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EPA Superfund Record of Decision:

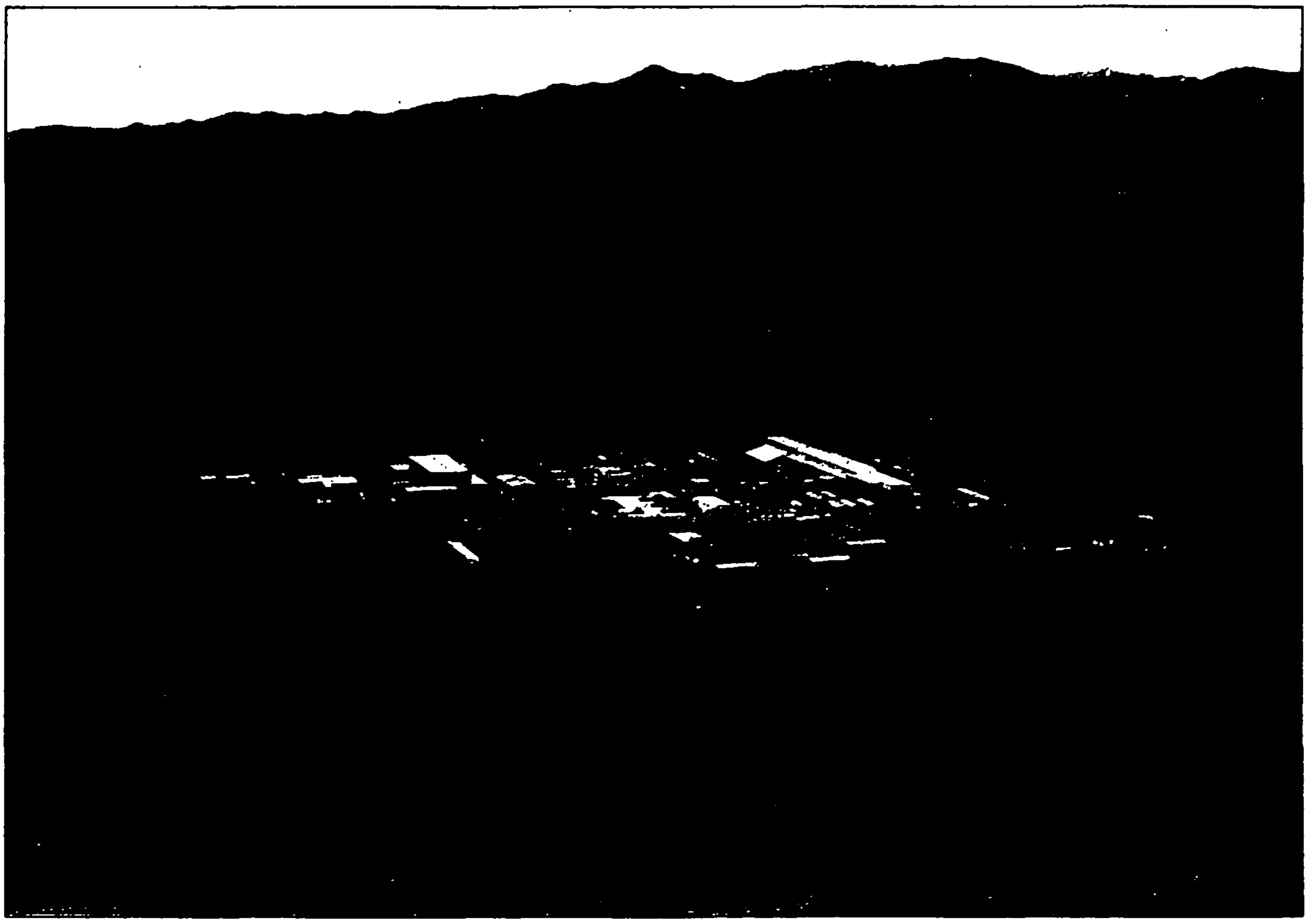
Idaho National Engineering Lab (USDOE) OU 8-08 Idaho Falls, ID 9/29/1998

