treatment would inhibit leaching from grouted waste forms, reducing transport of contaminants into the vadose zone and aquifer.

The surface barrier would preclude direct exposure to buried waste by human or ecological receptors through surface exposure pathways. Overall thickness of the surface barrier, coupled with long-term institutional controls, would preclude inadvertent human intrusion. Groundwater-pathway risk would be mitigated by combined effects of the OCVZ vapor vacuum extraction system and low permeability of the surface barrier. All remedial elements included in the Preferred Alternative, with the exception of OCVZ operations, would be permanent and expected to remain functional indefinitely.

The following subsections discuss the magnitude of ***residual risk*** and reliability of long-term controls.

Magnitude of Residual Risk—Based on qualitative analysis of the expected performance of the surface barrier, all surface exposure pathways would be interrupted, satisfying all remedial action objectives at the surface for both human and ecological receptors. Long-term modeling indicates the effectiveness of the Preferred Alternative in retarding migration of contaminants of concern remaining in the SDA. Results show that this alternative would effectively reduce contaminant migration and cumulative groundwater pathway risk.

The Preferred Alternative also would prevent groundwater concentrations from exceeding MCLs. Monitoring would be established to address uncertainties, especially for nitrate and solvents.

Reliability of Long-Term Controls—Some level of residual risk would remain indefinitely after implementation of this remedial alternative. However, the magnitude of risk from combined radiological and chemical hazards would be within ***EPA's risk range*** of 10^{-6} to 10^{-4}. Reliability depends on long-term durability of the surface barrier; long-term monitoring and management would be required to maintain its effectiveness.

In general, evapotranspiration surface barriers are not as susceptible to damage by differential settlement as are barriers that incorporate a continuous drainage layer.[31] However, deep subsidence events (e.g., collapse of a large waste box) could disrupt the contour of the barrier surface and cause increased infiltration. Therefore, this alternative includes pretreatment of Pad A and pit areas to minimize future subsidence. A combination of methods, to be determined during remedial design, will be applied.

Overall thickness of material above the biointrusion layer for this alternative decreases the likelihood of plant roots and burrowing animals reaching buried waste. The potential for biotic intrusion is further reduced by a coarse rock layer, which also would reduce potential inhalation exposures (e.g., solvent vapors) for animals burrowing in upper portions of the surface barrier.

Long-term management and 5-year reviews under CERCLA would be required to ensure continued performance of the remedy. Environmental monitoring would include routinely collecting and analyzing multimedia samples for contaminants of concern. The SDA would be restricted to industrial land use because of residual contamination. Surveillance and maintenance would be conducted to identify and repair differential settlement, inadequate drainage, or other observable degradation of the surface barrier. Institutional controls and long-term activities would be managed by a federal agency (e.g., DOE or the Bureau of Land Management) to ensure that effective protection is maintained.

Reduction of Toxicity, Mobility, or Volume Through Treatment—The Preferred Alternative would treat small, specified areas within the waste zone using in situ grouting to reduce mobility of releasable technetium-99 and iodine-129. Treatment of specified disposal areas would immobilize approximately 50% of the technetium-99 that might readily migrate from source materials (i.e., surface-contaminated debris, resins, and ***fuel examination waste***).

residual risk—risk remaining after all aspects of cleanup are complete.

EPA's risk range—the range of carcinogenic risk is 10^{-6} to 10^{-4}, encompassing all values from 1×10^{-6} to 9×10^{-4} (i.e., 0.000001 to 0.0009). See more information about risk threshold values on page 2.

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conversions—

Probability	Exponential Notation
1 in 1 (certain)	1E+0
1 in 10	1E-01
1 in 100	1E-02
1 in 1,000	1E-03
1 in 10,000	**1E-04**
1 in 100,000	1E-05
1 in 1,000,000 (1 in 1 million)	**1E-06**
1 in 10,000,000 (1 in 10 million)	1E-07

Probability	Scientific Notation
1 in 1 (certain)	1×10^{0}
1 in 10	1×10^{-1}
1 in 100	1×10^{-2}
1 in 1,000	1×10^{-3}
1 in 10,000	$\mathbf{1 \times 10^{-4}}$
1 in 100,000	1×10^{-5}
1 in 1,000,000 (1 in 1 million)	$\mathbf{1 \times 10^{-6}}$
1 in 10,000,000 (1 in 10 million)	1×10^{-7}

Probability	Decimal Notation
1 in 1 (certain)	1
1 in 10	0.1
1 in 100	0.01
1 in 1,000	0.001
1 in 10,000	**0.0001**
1 in 100,000	0.00001
1 in 1,000,000 (1 in 1 million)	**0.000001**
1 in 10,000,000 (1 in 10 million)	0.0000001

fuel examination waste—residuals generated during destructive interrogation of test specimens used to evaluate material properties of reactor components.

Approximately 0.2 acres (1,000 linear feet) of trench and soil vaults would be grouted from the underlying basalt to within 2 ft of the ground surface. In situ grouting substantially increases the volume of contaminated media, but produces a cohesive waste form in the subsurface that would be resistant to leaching.

Treatment, as traditionally defined, is not a primary element of targeted waste retrieval, though minor treatment elements are included for targeted uranium waste. Uranium, which is nontransuranic, would be retrieved and sent to an authorized facility for treatment, as necessary, and disposed of in accordance with waste acceptance criteria. In addition, treatment may be required, based on results from gas-generation testing, to satisfy shipping criteria for some retrieved waste. The Preferred Alternative also would remove a substantial amount of waste contaminated with solvents and transuranics, repackage it, and dispose of it at the Waste Isolation Pilot Plant. The Waste Isolation Pilot Plant is a deep geologic repository that isolates waste from the environment.

The Preferred Alternative also includes continued operation of the OCVZ system, which extracts vapor from the vadose zone. Toxins in the vapor (e.g., carbon tetrachloride) are thermally oxidized and destroyed. Toxicity is irreversibly reduced by thermal oxidization.

Though treatment is not a component of the surface barrier, contaminant mobility to the underlying aquifer would be mitigated by inhibiting infiltration through the waste. The gas-collection and biointrusion layer would direct vapor away from the surface soil and prevent plant roots and burrowing animals from transporting contamination to the surface.

Short-Term Effectiveness—Potential risk to the public and workers during implementation of remedial components included in the Preferred Alternative would be equivalent to the combined risks for modules from Alternatives 3 and 4a. In total, risks would be moderate when controls typical of DOE waste management operations are used.

Previous operating experience suggests that all aspects of remedial action, including in situ grouting and targeted waste retrieval, could be conducted without exposing members of the public to significant amounts of hazardous or radioactive contaminants. Approximately four public injuries could be incurred in an accident involving transport of construction materials to the SDA over public thoroughfares. However, engineering and administrative controls would minimize potential short-term risk to the public (e.g., transportation schedules and routes would be designed to minimize interference with public traffic patterns). A fatality involving a member of the public during transport of construction materials for the Preferred Alternative would be highly unlikely.

Short-term risk to workers would be moderate and could be readily mitigated. A maximally exposed remediation worker would incur a moderate increase in lifetime cancer risk relative to a worker involved in routine construction activities in the SDA. Most cancer risk would be associated with handling waste (e.g., retrieval and packaging) during retrieval of subgrade pit areas. Chemical hazards for nearby workers not directly involved with remedial action would be moderately low. Workers implementing remedial components included in the Preferred Alternative could incur as many as 57 recordable industrial accidents. A worker fatality would be highly unlikely during implementation of this alternative.

Overall risk to the environment during implementation of the Preferred Alternative would remain at or below levels identified in the baseline risk assessment, with significant impacts to the habitat, plants, and animals immediately surrounding the SDA caused by noise, dust, and physical disturbance.

Fencing around the construction perimeter is a component of this alternative and would continue to reduce, although not entirely exclude, access to the active area by larger animals. Remediation activities would be confined largely to the current footprint of the SDA.

All components of the Preferred Alternative, including construction of the evapotranspiration surface barrier, would be completed within 18 years of project inception (see Figure 19). Overall, short-term effectiveness of this alternative is moderate.

Implementability—All remedial components included in the Preferred Alternative are well understood and commercially available. Methods for excavating pit areas are based on those currently used by the Accelerated Retrieval Project. In situ grouting has been used previously in the SDA to encapsulate irradiated beryllium reflector blocks using paraffin grout.[7] In situ grouting equipment using cement grout would be even more reliable because civil applications routinely use cement grouts. Additional design and demonstration of operational readiness may be required before in situ treatment of trenches and soil vaults with cement grout; however, using cement grout would provide adequate contamination control, and volumes of secondary waste (e.g., grout spoils or returns) would be small. Methods for constructing the evapotranspiration surface barrier are commonly used in civil engineering practice.

Initially, the Accelerated Retrieval Project encountered some delays caused by the presence of ***roaster oxides***. The targeted waste approach has matured through experience at the Accelerated Retrieval Project. Improved equipment and procedures are in place to protect workers and the environment. Further complications are not expected for the Preferred Alternative.

Experience with in situ grouting in the SDA suggests that this remedial component is reliable. Exact locations of specified waste disposals would be validated using geophysical methods before grouting. In addition, procedures would be needed to address large, dense objects that could result in probe refusal before reaching the underlying basalt.

Currently, the Waste Isolation Pilot Plant is the only facility that can receive transuranic waste for disposal. The volume of waste containerized by the Preferred Alternative and shipped to the Waste Isolation Pilot Plant is projected to be within the existing capacity of this disposal facility.