September 30, 1998

STATE OF IDAHO
DIVISION OF ENVIRONMENTAL QUALITY

Final Record of Decision

Naval Reactors Facility



Operable Unit 8-08
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

Final Record of Decision
Naval Reactors Facility
Operable Unit 8-08

September 30, 1998

Prepared for the
U.S. Department of Energy
Pittsburgh Naval Reactors Office
Idaho Branch Office
P. O. Box 2469
Idaho Falls, Idaho 83403-2469

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PART I
DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

Naval Reactors Facility, Waste Area Group 8
Operable Unit 8-08
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial actions for nine sites in Operable Unit (OU) 8-08 at the Naval Reactors Facility (NRF) located on the Idaho National Engineering and Environmental Laboratory (INEEL). NRF has been designated as Waste Area Group (WAG) 8, which is one of ten WAGs at the INEEL identified by the U.S. Environmental Protection Agency (EPA) Region 10, the Idaho Department of Health and Welfare (IDHW), and the U.S. Department of Energy (DOE) in the Federal Facilities Agreement and Consent Order (FFA/CO). These remedial actions were selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This document also presents the decision of performing no remedial action for 55 additional sites at WAG 8. The decisions made in this document are based on information in the Administrative Record file for NRF.

The EPA and IDHW concur with the selected remedial actions for the nine sites of concern and the no remedial action decision for the 55 remaining sites.

ASSESSMENT OF THE SITE

The FFA/CO Action Plan describes OU 8-08 as the WAG 8 Comprehensive Remedial Investigation/Feasibility Study (RI/FS) and includes several potential radiological sites. There have been nine operable units and 87 sites identified at NRF. Each operable unit contains a site or group of sites with similar characteristics. With the exception of 18 radiological sites and two post-RI/FS new sites, each site has been investigated under a previous assessment. These previous assessments evaluated the sites individually without respect to their proximity to other sites. Previous decision documents have been issued for 23 of the 87 sites. Decisions for the remaining 64 sites are provided in this Record of Decision. One purpose of the Comprehensive RI/FS was to thoroughly investigate 18 potential radiological sites that were not previously investigated. Another purpose of the Comprehensive RI/FS was to assess the potential cumulative, or additive, effects of all identified sites at NRF on human health and the environment including potential impacts to the groundwater. The 23 sites with previous decision documents were included in the comprehensive assessment to ensure the specified action or no action delineated in the decision document remains protective of human health and the environment from a cumulative perspective.

Thirteen of the 23 sites addressed by previous decision documents were not part of an operable unit and were determined to be no action sites under a Consent Order and Compliance Agreement (COCA) which preceded the FFA/CO. Ten other sites in OUs 8-05, 8-06, and 8-07 were addressed under a previous Record of Decision. The Comprehensive RI/FS determined that the decisions made for the 23 sites were appropriate and no additional human health or environmental concerns exist from a cumulative perspective.

This Record of Decision addresses 64 sites by providing selected remedial actions for nine sites and recommending no remedial action for 55 sites. Fifty-five sites present no risk or an acceptable risk to human health or the environment, and therefore do not require a remedial action. The no remedial action sites are identified as follows: NRF-03, 06, 08, 33, 40, 41, and 53 in OU 8-01; NRF-09, 37, 38, 42, 47, 52A, 52B, 54, 55, 61, 64, and 68 in OU 8-02; NRF-10, 15, 18A, 18B, 20, 22, 23, 45, and 56 in OU 8-03, NRF-28, 29, 31, 44, 58, 62, 65, 69, 70, 71, 72, 73, 74, 75, 76, and 77 in OU 8-04; NRF-02, 13, 16, 32, 43, 66, 79, and 81 in OU 8-08; OU 8-09; and NRF-82 and 83 which are not included in an OU. Actual or threatened releases of hazardous substances from nine sites, if not addressed by implementing the response actions selected in this Record of Decision, may present an imminent and substantial endangerment to human health and the environment. These sites are NRF-11, 12A, 12B, 14, 17, 19, 21A, 21B, and 80 in OU 8-08.