If portions of some targeted waste forms (i.e., Series 741 sludge, Series 743 sludge, graphite, filters, and roaster oxides) do not contain transuranic radionuclides (i.e., cannot be sent to the Waste Isolation Pilot Plant), treatment for solvent vapors may be applicable at an appropriate treatment and disposal facility to satisfy land disposal requirements. Acceptance of this waste type depends on the capacity and treatment process available at the treatment and disposal facility.

Equipment and specialists required for SDA waste retrieval, in situ grouting, and construction of an evapotranspiration surface barrier are available at the INL Site and within the commercial sector, and these technologies have been applied either at the INL Site or within the DOE complex. In addition, these technologies are sufficiently developed to allow full-scale deployment within the SDA.

Based on previous responses to requests for proposals, several qualified vendors would bid to retrieve waste, deploy in situ grouting, and address subsidence of Pad A and pit areas in the SDA. Several commercial firms likely would respond to requests for proposals to design and construct an evapotranspiration surface barrier. Some design and testing may be required to develop an optimal strategy for addressing subsidence of Pad A and pit areas.

roaster oxides—Processes at Rocky Flats Plant produced chips of uranium metal (i.e., uranium oxide). Because these chips could spontaneously ignite, they were heated (i.e., roasted) to burn off the uranium oxide and make the material safe for shipping and handling. Batches of the resulting roaster oxides sometimes contained small amounts of uranium oxide that did not ignite during treatment. When these materials are exposed during retrieval at the Accelerated Retrieval Project, they react as expected, spontaneously igniting and causing small, localized flares of short duration.

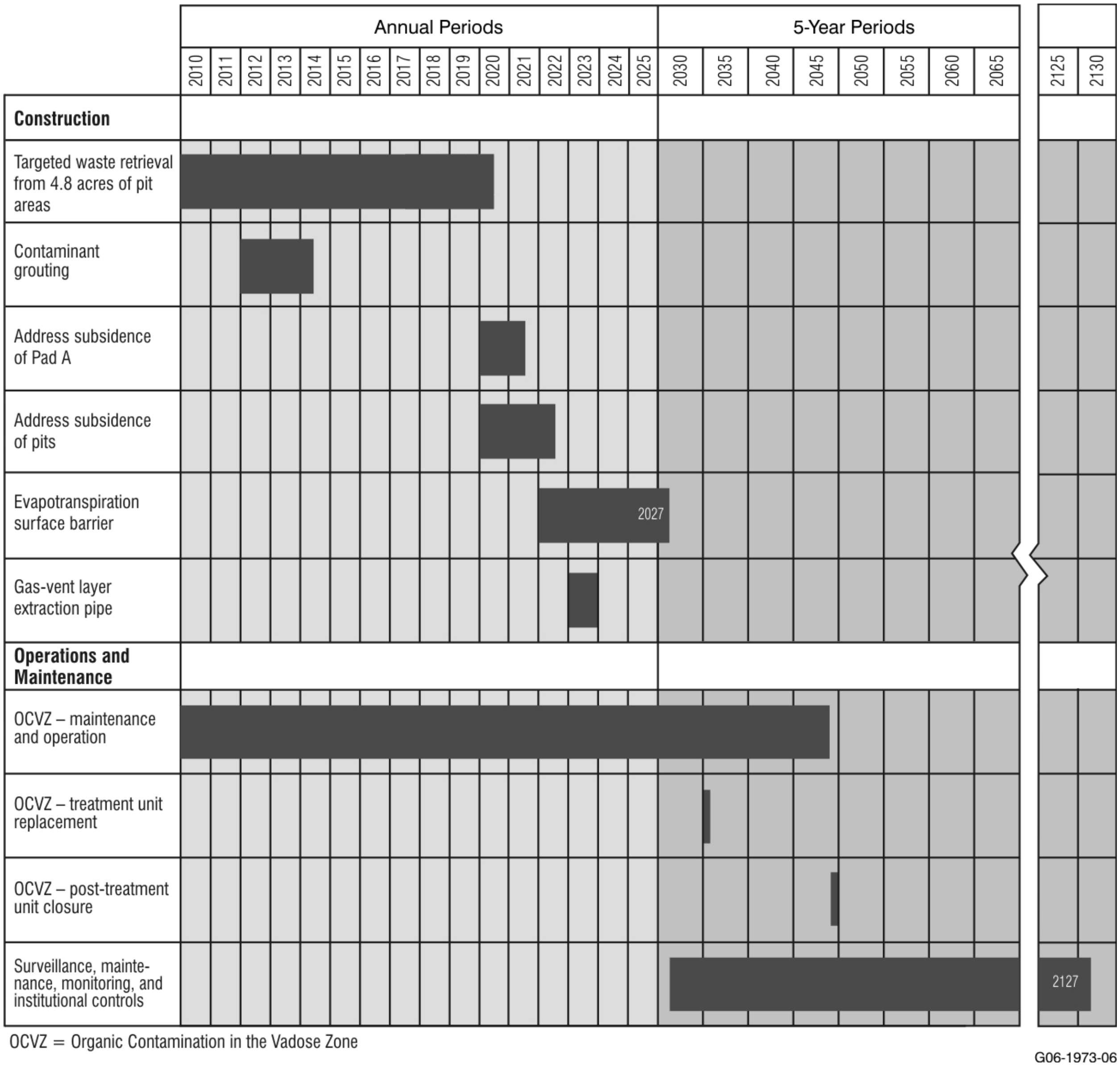


Figure 19. Summary schedule for the Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls.

Cost

Table 5 provides the cost summary for the Preferred Alternative. Capital, operations and maintenance, and periodic costs are provided as current value and net present value. The base year in calculating net present value is 2006, with construction of the remedy beginning in the year 2010 and ending in 2027. Estimates include costs for 100 years of surveillance, maintenance, monitoring, and institutional controls following construction.

Table 5. Cost estimates for the Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls.

Activity	Current Value ($M)	Net Present Value ($M-2006)
Capital costs		
4.8-acre excavation of pit areas, as currently proposed by DOE (see State Acceptance on page 40), including some portion of Pit 9, the 0.8 acres addressed by Accelerated Retrieval Projects I and II, and all additional retrievals (2010 through 2018)	803.2	616.9
Contaminant grouting (2012 through 2014)	11.6	9.3
Address subsidence of Pad A (2018 through 2019)	3.3	2.2
Address subsidence of pits (2018 through 2020)	5.5	3.6
Containment with evapotranspiration surface barrier with biotic barrier and vented gas transport layer (2020 through 2027)	94.0	52.7
Install gas vent layer extraction pipe within surface barrier (2022)	0.5	0.3
Replace OCVZ treatment units every 20 years (2030)	2.3	1.1
Total capital cost	**920.4**	**686.1**
Operations and maintenance costs		
OCVZ operations, maintenance, and monitoring (2010 through 2045)	60.1	33.1
Surface barrier maintenance, environmental monitoring, project management, and technical support (2027 through 2127)	86.6	14.3
Total operations and maintenance cost	**146.7**	**47.4**
Periodic costs		
Prepare final remedial action report, annual summary reports, 5-year reviews, and final operations and maintenance report (2027)	5.2	0.8
Total periodic cost	**5.2**	**0.8**
Total cost	**1,072.3**	**734.3**

Alternatives:

1. No Action
2. Surface Barrier
   2a—Modified RCRA Type C Surface Barrier
   2b—Evapotranspiration Surface Barrier
3. In Situ Grouting
4. Partial Retrieval, Treatment, and Disposal
   4a—4-Acre Retrieval, Treatment, and Disposal
   4b—2-Acre Retrieval, Treatment, and Disposal
5. Full Retrieval, Treatment, and Disposal

☑ Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls.

All alternatives, except No Action, include an engineered surface barrier, continued operation of the OCVZ system to extract and treat solvent vapors from the vadose zone, and long-term surveillance, maintenance, monitoring, and institutional controls.

EVALUATION AND COMPARISON OF ALTERNATIVES

This section compares the performance of action alternatives relative to CERCLA evaluation criteria. Alternative 1 (No Action), comprising environmental monitoring with no other steps to reduce exposure, does not satisfy threshold criteria. It does not provide overall protection or satisfy ARARs. Over time, plants and animals would transport contaminants to the surface, resulting in contaminant concentrations in surface soil that could exceed risk thresholds. Concurrently, moisture would continue to infiltrate through buried waste, resulting in contaminant concentrations in groundwater that could exceed risk thresholds.

Overall Protection of Human Health and the Environment

All action alternatives would provide adequate and relatively equivalent protection and would satisfy this threshold criterion, primarily because all action alternatives include (1) a surface barrier and (2) extraction of solvent vapors from the vadose zone. Overall thickness of the surface barrier, coupled with long-term institutional controls, would preclude inadvertent human intrusion and prevent unacceptable exposure to biota from soil. The surface barrier would inhibit transport of contaminants to the surface by plants and animals and reduce infiltration to inhibit migration of contaminants of concern into the vadose zone and underlying aquifer. Continued operation of the OCVZ system would collect vadose zone vapors to reduce transport of solvents to the aquifer.

Compliance with Applicable or Relevant and Appropriate Requirements

All action alternatives would comply with ARARs and would, therefore, be eligible for selection based on this threshold criterion. Each alternative would comply with ARARs relating to radiation protection, airborne concentrations, groundwater quality, MCLs, archeological artifacts, and other chemical-, action-, and location-specific regulations.

Long-Term Effectiveness and Permanence

Evaluation of alternatives under this criterion addresses the anticipated risk remaining after remedial actions are complete (i.e., after construction of the final surface barrier). This criterion highlights the extent and effectiveness of controls that may be required to manage residual risk after construction is complete. The main considerations are magnitude of residual risk and adequacy and reliability of controls.

Long-term effectiveness is qualitatively evaluated for human-health surface exposure pathways and ecological receptors. This approach is adopted because each action alternative includes an engineered surface barrier that inhibits biotic intrusion and subsequent contaminant transport to the surface, thus interrupting surface exposure pathways for all receptors. Overall thickness of the surface barrier, coupled with long-term institutional controls, would preclude inadvertent human intrusion. As a result, effectiveness in addressing surface exposure pathways is not a discriminating factor among alternatives.

Conversely, long-term effectiveness relating to groundwater is quantitatively evaluated. Estimates of contaminant concentrations in the aquifer were modeled for each alternative. Resultant concentrations are addressed in two ways: (1) they are assessed for risk and compared to risk thresholds and remedial action objectives, and (2) they are compared directly to MCLs. The magnitude of residual concentrations and risk are dominating factors in assessing long-term effectiveness for groundwater.

Magnitude of Residual Risk—The Feasibility Study[2] described residual risk for three timeframes: 100, 1,000, and 10,000 years from year 2010. Groundwater ingestion risk over 1,000 years was evaluated for a hypothetical resident living next to the SDA. All action alternatives provide essentially the same level of protection as the Preferred Alternative, with slightly better long-term performance for Alternative 5 in the distant future (i.e., after 500 years).

As modeled (instantaneous remediation in year 2010), all action alternatives satisfy remedial action objectives by reducing cumulative risk to less than 1 in 10,000 by the end of the 100-year hypothetical institutional control period (year 2110). However, modeling instantaneous remediation does not account for time required to implement each alternative. In reality, alternatives that require less time to implement reduce the amount of contamination that could accumulate in the vadose zone and potentially reach the aquifer. Thus, Alternative 2 (Surface Barrier) would perform slightly better within 100 years because it would require the least amount of time to implement. More time would be required for Alternative 3 (In Situ Grouting), Alternative 4 (Partial Retrieval, Treatment, and Disposal), and the Preferred Alternative (Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls), while substantially more time would be required for Alternative 5 (Full Retrieval, Treatment, and Disposal).

Results for the 1,000-year timeframe are less sensitive to implementation periods for the respective alternatives. All action alternatives would satisfy remedial action objectives by the end of 100 years and would continue to reduce risk at a roughly equivalent rate until about halfway through the 1,000-year period, when Alternative 5 begins to slightly out-perform other alternatives.

Risk continues to diminish in the 10,000-year timeframe, and any initial sensitivity to implementation timeframes is no longer significant.

Results over time are similar for the cumulative hazard index, though the slight advantage Alternative 5 has over other alternatives is less pronounced because the hazard index is associated primarily with chemicals, while risk is dominated by radionuclides. Chemicals identified as contaminants of concern for Waste Area Group 7 (see Table 3) are not as persistent in the environment as radionuclides.

Adequacy and Reliability of Controls—In terms of adequacy and reliability of controls, all action alternatives are nearly equivalent. Alternative 2a would incorporate Pad A into a surface barrier without addressing its potential subsidence; therefore, an increased level of maintenance to ensure surface barrier integrity could be required for some years until subsidence no longer occurred on Pad A.

Long-term surveillance, maintenance, monitoring, and institutional controls would be required for all action alternatives. Control would be required indefinitely (i.e., until discontinued through the CERCLA 5-year review process), involving a combination of active and passive measures to protect human health and the environment. Alternative 5 provides an advantage in terms of adequacy and reliability of controls because all buried waste would be gone; however, the site still would not qualify for unrestricted land use because of concentrations that would have migrated into the vadose zone. Therefore, institutional controls would be required for Alternative 5 as for the other action alternatives.

Alternatives:

1. No Action
2. Surface Barrier
   2a—Modified RCRA Type C Surface Barrier
   2b—Evapotranspiration Surface Barrier
3. In Situ Grouting
4. Partial Retrieval, Treatment, and Disposal
   4a—4-Acre Retrieval, Treatment, and Disposal
   4b—2-Acre Retrieval, Treatment, and Disposal
5. Full Retrieval, Treatment, and Disposal

☑ Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls.

All alternatives, except No Action, include an engineered surface barrier, continued operation of the OCVZ system to extract and treat solvent vapors from the vadose zone, and long-term surveillance, maintenance, monitoring, and institutional controls.

Reduction of Toxicity, Mobility, or Volume through Treatment

This evaluation criterion addresses the statutory preference for actions that incorporate treatment technologies, as their principal element, that permanently and significantly reduce toxicity, mobility, or volume of hazardous substances. This preference is satisfied when treatment is used to reduce principal threats by destroying toxic contaminants, reducing total mass of toxic contaminants, irreversibly reducing contaminant mobility, or reducing total volume of contaminated media. The SDA does not contain any principal threat waste (i.e., source materials containing liquids or highly mobile materials posing a risk potential of 10 in 10,000[32]). Waste types that contain solvents (e.g., carbon tetrachloride, tetrachloroethylene, and trichloroethylene) comprise the only potential principal threat waste. Though these contaminants are mobile, toxic, and affect the aquifer, risk from solvents is less than 10 in 10,000 (see Table 3) and solvent vapors already are being destroyed through treatment by the OCVZ system. Because continued operation of the OCVZ system to collect and treat solvent vapors is a component of each action alternative, treatment of (potential) principal threat waste is not a discriminating factor in the relative comparison.

Each action alternative employs a surface barrier to reduce infiltration and thermal treatment by the OCVZ system to destroy solvent vapors extracted from the vadose zone. The surface barrier would inhibit migration of contaminants by reducing the amount of water that infiltrates into the waste, but would not employ treatment as a principal element. Thermal treatment is an important element in reducing toxicity, mobility, and volume of solvent vapors collected from the vadose zone; however, it does not address the source of contamination (i.e., Series 743 sludge) that remains in the buried waste. Because each action alternative includes a surface barrier and continued operation of the OCVZ system to collect and treat solvent vapors from the vadose zone, these components do not offer any discrimination between alternatives.

Alternative 5 and the Preferred Alternative rank high for this criterion. Alternative 5 ranks high because treatments that may be required to meet waste acceptance criteria for treatment, storage, and disposal facilities outside the SDA would be applied. The Preferred Alternative ranks high because it includes both in situ grouting (as described for Alternative 3) and treatment of targeted uranium waste (as described for Alternative 4). Alternatives 3 and 4 rank slightly lower for this criterion. Alternative 3 treats technetium-99 and collocated iodine-129 waste forms by grouting, to inhibit transport into the vadose zone and aquifer. Alternative 3 also includes retrieval and ex situ grouting of Pad A waste. Alternative 4 also incorporates limited treatment of targeted uranium waste and other waste forms that must be treated to satisfy waste acceptance criteria. Alternative 2 ranks lowest because it applies no treatment other than continued operation of the OCVZ system.

Short-Term Effectiveness

This evaluation criterion addresses risk incurred during construction and implementation of a remedy. Alternatives are evaluated in terms of hazard to remediation workers, collocated workers, and members of the public. Environmental impacts also are considered. Types of risk that can be incurred include exposures to chemicals and radionuclides, typical construction hazards, and transportation. Transportation accidents include shipping construction material to the SDA from sources within and outside of the INL Site. For those alternatives involving retrieval (i.e., Alternatives 4, 5, and the Preferred Alternative), risk associated with transport of waste outside the INL Site is incurred by the receiving facility (i.e., the Waste Isolation Pilot Plant). Though waste transport would pose risk, that risk is not double-counted for OU 7-13/14.

In general, short-term effectiveness diminishes with increasing complexity of the alternative and the amount of time required for implementation. Figure 20 illustrates approximate timeframes required to achieve remedial action objective. Completing surface barrier construction achieves remedial action objectives for each alternative. Postconstruction operation and maintenance of the OCVZ system are not elements that affect short-term effectiveness.

Alternative 2 performs best in terms of this criterion. Though some element of risk to workers would be associated with surface barrier construction, such risks include routine industrial hazards that could be readily mitigated through engineering and administrative controls. Effects on collocated workers, the environment, and members of the public would be minimal. Alternative 2a does not include retrieval of Pad A waste, so its short-term effectiveness is slightly better than Alternative 2b. Installation of additional near-surface vapor vacuum extraction wells under Alternative 2a involves standard construction techniques that would not substantially influence short-term effectiveness. Implementation timeframes are 7 and 10 years for Alternatives 2a and 2b, respectively. These relatively short implementation periods also reduce the probability that a serious accident would occur.

Alternative 3 is next best. Elements of risk associated with surface barrier construction, Pad A retrieval, and subsidence control for pits are the same as for Alternative 2. A slight amount of additional risk would be incurred as a consequence of additional waste handling required to transport and treat Pad A waste and to deploy in situ grouting in highly contaminated areas. Experience gained by in situ grouting of beryllium blocks in the SDA would reduce risk associated with grouting. Risk would be limited to remediation workers. The implementation timeframe for Alternative 3 is 10 years, the same as for Alternative 2b. Implementation timeframes for Alternatives 2b and 3 are 3 years longer than for Alternative 2a because of Pad A waste retrieval.

Short-term risk associated with Alternative 4 shows a moderate increase compared to Alternative 3. In general, Alternative 4 is more complex and would require longer implementation times, though engineering and administrative controls could mitigate most risk associated with this alternative. The primary feature that increases risk is potential exposure to contaminants during retrieval and handling of buried waste. Because waste would be disturbed, some potential for airborne release would be incurred, with moderate risk to remediation workers and a slight increase in risk to collocated workers and members of the public. Because of the longer duration involved in retrieving Pad A and a larger cumulative pit area, Alternative 4a (4-Acre Retrieval) would pose slightly more short-term risk than Alternative 4b (2-Acre Retrieval). Implementation timeframes for Alternatives 4a and 4b are 16 and 12 years, respectively—somewhat longer than for Alternatives 2 and 3.