DESCRIPTION OF REMEDY

Operable Unit 8-08 consists of 18 potential radiological sites and the sites addressed in the comprehensive assessment of all identified sites at NRF. The assessment of Operable Unit 8-08 was accomplished in the NRF Comprehensive RI/FS. The RI/FS tasks were to thoroughly investigate 18 sites not previously evaluated (radiological areas including one OU 8-03 site) and to comprehensively assess the cumulative risk posed by all NRF sites. The site assessments for the 18 radiological areas resulted in the identification of nine sites of concern. The comprehensive assessment included all sites at NRF and did not identify any additional sites of concern. Twenty-three of the 87 identified sites at NRF were addressed in previous decision documents, therefore, this Record of Decision addresses decisions made for the remaining 64 sites. Of the 64 sites, 55 do not require additional action. Forty-three of the 55 sites are recommended for No Action and the other 12 of 55 sites are recommended for No Further Action. A No Action decision indicates the sites have no source present or a source is present at a level with an acceptable human health and environment risk for unrestricted use. A No Further Action decision indicates the site has a source or potential source present that does not have an exposure route available under current site conditions. Because the No Further Action decision potentially results in hazardous substances remaining onsite above risk-based levels, a CERCLA review will be conducted within five years after commencement of final remedial actions at NRF to ensure that the No Further Action decision remains effective.

For the protection of human health and the environment, remedial action objectives and goals were developed for the nine sites of concern. The remedial action objectives, associated goals, and the general actions necessary to meet the objectives and goals are as follows:

- Soil contaminated with cesium-137 greater than 16.7 picocuries per gram (pCi/g) will be excavated and/or covered with an engineered cap to prevent external gamma radiation exposure from exceeding an excess cancer risk of 1 in 10,000 for the future 100-year residential receptor.
- Soil contaminated with strontium-90 greater than 45.6 pCi/g will be excavated and/or covered to prevent ingestion of soil and food crops from exceeding an excess cancer risk of 1 in 10,000 for the future 100-year residential receptor.
- Soil contaminated with lead greater than 400 parts per million (ppm) will be excavated and/or covered to prevent direct contact with lead contaminated soil.
- To prevent the release of contaminated soils, an adequate cover will be used to inhibit erosion by natural processes and biotic intrusion by resident plant or animal species.
- Contaminated soil will be excavated and/or covered, as outlined above, to prevent exposure to contaminants of concern that may cause adverse effects on resident species populations.

In order to meet the objectives and goals for the protection of human health and the environment, the selected remedy for the nine sites of concern consists of limited excavation, disposal, and containment. The major components of the selected remedy include:

- Excavating contaminated soil above remediation goals and debris from six of the nine sites;
- Consolidating the excavated soil at one site (S1W Leaching Beds);
- Disposing of radiological, non-hazardous debris to an INEEL disposal facility or an appropriate off-site (away from INEEL) disposal facility and, if necessary, disposing of radiological, hazardous debris as a mixed waste per the INEEL Site Treatment Plan;
- Constructing engineered covers primarily of native earthen materials in two areas that would cover the three sites not excavated, which includes the site where soil was consolidated. Cover materials will be determined in the Remedial Design/Remedial Action Work Plan;
- Radiation surveys and soil sampling during excavation;
- Soil and groundwater sampling to monitor any potential releases from the covered areas;
- Periodic inspection and maintenance of covers to ensure their integrity;
- Establishing fencing or other barriers and land use restrictions.

The possibility exists that contaminated environmental media not identified in the FFA/CO or in this comprehensive investigation will be discovered in the future as a result of routine operations, maintenance activities, and decontamination and dispositioning activities at NRF. Upon discovery of a new contaminant source by DOE, IDHW, or EPA, the contaminant source will be evaluated and appropriate response actions taken in accordance with the FFA/CO.

STATUTORY DETERMINATION

The selected remedy for the nine sites of concern is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial actions, and is cost effective. This remedy utilizes permanent solutions; however, it does not satisfy the statutory preference for treatment as a principal element of the remedy. Treatment was found to be ineffective, difficult to implement, and/or not cost effective. The contaminated soils can be reliably contained at NRF.

Because this remedy may result in hazardous or radiological substances remaining on site above risk-based levels, a review will be conducted within five years after commencement of final remedial actions to ensure that the remedy continues to provide adequate protection of human health and the environment.