Under the Preferred Alternative, short-term risk would be attributable primarily to retrieval from pit areas (as described for Alternative 4a), with slight increases for mitigating subsidence of Pad A (as described for Alternative 4b) and in situ grouting (as described in Alternative 3). In situ grouting could be deployed concurrent with targeted waste retrieval. The implementation timeframe for the Preferred Alternative is 18 years.

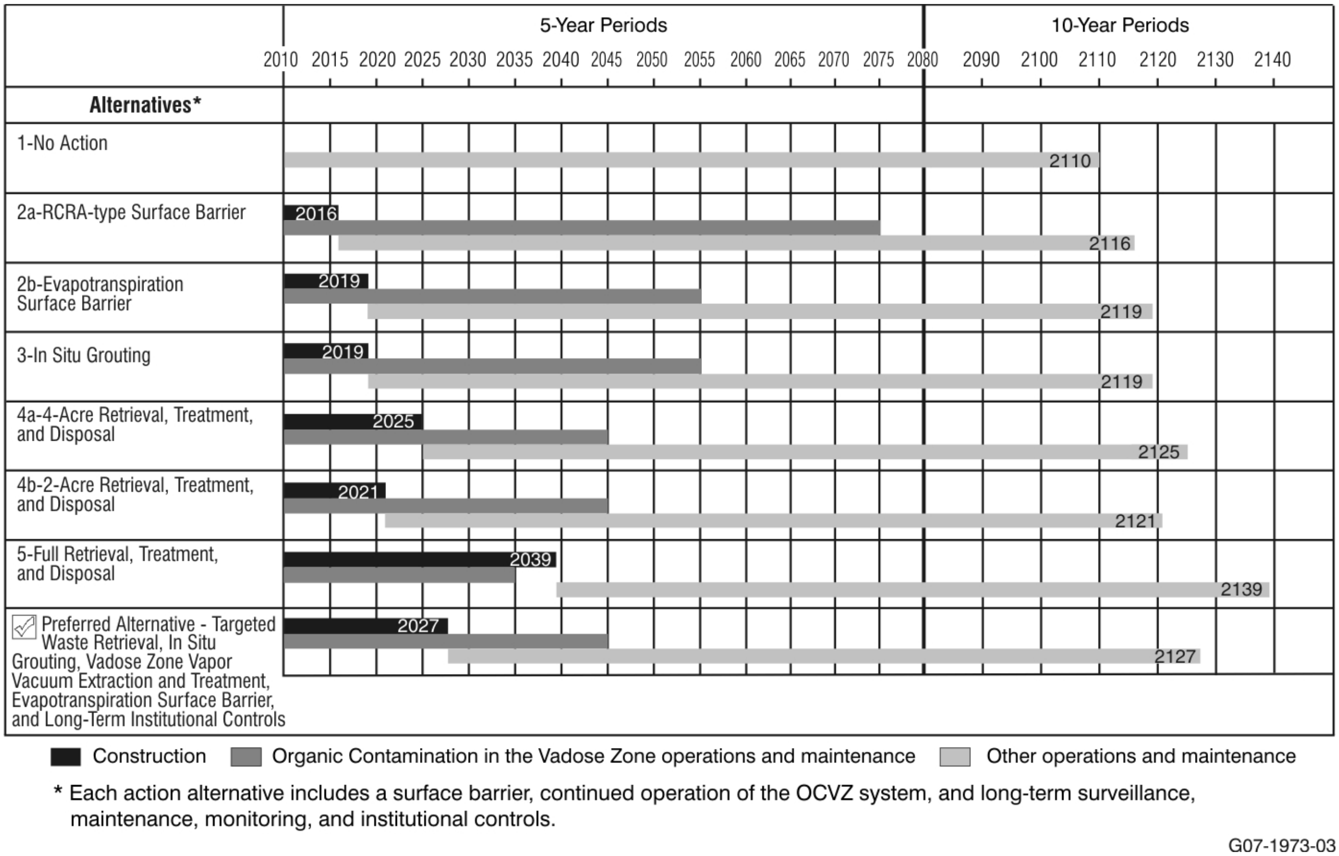


Figure 20. Approximate implementation timeframes for each remedial alternative.

Alternatives:

1. No Action
2. Surface Barrier
   2a—Modified RCRA Type C Surface Barrier
   2b—Evapotranspiration Surface Barrier
3. In Situ Grouting
4. Partial Retrieval, Treatment, and Disposal
   4a—4-Acre Retrieval, Treatment, and Disposal
   4b—2-Acre Retrieval, Treatment, and Disposal
5. Full Retrieval, Treatment, and Disposal

☑ Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls.

All alternatives, except No Action, include an engineered surface barrier, continued operation of the OCVZ system to extract and treat solvent vapors from the vadose zone, and long-term surveillance, maintenance, monitoring, and institutional controls.

Alternative 5, by a significant margin, poses the greatest amount of short-term risk to remediation workers, collocated workers, members of the public, and the environment. Alternative 5 is highly complex, incorporating substantially more construction for retrieval and interim storage and much more waste retrieval and handling. Retrieving waste from areas totaling 35 acres would greatly increase risk compared to the 4-acre retrieval described in Alternative 4a. Techniques developed for the Accelerated Retrieval Project would not be completely adequate, and remote-retrieval techniques would be required for some waste forms. Necessary engineering and administrative controls would have to be developed to manage risk. This alternative would require three decades to implement, substantially longer than for other alternatives.

Implementability

The implementability criterion addresses technical and administrative feasibility of implementing an alternative and availability of required services and materials. All alternatives would be technically and administratively feasible with sufficient availability of required services and materials with varying levels of ease.

All action alternatives include a surface barrier. Construction of a surface barrier is completely implementable, involving well developed standard construction techniques. Competition for borrow source material may require administrative attention to prioritize projects and obtain permit modifications. In particular, topsoil for establishing vegetation on the surface barrier and materials for the biotic barrier within the surface barrier may be in short supply on the INL Site. However, such materials can be transported from sources outside the INL Site, if necessary.

Alternatives 2, 3, 4, and the Preferred Alternative are technically and administratively feasible, with few potential issues and very few discriminating trade-offs. Services, materials, and vendors for each technical component are generally available. For Alternatives 2b and 3, which involve transferring Pad A waste into the Low-Level Waste Pit (without and with treatment, respectively), a potential administrative complication would arise relating to disposal capacity. Space may not be sufficient in the Low-Level Waste Pit or at the Idaho CERCLA Disposal Facility, precluding transfer of Pad A waste. Either an alternative off-INL Site disposal facility would be identified, or a new disposal cell could be required. Both approaches are technically and administratively feasible, though construction of a new cell could be more difficult administratively. For Alternative 4 and the Preferred Alternative, the targeted waste approach was developed to reduce problems with implementability while maximizing the amount of targeted waste to be removed. Targeted waste, by definition, must be visually identifiable and excludes large objects, waste with high-exposure rates, and classified waste. The Accelerated Retrieval Project has developed solutions for all expected waste forms, though some uncertainty remains regarding disposition of nontransuranic waste. Strategies (e.g., characterization, treatment, and disposal) for small amounts of unexpected waste would be developed, if needed. A field-scale demonstration of methods to address subsidence in pits or Pad A could be required to develop safety protocols for all action alternatives, a task that is technically and administratively feasible. Some modification to techniques for belowgrade retrieval within a retrieval enclosure could be required to customize the Accelerated Retrieval Project approach for application to abovegrade retrieval of Pad A waste (Alternatives 2b, 3, and 4a). All other aspects of Alternatives 2, 3, and 4 are sufficiently developed, both technically and administratively, such that significant implementability issues or lack of required services and materials would not be anticipated.

Alternative 5 could encounter several implementability obstacles. The Agencies developed this alternative based on the same technical approaches being deployed at the Accelerated Retrieval Project. These techniques would not be adequate to safely retrieve high-exposure-rate waste forms and large objects. Additional strategies would be needed, such as remote retrieval and in situ size reduction (perhaps remotely). Alternative 5 incorporates methods developed by the Remote-Handled Transuranic Project to transfer high-integrity containers of waste into and out of the Intermediate-Level Transuranic Storage Facility. These transfers were conducted in open air with no constraints on the height of the crane used to maintain distance and reduce exposure to gamma radiation. A similar operation within a retrieval enclosure would be challenging. A potential administrative difficulty is that a path to disposal would not be available for some retrieved waste forms. This analysis incorporates the assumption that a temporary (less than 20 years) storage facility would be constructed near the SDA to house such waste until an appropriate facility would be developed by another program (a repository constructed and managed by a federal agency or commercial enterprise). Based on difficulties experienced with obtaining approvals for the Waste Isolation Pilot Plant and Yucca Mountain, potential difficulties for a new facility also could arise. Another administrative issue relates to disposal capacity at the Waste Isolation Pilot Plant. The facility may not have sufficient capacity to accept all the potentially transuranic waste currently buried in the SDA.

Alternatives:

1. No Action
2. Surface Barrier
   - 2a—Modified RCRA Type C Surface Barrier
   - 2b—Evapotranspiration Surface Barrier
3. In Situ Grouting
4. Partial Retrieval, Treatment, and Disposal
   - 4a—4-Acre Retrieval, Treatment, and Disposal
   - 4b—2-Acre Retrieval, Treatment, and Disposal
5. Full Retrieval, Treatment, and Disposal

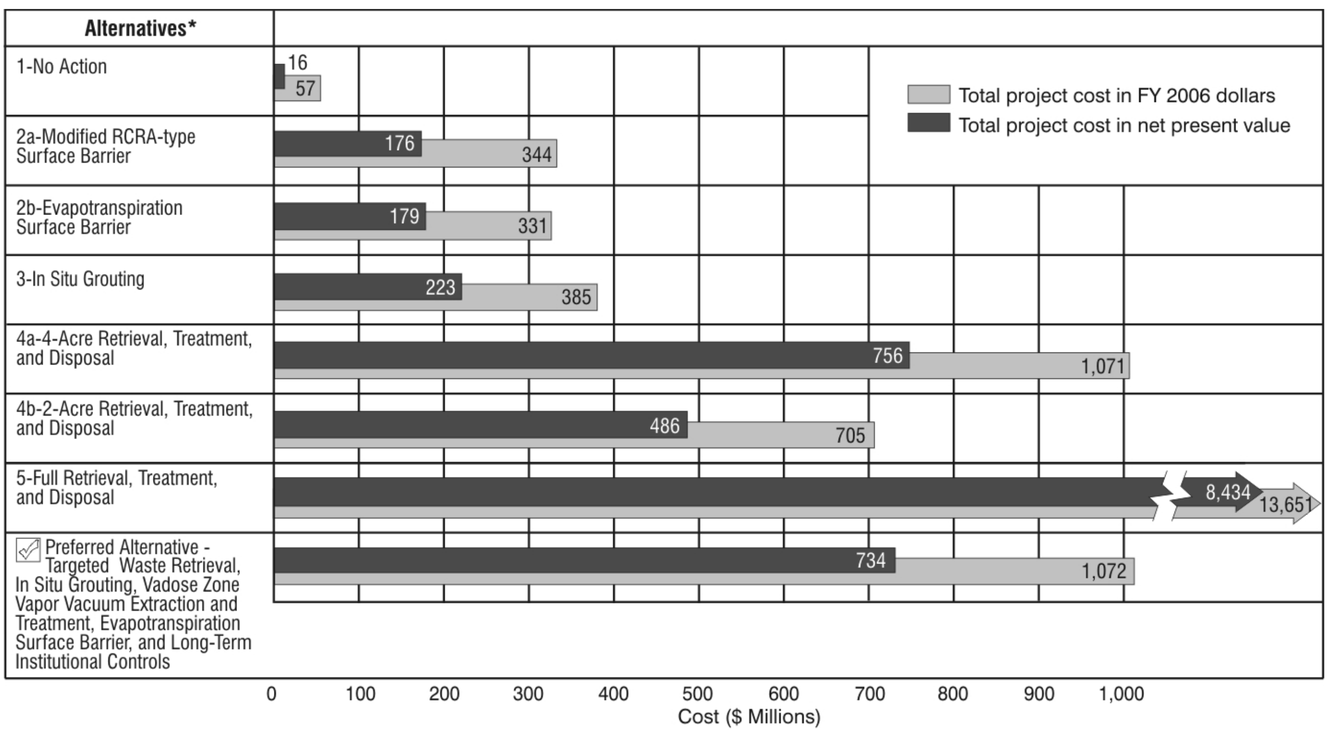
☑ Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls.

All alternatives, except No Action, include an engineered surface barrier, continued operation of the OCVZ system to extract and treat solvent vapors from the vadose zone, and long-term surveillance, maintenance, monitoring, and institutional controls.

Cost

Estimates for OU 7-13/14 were prepared with the best available information, at a much greater level of detail (modules) than is typical for a feasibility study. In general, confidence in the accuracy of cost estimates is high, with expected accuracy of -30 to +50% recommended in EPA guidance.[33] Retrieval modules in Alternatives 4 and 5 and the Preferred Alternative were based on plans for the two Accelerated Retrieval Project non-time-critical removal actions. The first removal action is approximately 65% complete and operations have just started at the second removal action. Operations to date show that actual costs are higher than estimated costs, but still within the range of accuracy of -30 to +50%. Cost estimates will be refined for the selected alternative to provide more accurate approximations in the OU 7-13/14 ROD.

Figure 21 compares and summarizes costs associated with each alternative. Estimates are presented in Fiscal Year 2006 dollars and in net present value. The No Action alternative, comprising 100 years of environmental monitoring using the existing monitoring system, is the lowest cost alternative. Costs increase for Alternatives 2, 3, 4, and 5, consistent with increasing complexity and implementation timeframes. Net present value cost for the Preferred Alternative is less than for Alternative 4a because it does not include retrieval of Pad A. Estimates for retrieval alternatives—Alternatives 4, 5, and the Preferred Alternative—do not include costs for transportation to the Waste Isolation Pilot Plant. These costs would be incurred by the Waste Isolation Pilot Plant and are not double-counted for OU 7-13/14.



* Each action alternative includes a surface barrier, continued operation of the OCVZ system, and long-term surveillance, maintenance, monitoring, and institutional controls.

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Figure 21. Comparison and summary of cost associated with each alternative.

☑ Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls

The Preferred Alternative combines targeted waste retrieval from 4.8 acres of pit areas, as currently proposed by DOE (see State Acceptance on page 40), with in situ grouting, vadose zone vapor vacuum extraction and treatment, evapotranspiration surface barrier, and long-term institutional controls. The estimated cost is approximately $734 million (net present value) and would take as much as 18 years to complete. Among all the alternatives, the combination of elements in the Preferred Alternative provides the best balance of trade-offs. Retrieval of targeted waste from 4.8 acres of pit areas within RWMC optimizes removal of source material with high solvent and transuranic content for off-INL Site disposal. The Preferred Alternative strikes a balance between waste retrieval, expediting installation of a surface barrier, worker safety, and cost. EPA supports taking this balanced approach on cleanup. See State Acceptance (page 40) for details on the State's perspective. The underlying logic for the major components of the Preferred Alternative is as follows:

- **Targeted Waste Retrieval—**Retrieving targeted waste from 4.8 acres of pit areas, as currently proposed by DOE (see State Acceptance on page 40)—including some portion of Pit 9 and the 0.8 acres being addressed by Accelerated Retrieval Projects I and II in Pits 4 and 6—would reduce inventories of solvents to address the current threat to the aquifer, transuranic radionuclides to address stakeholder concerns, and uranium radionuclides to address uncertainties in modeling.
- **In Situ Grouting—**In situ grouting soil vaults and trench areas totaling 0.2 acres would reduce mobility of technetium-99 and iodine-129 to address future threats to the aquifer. Grouting would be done concurrent with retrievals and in advance of surface barrier installation.
- **Vadose Zone Vapor Vacuum Extraction and Treatment—**Continuing operation of vapor vacuum extraction and would remove and treat solvents from the vadose zone to address the current threat to the aquifer. Coupled with targeted waste retrieval, this addresses the most imminent threat to groundwater quality. Vapor extraction from the vadose zone would continue throughout retrieval and beyond, as necessary.
- **Evapotranspiration Surface Barrier—**Constructing an evapotranspiration surface barrier would inhibit transport to the surface by plants and animals to address future threats to plants, animals, and nearby residents, and would inhibit migration into the subsurface to address future threats to the aquifer. Coupled with vadose zone vapor extraction, the surface barrier would be effective for all contaminants. Monitoring and modeling indicate that carbon-14 and technetium-99 could threaten groundwater quality (i.e., exceed risk thresholds) beneath the SDA over the next 100 years (see Table 2). Carbon tetrachloride from solvents already exceeds its MCL, and several other contaminants of concern could exceed MCLs over the next few hundred years (see Table 4). Other secondary contaminants of concern (e.g., uranium-238) could exceed MCLs several thousands of years in the future (see page 14). The most effective action to inhibit migration of contaminants from buried waste is to reduce infiltrating moisture that would move through the SDA and downward toward the Snake River Plain Aquifer. This is best accomplished by constructing a surface barrier; specifically, one that stores excess moisture until it evaporates or

Alternatives:

1. No Action
2. Surface Barrier
   - 2a—Modified RCRA Type C Surface Barrier
   - 2b—Evapotranspiration Surface Barrier
3. In Situ Grouting
4. Partial Retrieval, Treatment, and Disposal
   - 4a—4-Acre Retrieval, Treatment, and Disposal
   - 4b—2-Acre Retrieval, Treatment, and Disposal
5. Full Retrieval, Treatment, and Disposal

☑ Preferred Alternative—Targeted Waste Retrieval, In Situ Grouting, Vadose Zone Vapor Vacuum Extraction and Treatment, Evapotranspiration Surface Barrier, and Long-Term Institutional Controls.

All alternatives, except No Action, include an engineered surface barrier, continued operation of the OCVZ system to extract and treat solvent vapors from the vadose zone, and long-term surveillance, maintenance, monitoring, and institutional controls.

is absorbed by plants and transpired to the atmosphere, commonly referred to as an evapotranspiration surface barrier. Timely construction of the evapotranspiration surface barrier is a high priority because the sooner the surface barrier is complete, the less likely that longer-lived contaminants will migrate toward the aquifer (see secondary contaminants of concern on page 14 and Magnitude of Residual Risk on page 33).

- **Long-Term Institutional Controls—**Establishing and maintaining long-term, surveillance, maintenance, monitoring, and institutional controls would preserve integrity of the surface barrier, limit access, and enforce land-use restrictions to ensure continued effectiveness of the remedy.