The agencies agree that no remedial action be taken for 55 of the 64 sites. For 12 of the 55 sites, where no action is being taken because an exposure route is not present under current site conditions (No Further Action decision), the site conditions will be reviewed at least every five years to ensure that performing no action remains protective of human health and the environment. For the 43 of 55 sites with a No Action decision, follow-up reviews are not required.

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Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 8-08, located in Waste Area Group 8, Naval Reactors Facility at the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy and the Environmental Protection Agency, with concurrence by the Idaho Department of Health and Welfare.

Chuck Clarke ____________________ 9/29/98 ____________________

Chuck Clarke, Regional Administrator
Region 10
U.S. Environmental Protection Agency

Date

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for J. M. Sandoval, Assistant Administrator 09/24/98

Wallace N. Cory, Administrator — Date

Division of Environmental Quality

Idaho Department of Health and Welfare

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Theron M. Bradley

Theron M. Bradley, Manager
U.S. Department of Energy
Naval Reactors Idaho Branch Office

Sept 24, 1998
Date

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Acronyms

AOC	area of contamination
ARARs	applicable or relevant and appropriate requirements
A1W	Large Ship Reactor Prototype
BB	Butler Building
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	contaminants of concern
COCA	Consent Order and Compliance Agreement
COPC	contaminants of potential concern
DOE	Department of Energy
ECF	Expended Core Facility
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
HEAST	Health Effects Assessment Summary Tables
HQ	hazard quotient
IDHW	Idaho Department of Health and Welfare
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IRIS	Integrated Risk Information System
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NHPA	National Historic Preservation Act
NPL	National Priorities List
NRF	Naval Reactors Facility
NRHP	National Register of Historic Places
OU	operable unit
PCB	polychlorinated biphenyl
pCi/g	picocurie per gram
ppb	parts per billion
ppm	parts per million
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RWMC	Radioactive Waste Management Complex
SDP	Bettis Atomic Power Laboratory Site Development Plan
SLERA	Screening Level Ecological Risk Assessment
SRPA	Snake River Plain Aquifer
S5G	submarine reactor plant prototype
S1W	Submarine Thermal Reactor Prototype
TRA	Test Reactor Area
UCL	upper confidence limit
USGS	United States Geological Survey
UST	underground storage tank
WAG	Waste Area Group

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PART II
DECISION SUMMARY

1.0 Site Background

1.1 Idaho National Engineering and Environmental Laboratory

The Idaho National Engineering and Environmental Laboratory (INEEL) is a government facility managed by the U.S. Department of Energy (DOE), located 32 miles west of Idaho Falls, Idaho, and occupies 890 square miles (mi^2) of the northeastern portion of the Eastern Snake River Plain. Facilities at the INEEL are primarily dedicated to nuclear research, development, and waste management.

The INEEL was established in 1949 as the National Reactor Testing Station by the United States Atomic Energy Commission as a site for building, testing, and operating nuclear reactors, fuel processing plants, and support facilities with maximum safety and isolation. In 1974, the area was designated as the Idaho National Engineering Laboratory to reflect the broad scope of engineering activities conducted there. The name was changed to the INEEL in 1997 to reflect the redirection of its mission to include environmental research.

The U.S. Government occupied portions of the INEEL prior to its establishment as the National Reactor Testing Station. During World War II, the U.S. Navy used about 270 mi^2 of the site as a gunnery range. The U.S. Army Air Corps once used an area southwest of the naval gunnery area as an aerial gunnery range. The present INEEL site includes all of the former military areas and a large adjacent area withdrawn from the public domain for use by the DOE. The former Navy administration shop, warehouse, and housing area are presently the Central Facilities Area of the INEEL.

The Bureau of Land Management manages the surrounding areas for multipurpose use. The developed area within the INEEL is surrounded by a 500 mi^2 buffer zone used for cattle and sheep grazing. Communities nearest to the INEEL are Atomic City (south), Arco (west), Butte City (west), Howe (northwest), Mud Lake (northeast), and Terreton (northeast). In the counties surrounding the INEEL, approximately 45% is agricultural land, 45% is open land, and 10% is urban. Sheep, cattle, hogs, poultry, and dairy cattle are produced; and potatoes, sugar beets, wheat, barley, oats, forage, and seed crops are cultivated. The U.S. Government or private individuals own most of the land surrounding the INEEL.