It is necessary to implement the Preferred Alternative identified in this Proposed Plan to protect public health and welfare from actual or threatened releases of contaminants into the environment. The Agencies can change the Preferred Alternative in response to public comment or new information.

Based on information currently available, the Preferred Alternative meets threshold criteria and provides the best balance of trade-offs among the other alternatives with respect to balancing and modifying criteria. The Preferred Alternative is expected to satisfy the following statutory requirements of CERCLA: (1) be protective of human health and the environment, (2) comply with ARARs, (3) be cost effective, and (4) use permanent solutions and alternative treatment technologies or resource-recovery technologies to the maximum extent practicable.

State Acceptance

The State agrees with including retrieval of targeted waste, vapor vacuum extraction and treatment of solvent vapors, in situ grouting of mobile radionuclides, stabilization of waste disposal areas to minimize subsidence, and installing a surface barrier in the Preferred Alternative. These actions will reduce the amount of contamination in the SDA and prevent remaining contamination from spreading. However, the State has not agreed to accept DOE's currently proposed retrieval area of 4.8 acres. The State will await public review of and comment on the Proposed Plan before determining the appropriate acreage for waste retrieval.

The State expects the final ROD for the SDA (i.e., OU 7-13/14) to be consistent with its 1995 court settlement[34] with DOE.

Community Acceptance

Community acceptance will be evaluated in conjunction with public review of this Proposed Plan. The Agencies will prepare responses to public comments in the responsiveness summary that will be appended to the OU 7-13/14 ROD.

NO ACTION AND NO FURTHER ACTION SITES WITHIN WASTE AREA GROUP 7

Waste Area Group 7 contains 13 operable units. OU 7-13/14 is the comprehensive RI/FS addressed in this Proposed Plan. Three additional operable units—OU 7-08 (OCVZ), OU 7-10 (Pit 9 Process Demonstration), and OU 7-12 (Pad A)—will be integrated into OU 7-13/14, as described on page 10. The Agencies conclude that no action or no further action is required for 10 operable units within Waste Area Group 7. Table 6 lists all operable units in Waste Area Group 7.

Table 6. Operable units in Waste Area Group 7.

	Operable Unit	Status
7-01	Soil Vault Rows (1–13)	No further action. This operable unit is addressed under OU 7-13/14.
7-02	Acid Pit	No further action. This operable unit is addressed under OU 7-13/14.
7-03	Nontransuranic pits and trenches	No further action. This operable unit is addressed under OU 7-13/14.
7-04	Air pathway	No further action. This operable unit is addressed under OU 7-13/14.
7-05	Surface water pathways and surficial sediments	No further action. This operable unit is addressed under OU 7-13/14.
7-06	Groundwater pathway	No further action. This operable unit is addressed under OU 7-13/14.
7-07	Vadose zone radionuclides and metals	No further action. This operable unit is addressed under OU 7-13/14.
7-08	Vadose zone organics RI/FS	Remediation is in progress, in accordance with the OU 7-08 ROD, and will continue under the OU 7-13/14 ROD. The OU 7-08 ROD will be superseded.
7-09	Transuranic Storage Area releases	No action. Facilities will be closed under their respective programs (e.g., Advanced Mixed Waste Project).
7-10	Pit 9 process demonstration	No further action. Some portion of Pit 9 will be retrieved under the comprehensive ROD for OU 7-13/14, and the OU 7-10 ROD will be integrated with the OU 7-13/14 ROD.
7-11	Septic tanks	No action. Hazardous or radioactive contaminants were not detected above regulatory levels.
7-12	Pad A RI/FS	Postremediation maintenance and monitoring is ongoing, in accordance with the OU 7-12 ROD. Changes to incorporate Pad A into the comprehensive remedy will be addressed under the OU 7-13/14 ROD and the OU 7-12 ROD will be superseded.
7-13	Transuranic pits and trenches	See OU 7-13/14.
7-14	Comprehensive RI/FS	See OU 7-13/14.
7-13/14	Comprehensive RI/FS	Operable Units 7-13 and 7-14 were combined into a single comprehensive RI/FS, designated OU 7-13/14. This Proposed Plan is part of the decision process for OU 7-13/14.

The following sections of this Proposed Plan summarize information on the 10 ***no action*** and ***no further action operable units***. The two no action operable units are release sites outside the SDA (i.e., OUs 7-09 and 7-11). All other operable units are associated with the SDA. The Preferred Alternative, which includes an evapotranspiration surface barrier over the entire landfill, would effectively mitigate residual risk associated with the eight no further action operable units in the SDA.

no action operable unit—sites that can be released for unrestricted land use because they pose no risk (e.g., OUs 7-09 and 7-11).

no further action operable unit—sites that can not be released for unrestricted land use, requiring long-term management.

OU 7-01—Soil Vaults

Based on screening-level assessment of Soil Vault Rows 1 through 13,[35] the Agencies concluded that waste in soil vaults would be evaluated in the comprehensive RI/FS to assess potential transport of contaminants to the surface in concentrations that could exceed threshold values.[8] The OU 7-13/14 RI/FS encompasses all waste within the SDA, including that buried in soil vaults. Therefore, no further action is warranted under OU 7-01.

OU 7-02—Acid Pit

Based on screening-level assessment,[36] the Agencies concluded that more refined modeling was necessary to reduce uncertainty associated with the Acid Pit risk evaluation for mercury.[9] Subsequent refined modeling[37] showed that risk from mercury did not exceed threshold values.[38] The Acid Pit also was partially grouted in 1997.[39] Therefore, no further action is warranted under OU 7-02.

OU 7-03—Nontransuranic-Contaminated Waste Pits and Trenches

Specified pits and trenches identified as nontransuranic were evaluated using screening-level techniques,[10] and the Agencies concluded that these pits and trenches would be evaluated in an RI/FS.[10] The OU 7-13/14 RI/FS encompasses all waste within the SDA, including that buried in nontransuranic pits and trenches. Therefore, no further action is warranted under OU 7-03.

OU 7-04—Air Pathway

Potential risk attributable to exposures through the air pathway was evaluated using screening-level techniques.[11] The Agencies concluded that further evaluation in the comprehensive RI/FS was warranted.[11] The OU 7-13/14 RI/FS assessed risk for this pathway and concluded that risk thresholds could be exceeded (see Tables 2 and 3). Alternatives evaluated for OU 7-13/14 address these risks; therefore, no further action is warranted under OU 7-04.

OU 7-05—Surface Water Pathways and Surficial Sediments

Potential risk attributable to exposures through surface water pathways and surficial sediments was evaluated using screening-level techniques.[40] The Agencies concluded that final evaluation would be implemented in the comprehensive RI/FS.[12] The OU 7-13/14 RI/FS assessed risk for surficial sediments and concluded that risk thresholds could be exceeded (see Tables 2 and 3). Alternatives evaluated for OU 7-13/14 address these risks; therefore, no further action is warranted under OU 7-05.

OU 7-06—Groundwater Pathway

Potential risk attributable to exposures through groundwater pathways was evaluated using screening-level techniques.[41] The Agencies concluded that final evaluation would be implemented in the comprehensive RI/FS.[13] The OU 7-13/14 RI/FS assessed risk for groundwater pathways and concluded that risk thresholds could be exceeded (see Tables 2 and 3). Alternatives evaluated for OU 7-13/14 address these risks; therefore, no further action is warranted under OU 7-06.

OU 7-07—Vadose Zone Radionuclides and Metals

Potential risk attributable to dissolved-phase contaminants that could migrate from the vadose zone and into the aquifer was evaluated using screening-level techniques.[14] The Agencies concluded that more refined methods would be implemented to address the vadose zone in the comprehensive RI/FS.[14] The OU 7-13/14 RI/FS assessed risk for groundwater pathways, including potential transport through the vadose zone, and concluded that risk thresholds could be exceeded for groundwater (see Tables 2 and 3). Alternatives evaluated for OU 7-13/14 address these risks; therefore, no further action is warranted under OU 7-07.

OU 7-09—Transuranic Storage Area Releases

The screening-level investigation for OU 7-09[15] addressed historical releases within the Transuranic Storage Area, focusing on potential releases from the Intermediate-Level Transuranic Storage Facility and storage Pads 1, 2, 3, and R. RCRA closure of the Intermediate-Level Transuranic Storage Facility has been approved by DEQ, and final decommissioning will be completed as CERCLA non-time-critical removal actions under general decommissioning activities for ICP.[42]

Based on information from historical releases in the Transuranic Storage Area, surface soil immediately adjacent to Pad R was identified as the only source that might pose a threat to human health and the environment. Contaminant releases on and adjacent to Pad R are associated with a breached waste box discovered in April 1988. Contaminated portions of Pad R and adjacent soil are entirely enclosed by the Advanced Mixed Waste Treatment Project retrieval enclosure. The Advanced Mixed Waste Treatment Project is projected to be completed no later than December 2018, after which, the facilities will be deactivated, decontaminated, and decommissioned. Decommissioning would include clean closure of the facility footprint to RCRA standards. Administrative closure of the Transuranic Storage Area then would be implemented in accordance with management control procedures. Figure 22 provides photographs of waste retrieval work at the Transuranic Storage Area within the Advanced Mixed Waste Treatment Project retrieval enclosure.

All media contaminated during the 1988 incident will be removed as part of the closure process. In addition, soil contamination resulting from waste retrieval from Pads 1, 2, 3, or R, or discovered beneath the underlying asphalt pads, would be removed before the retrieval enclosure is deactivated, decontaminated, and decommissioned. Radioactive contamination is anticipated to involve only shallow surface soil (e.g., less than 1 ft deep), and deep saturation of soil with organic contaminants (i.e., solvents) is not anticipated. After deactivating, decontaminating, and decommissioning the facility is complete, excavations would be filled with clean fill, a uniform grade would be established, and vegetation would be established on the area. Because residual contamination is not anticipated following clean closure of the Advanced Mixed Waste Treatment Project, no action is warranted under OU 7-09.

OU 7-10—Pit 9 Process Demonstration

As discussed on page 10, it is proposed that no further action will be implemented under the OU 7-10 ROD. Pit 9 was evaluated as a part of OU 7-13/14 and will be integrated with the final ROD. As part of the Preferred Alternative, some portion of Pit 9 will be retrieved using the targeted waste approach described in this Proposed Plan under authority of the OU 7-13/14 ROD or as an additional removal action, such as the Accelerated Retrieval Projects.

OU 7-11—Septic Tanks and Drain Fields

Potential risk attributable to three septic tank systems at RWMC was evaluated using screening-level techniques.[16] Because hazardous or radioactive contaminants were not detected in the systems, the Agencies concluded that no action was warranted under OU 7-11.

Figure 22. Transuranic Storage Area waste retrieval operations in the Advanced Mixed Waste Treatment Facility retrieval enclosure.

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REFERENCES

Body Text References

This list of source material is provided for readers who want more detailed information than is presented in this Proposed Plan. These documents are available in the Administrative Record or other federal archives, as indicated. Locations of the Administrative Record are listed in the side bar of page 49.

1. K. Jean Holdren, Danny L. Anderson, Bruce H. Becker, Nancy L. Hampton, L. Don Koeppen, Swen O. Magnuson, and A. Jeffrey Sondrup, *Remedial Investigation and Baseline Risk Assessment for OU 7-13/14*, DOE/ID-11241, U.S. Department of Energy Idaho Operations Office, 2006.
2. K. Jean Holdren, Thomas E. Bechtold, Brian D. Preussner, *Feasibility Study for OU 7-13/14*, DOE/ID-11268, Rev. 0, U.S. Department of Energy Idaho Operations Office, 2007.
3. 42 USC § 9601 et seq., "Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA/Superfund)," *United States Code,* 1980.
4. Dale A. Cresap, M. Doug McKenzie, and A. Jeffrey Sondrup, *Environmental and Operational Annual Report for the OU 7-08 Organic Contamination in the Vadose Zone Project—July 2005 through June 2006*, RPT-229, Idaho National Laboratory, Idaho Cleanup Project, 2006.
5. 54 FR 48184, "National Priorities List of Uncontrolled Hazardous Waste Sites; Final Rule," *Federal Register,* 1989.
6. DOE-ID, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, Administrative Record No. 1088-06-29-120, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, 1991.
7. Steve L. Lopez, William H. Landman, Donald E. Sebo, and Vivian G. Schultz, *Summary Report for the OU 7-13/14 Early Actions Beryllium Encapsulation Project*, ICP/EXT-04-00646, Rev. 1, Idaho National Engineering and Environmental Laboratory, Idaho Completion Project, 2005.
8. DOE-ID, *Action Determination for OU 7-01 Soil Vault Rows*, Administrative Record No. 10034, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, 1995.
9. DOE-ID, *Action Determination for OU 7-02*, Administrative Record No. 5055, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, 1994.
10. INEL, *Decision Documentation Package for OU 7-03 Non-TRU Pits and Tr*enches, Administrative Record No. 5592, Idaho National Engineering Laboratory, 1993.
11. INEL, *OU 7-04 Air Pathway Track 2 Preliminary Scoping Package*, Administrative Record No. 10017, Idaho National Engineering Laboratory, 1994.
12. DOE-ID, *Action Determination for OU 7-05*, Administrative Record No. 5864, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, 1994.

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DEQ	Idaho Department of Environmental Quality
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
ICP	Idaho Cleanup Project
INL	Idaho National Laboratory
MCL	maximum contaminant level
mrem	millirem
OCVZ	Organic Contamination in the Vadose Zone
OU	operable unit
RCRA	Resource Conservation and Recovery Act
RI/FS	remedial investigation and feasibility study
ROD	record of decision
RWMC	Radioactive Waste Management Complex
SDA	Subsurface Disposal Area

13. DOE-ID, *Action Determination for OU 7-06*, Administrative Record No. 5868, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, 1994.

14. INEL, *OU 7-07 Vadose Zone Rad/Metals Track 2 Preliminary Scoping Package*, Administrative Record No. 10004, Idaho National Engineering Laboratory, 1994.

15. INEL, *Decision Documentation Package for OU 7-09 TSA Releases*, Administrative Record No. 5689, Idaho National Engineering Laboratory, 1993.

16. INEL, *Decision Documentation Package for OU 7-11 Septic Systems*, Administrative Record No. 5235, Idaho National Engineering Laboratory, 1993.

17. DOE-ID, *Record of Decision: Declaration for Organic Contamination in the Vadose Zone OU 7-08, Idaho National Engineering Laboratory, Radioactive Waste Management Complex, Subsurface Disposal Area*, Administrative Record No. 5761, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; and Idaho Department of Health and Welfare, 1994.

18. DOE-ID, *Record of Decision: Declaration for Pad A at the Radioactive Waste Management Complex Subsurface Disposal Area at the Idaho National Engineering Laboratory*, Administrative Record No. 5632, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; and Idaho Department of Health and Welfare, 1994.

19. DOE-ID, *Record of Decision: Declaration for Pit 9 at the Radioactive Waste Management Complex Subsurface Disposal Area at the Idaho National Engineering Laboratory*, Administrative Record No. 5569, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; and Idaho Department of Health and Welfare, 1993.

20. 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, Office of the Federal Register, 2006.

21. DOE-ID, *Explanation of Significant Differences for the Pit 9 Interim Action Record of Decision at the Radioactive Waste Management Complex at the Idaho National Engineering and Environmental Laboratory*, Administrative Record No. 10537, U.S. Department of Energy Idaho Operations Office; U.S. Environmental Protection Agency, Region 10; Idaho Department of Health and Welfare, 1998.

22. DOE, *Agreement to Extend Deadlines*, *the United States Environmental Protection Agency, the Idaho Department of Environmental Quality, and the United States Department of Energy* Administrative Record No. 25088, U.S. Department of Energy, State of Idaho, U.S. Environmental Protection Agency, 2007.

23. V. E. Halford, D. R. Perry, W. C. Craft III, J. J. King, J. M. McCarthy, I. D. Figueroa, and Y. McClellan, *Remedial Investigation/Feasibility Study for Pad A Operable Unit 7-12, Waste Area Group 7, Radioactive Waste Management Complex*, *Idaho National Engineering Laboratory*, EGG-WM-9967, Vol. 1, Idaho National Engineering Laboratory, 1993.

24. Shannon C. Flynn, *Operations and Maintenance Plan for the Pad A Limited Action Operable Unit 7-12 at the Radioactive Waste Management Complex*, ICP/EXT-04-00732, Rev. 1, Idaho National Laboratory, Idaho Cleanup Project, 2005.

25. Danny L. Anderson and Bruce H. Becker, *Source Release Modeling Report for OU 7-13/14*, ICP/EXT-05-01039, Rev. 1, Idaho National Laboratory, Idaho Cleanup Project, 2006.

26. Swen O. Magnuson and A. Jeffrey Sondrup, *Subsurface Flow and Transport Model Development for the OU 7-13/14 Remedial Investigation and Feasibility Study*, ICP/EXT-05-01016, Rev. 1, Idaho National Laboratory, Idaho Cleanup Project, 2006.

27. Douglas E. Burns, *Guidance Protocol for the Performance of Cumulative Risk Assessments at the INEL,* INEL-95/131, Rev. 0, Idaho National Engineering Laboratory, 1995.

28. K. Jean Holdren and Barbara J. Broomfield, *Second Addendum to the Work Plan for the OU 7-13/14 Waste Area Group 7 Comprehensive Remedial Investigation/Feasibility Study*, DOE/ID-11039, Rev. 0, U.S. Department of Energy Idaho Operations Office, 2004.

29. EPA, *Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination,* OSWER Directive No. 9200.4-18, U.S. Environmental Protection Agency, Office of Emergency and Remedial Response and Office of Radiation and Indoor Air, 1997.

30. 42 USC § 6901 et seq., "Resource Conservation and Recovery Act of 1976 (Solid Waste Disposal Act)," *United States Code,* 1976.

31. Earl Mattson, Mark Ankeny, Steve Dwyer, Nancy Hampton, Gretchen Matthern, Brenda Pace, Alva Parsons, Mitch Plummer, Steve Reese, and Jody Waugh, *Preliminary Design for an Engineered Surface Barrier at the Subsurface Disposal Area*, ICP/EXT-04-00216, Rev. 0, Idaho National Engineering and Environmental Laboratory, Idaho Completion Project, 2004.

32. EPA, *A Guide to Principal Threat and Low Level Threat Wastes*, OSWER Directive 9380.3-06FS, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, 1991.

33. EPA, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final*, EPA/540/G-89/004, OSWER Directive 9355.3-01, U.S. Environmental Protection Agency, 1988.

34. DOE, *Settlement Agreement*, U. S. Department of Energy, U.S. Department of the Navy, and the State of Idaho, 1995.

35. D. E. Burns, B. H. Becker, and R. W. Jones, *Preliminary Scoping Track 2 Summary Report for OU 7-01*, INEL-94/0241, Idaho National Engineering Laboratory, 1994.