Fences and security personnel strictly control public access to facilities at the INEEL. State Highways 22, 28, and 33 cross the northeastern portion of the INEEL and U.S. Highways 20 and 26 cross the southern portion. A total of 90 miles of paved highways pass through the INEEL and is used by the general public.

1.2 Naval Reactors Facility

The Naval Reactors Facility (NRF) is located on the west central side of the INEEL, as shown on Figure 1, approximately 50 miles west of Idaho Falls, Idaho. NRF was established in 1949 as a testing site for the Naval Nuclear Propulsion Program. The Westinghouse Electric Company operates NRF for DOE, Office of Naval Reactors. NRF covers 7 square miles of which 80 acres are developed and, at various times, was occupied by up to 3,300 people. Approximately 650 Westinghouse employees and 390 long-term subcontractor employees are currently working at NRF. The nearest public roads to NRF are approximately 7 miles west, 10 miles north, and 10 miles south.

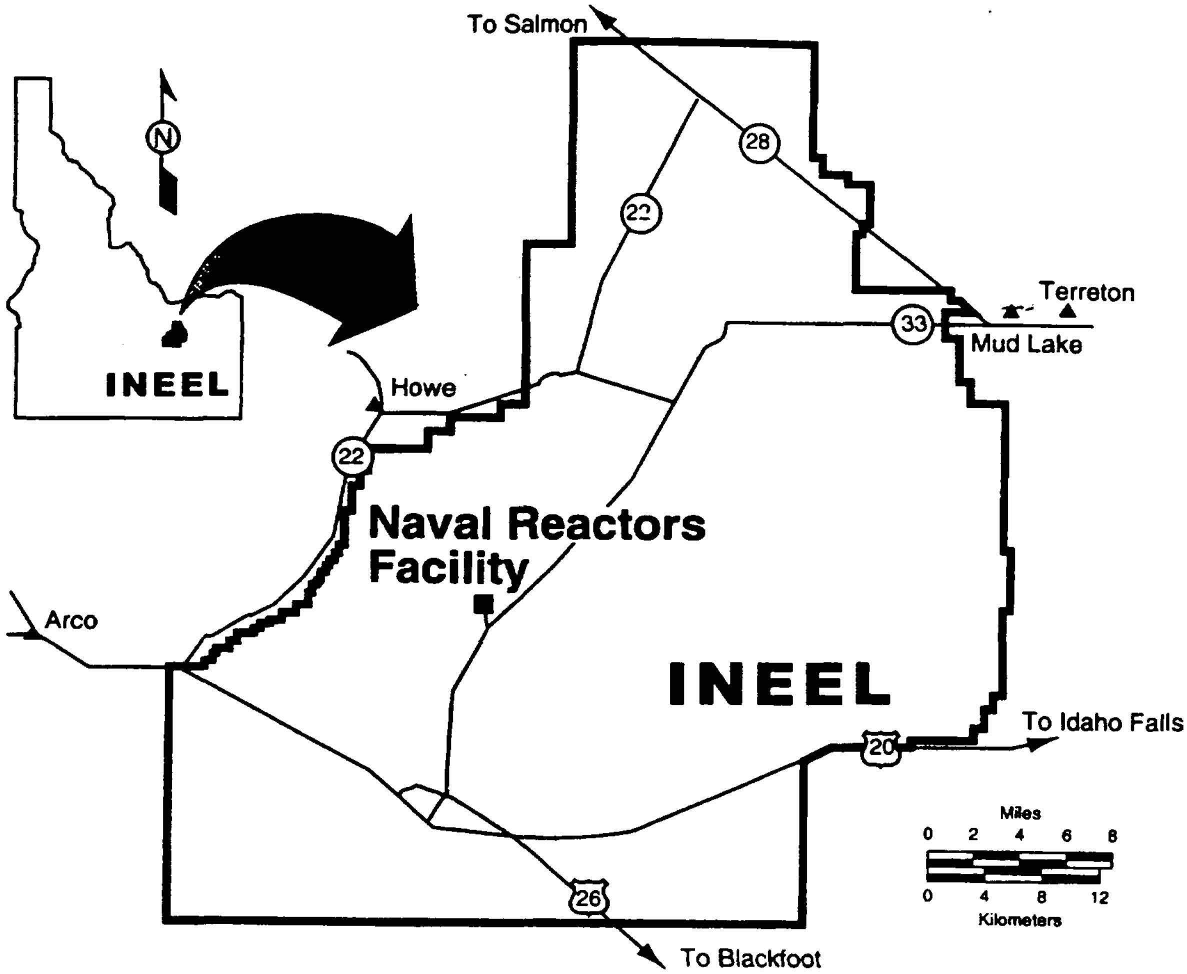

Figure 1. Location of the Naval Reactors Facility (Waste Area Group 8)

NRF consists of three Naval nuclear reactor prototype plants, the Expended Core Facility (ECF), and miscellaneous support buildings. Construction of the Submarine Thermal Reactor prototype (S1W) at NRF began in 1951. The prototype completed operation in 1989. The Large Ship Reactor Prototype (A1W) was constructed in 1958 and completed operation in January 1994. The submarine reactor plant prototype (S5G) was constructed in 1965 and completed operation in May 1995. The prototypes were used to train sailors for the nuclear navy and were used for research and development purposes. The Expended Core Facility, which receives, inspects, and conducts research on naval nuclear fuel, was constructed in 1958 and is still in operation.

1.3 Physical Characteristics

The INEEL is located on the northeastern portion of the Eastern Snake River Plain, a volcanic plateau that is composed primarily of volcanic rocks and relatively minor amounts of sediments. Underlying the INEEL is a series of basaltic flows containing sedimentary interbeds. The Snake River Plain Aquifer (SRPA) is the largest potable aquifer in Idaho, and underlies the Eastern Snake River Plain and the INEEL. The aquifer is approximately 200 miles long and 50 miles wide, and covers an area of approximately 9,600 mi^2. The depth to the SRPA at the INEEL varies from approximately 200 feet in the northeastern corner to approximately 900 feet in the southeastern corner. The distance between these extremes is 42 miles. The EPA designated the SRPA as a sole-source aquifer under the Safe Drinking Water Act on October 7, 1991. The aquifer possesses a high hydraulic conductivity on a large scale because of the presence of fractures in the basalt. Local hydraulic conductivity may vary greatly due to the heterogeneous distribution of the physical properties of the aquifer. Groundwater flow in the SRPA is to the south-southwest at rates between 1.5 to 20 feet per day. In the vicinity of NRF, recharge to the SRPA occurs by infiltration from the Big Lost River, Little Lost River and Birch Creek, and to a lesser extent by infiltration due to precipitation. The average annual precipitation at the INEEL is approximately 8.5 inches.

NRF is located in the central portion of the INEEL. The land surface at NRF is relatively flat, with elevations ranging from 4,835 feet towards the distal end of the NRF industrial waste ditch, which is located approximately one mile north of NRF, to 4,870 feet at the south end of NRF. NRF is not located in the 100-year flood plain, although parts of the INEEL are on the flood plain. A flood with a recurrence interval of 5,000 to 8,000 years is capable of inundating NRF.

NRF is located on the alluvial plain of the Big Lost River. The thickness of alluvial sediment in the vicinity of NRF ranges from several inches to in excess of 60 feet north of NRF. Most of the soil near NRF is mapped as sandy loam or loess. The loess is an accumulation of wind deposited silt sized particles. Near surface sediments at NRF consist of alluvial deposits of the Big Lost River and are composed of unconsolidated fluvial deposits of silt, sand, and pebble-sized gravel.

A complex sequence of basalt flows and sedimentary interbeds underlie NRF. The sedimentary interbeds vary in thickness and lateral extent and separate the basalt flows that underlie the surficial alluvium. Samples from basalt flows have been correlated into 23 flow groups that erupted from related source areas. Known source vents occur to the southwest, along what is referred to as the Arco volcanic rift zone, to the southeast along the axial volcanic zone, and to the north at Atomic Energy Commission Butte. The uneven alluvial thickness and undulating basalt surface at NRF are common of basalt flow morphology.