36. D. J. Jorgensen, D. J. Kuhns, J. J. King, and C. A. Loehr, *WAG-7 OU (Operable Unit) 7-02 Acid Pit Track 2 Summary Report*, EGG-ERD-10242, Idaho National Engineering Laboratory, 1994.

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

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

39. Guy G. Loomis, Andrew P. Zdinak, Mark A. Ewanic, and James J. Jessmore, *Acid Pit Stabilization Project (Volume l—Cold Testing),* INEEL/EXT-98-00009, Idaho National Engineering and Environmental Laboratory, 1998.

40. S. M. Burns, C. A. Loehr, and S. M. Waters, *Draft Final Scoping Track 2 Summary Report for OU 7-05: Surface Water Pathways and Surficial Sediments*, EGG-ERD-10449, Rev. 0, Idaho National Engineering Laboratory, 1993.

41. J. D. Burgess, B. D. Higgs, and T. R. Wood, *WAG-7 Groundwater Pathway Track 2 Summary Report*, EGG-ER-10731, Idaho National Engineering Laboratory, 1994.

42. DOE-ID, *Engineering Evaluation/Cost Analysis for General Decommissioning Activities under the Idaho Cleanup Project*, DOE/ID-11291, Rev. 0, U.S. Department of Energy Idaho Operations Office, 2006.

Sidebar References

a. 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, Office of the Federal Register, 2006.

b. BEIR V, *Health Effects of Exposures to Low Levels of Ionizing Radiation, BEIR V*, Washington, D.C.: Committee on the Biological Effects of Ionizing Radiations, National Academy Press, and National Research Council, 1990.

c. DOE O 5820.1, "Management of Transuranic Contaminated Material," U.S. Department of Energy, 1982.

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

e. EPA, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final*, EPA/540/G-89/004, OSWER Directive 9355.3-01, U.S. Environmental Protection Agency, 1988.

f. K. Jean Holdren, Danny L. Anderson, Bruce H. Becker, Nancy L. Hampton, L. Don Koeppen, Swen O. Magnuson, and A. Jeffrey Sondrup, *Remedial Investigation and Baseline Risk Assessment for OU 7-13/14*, DOE/ID-11241, U.S. Department of Energy Idaho Operations Office, 2006.

g. DOE-ID, *Action Memorandum for Accelerated Retrieval of a Described Area within Pit 4*, DOE/NE-ID-11179, Rev. 0, U.S. Department of Energy Idaho Operations Office, 2004.

h. DOE-ID, *Action Memorandum for the Accelerated Retrieval Project II within Pits 4 and 6 of the Subsurface Disposal Area*, DOE/NE-ID-11238, U.S. Department of Energy Idaho Operations Office, 2006.

i. V. E. Halford, D. R. Perry, W. C. Craft III, J. J. King, J. M. McCarthy, I. D. Figueroa, and Y. McClellan, *Remedial Investigation/Feasibility Study for Pad A Operable Unit 7-12, Waste Area Group 7, Radioactive Waste Management Complex*, *Idaho National Engineering Laboratory*, EGG-WM-9967, Vol. 1, Idaho National Engineering Laboratory, 1993.

j. K. Jean Holdren, Thomas E. Bechtold, Brian D. Preussner, *Feasibility Study for OU 7-13/14*, DOE/ID-11268, Rev. 0, U.S. Department of Energy Idaho Operations Office, 2007.

k. OMB, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, Appendix C, "Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analysis," OMB Circular No. A-94, Office of Management and Budget, URL: http://www.whitehouse.gov/omb/circulars/a094/a94_appx-c.html, Web page last visited October 15, 2007.

PUBLIC INVOLVEMENT

The public comment period for this Proposed Plan extends from October 22 to November 21, 2007. Citizens are encouraged to review this Proposed Plan, attend a public meeting or briefing, and provide feedback to the Agencies or the ICP Community Relations Office (see sidebar on this page).

Community acceptance is an important criterion in the evaluation of CERCLA cleanup alternatives. The Agencies will review and consider comments from citizens about this Proposed Plan and may modify the Preferred Alternative presented in this plan, based on those comments. Agency responses to all comments on this plan will be published as part of the OU 7-13/14 ROD, which is scheduled to be completed in 2008.

At least three public meetings will be held during the public comment period:

Tuesday November 13, 2007	**Wednesday November 14, 2007**	**Thursday November 15, 2007**
Centre on the Grove 850 W. Front St. Boise, Idaho	College of Southern Idaho 1315 Falls Avenue Taylor Student Union Bldg. Room 276–277 Twin Falls, Idaho	Shilo Inn 780 Lindsay Blvd. Idaho Falls, Idaho

Meetings will begin at 6:00 p.m. with an opportunity for informal discussion with Agency and project representatives. The Agencies will give a formal presentation at 7:00 p.m., and opportunities to ask questions and submit oral comments will follow. A court reporter will record comments, and transcripts will be placed in the Administrative Record. Written comments can be submitted to one of the project representatives at the meeting or mailed. A form is included in this Proposed Plan for your convenience. To ensure they will be considered, written comments must be mailed to the name and address specified on the form:

Mark R. Arenaz, Idaho Cleanup Project
DOE Idaho Operations Office, Mail Stop 1222
P.O. Box 1625
Idaho Falls, ID 83415-1222

This Proposed Plan and a form for submitting comments are also available online at http://idahocleanupproject.com. The Agencies will schedule additional meetings and briefings in other locations, based on level of public interest. To arrange briefings in other communities, call the toll-free number, 1-800-708-2680.

Administrative Record

The CERCLA Administrative Record for ICP at INL is available to the public at the following locations:

INL/ICP Technical Library
DOE Public Reading Room
1776 Science Center Drive
Idaho Falls, ID 83415
208-526-1185

Albertsons Library
Boise State University
1910 University Drive
Boise, Idaho 83725
208-385-1621

The Administrative Record also can be accessed on the Internet at http://ar.inel.gov.

Any library or other facility with Internet access can provide a connection to the Administrative Record.

Additional information about ICP and environmental restoration at the INL Site is available on the Internet at http://idahocleanupproject.com.

The INL is on the Internet at http://www.inl.gov.

The Agencies:

Mark Arenaz, U.S. Department of Energy Idaho Operations Office
P.O. Box 1625, Mailstop 1222
Idaho Falls, ID 83415-1222
208-526-1510

Daryl Koch, Idaho Department of Environmental Quality
1410 North Hilton
Boise, ID 83706
208-373-0492

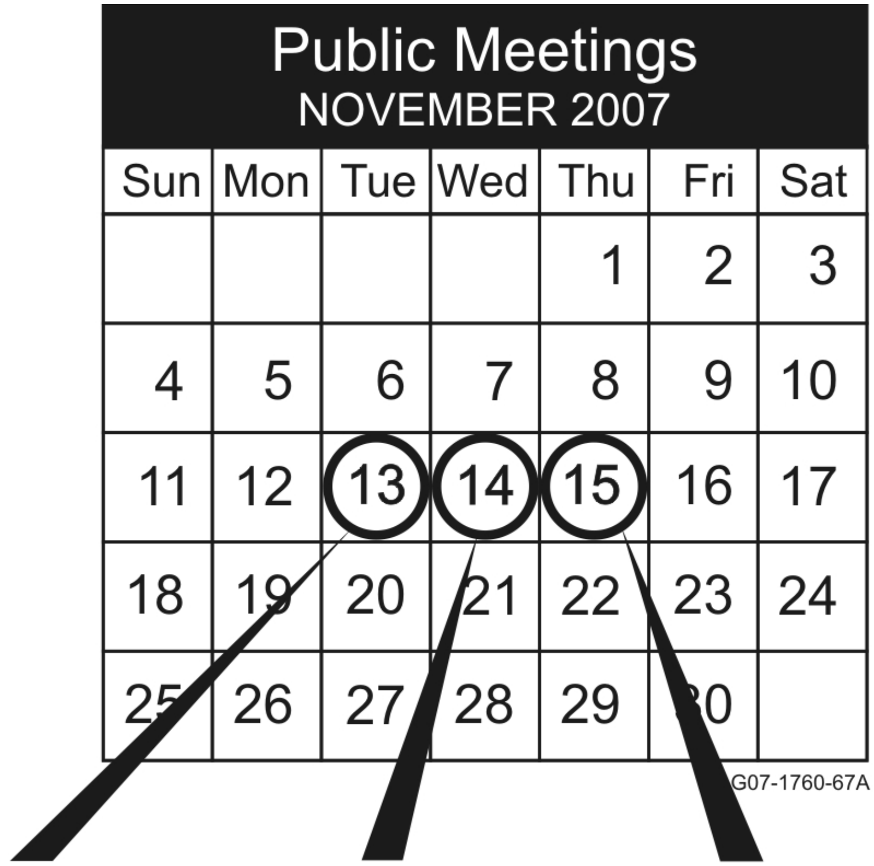
Dennis Faulk, U.S. Environmental Protection Agency, Region 10
309 Bradley Blvd., Suite 115
Richland, WA 99352
509-376-8631

More Information:

Contact: Erik Simpson, ICP Community Relations representative for RWMC, at 208-526-4700 or at erik.simpson@icp.doe.gov.

For general information, call 1-800-708-2680 or send mail to:

Erik Simpson
P.O. Box 1625, Mailstop 2501
Idaho Falls, ID 83415-2501



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Twin Falls
College of Southern Idaho
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Taylor Student Union Bldg
Rm. 276-277
6:00 p.m.
Date: November 14

Idaho Falls
Shilo Inn
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The Agencies want to hear from you to decide what actions to take for Radioactive Waste Management Complex Operable Unit 7-13/14

Comments ______________________________

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