The SRPA occurs approximately 375 feet below NRF, and consists of a series of saturated basalt flows and interlayered pyroclastic and sedimentary material. Drinking water for employees at NRF comes from several production wells located in the central portion of the facility. Perched water, which sets above the regional water table, occurs in several locations beneath NRF. All perched water at NRF is associated with past or current large volume surface sources of water. The most significant perched water at NRF is located beneath the outfall of the NRF industrial waste ditch.

1.4 Ecological Characteristics

Fifteen distinctive vegetative cover types have been identified at the INEEL. The vegetation cover class at NRF is primarily shrub-steppe flats with sagebrush being the dominant species and providing the majority of habitat. No threatened, endangered, or otherwise regulated flora is known to be present in the NRF area.

The variety of habitats on the INEEL supports numerous species of reptiles, birds, and mammals. Several bird species warrant special concern because of their threatened status or sensitivity to disturbance. These species include the ferruginous hawk, bald eagle, prairie falcon, merlin, long-billed curlew, and burrowing owl. NRF is not known to be within a critical habitat for endangered or threatened species. The bald eagle, golden eagle, and American peregrine falcon have been observed, but are not know to frequent the area around NRF.

The Threatened Fish and Wildlife Act does not identify any fish or wildlife species of concern at NRF. Migratory waterfowl frequent areas of NRF, but the areas with potential remedial actions do not provide critical habitat. The Idaho Department of Fish and Game lists the ringneck snake, whose occurrence is considered to be INEEL-wide, as a Category C sensitive species. NRF is a disturbed industrial area with continuous human activity that contains little suitable habitat for most endangered, threatened or sensitive species. Potential remedial actions at NRF are not expected to affect these species, including adverse impacts to migratory waterfowl, because of the limited area of concern, the previously disturbed nature of the area, and the expected limited duration of any potential remedial actions.

1.5 Archeological and Historical Characteristics

The area around NRF has been surveyed for archeological or historical value. Although some archeological remnants have been found around NRF, areas with potential remedial actions do not contain any known archeological or historical items of value. These areas have been previously disturbed and archeological or historical remnants would not be expected. Therefore, the regulatory requirements associated with the preservation of antiquities and archeological materials and sites are not a concern.

The Idaho State Historical Society has identified the INEEL as containing properties potentially eligible for the National Register of Historic Places (NRHP). Several structures at NRF may be eligible for the NRHP and, therefore, would be accorded the same protection under the National Historic Preservation Act (NHPA) as if they were listed under the act. If potential remedial actions may adversely impact these structures, all applicable requirements established under the NHPA will be followed for the remedial actions.

2.0 Summary of CERCLA Activities at NRF

2.1 CERCLA Background at NRF

In 1987, a Consent Order and Compliance agreement (COCA) was established between DOE and the U.S. Environmental Protection Agency (EPA) pursuant to the Resource Conservation and Recovery Act (RCRA) Section 3008(h). The COCA required an initial assessment and screening of all solid and/or hazardous waste disposal areas at the INEEL and set up a process for conducting any necessary corrective actions. In 1989, the INEEL was placed on the National Priorities List (NPL) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). In 1991, the EPA, Idaho Department of Health and Welfare (IDHW) and DOE signed the Federal Facility Agreement and Consent Order (FFA/CO), which superceded the COCA. The FFA/CO established the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This agreement and the associated Action Plan defined the decision process for conducting assessments and investigations of potential contaminant release areas.

To better manage the environmental investigations under CERCLA, the INEEL was divided into ten Waste Area Groups (WAGs), of which NRF was designated as WAG 8. Within each WAG, all areas with a potential for past contaminant releases were identified as sites. Those sites with similar releases and migration pathways were grouped into operable units (OUs). A total of 87 known or suspected contaminant release sites, of which 71 were classified in nine OUs, were identified at NRF as requiring further study under the CERCLA process. Table 1 lists the OUs and sites associated with NRF. Four sites, NRF-12, NRF-18, NRF-21, and NRF-52, were each divided into two separate sites for evaluation purposes (included in the 87 total sites). Figure 2 shows the status and decisions made for each identified OU at NRF. Figure 3 shows the location of each site with respect to NRF. The site numbers shown on Figure 3 correspond to the site numbers given on Table 1. The remainder of this section summarizes the CERCLA process used to determine the decisions made for each site.

2.2 CERCLA Investigations

Each of the 87 sites required an investigation to determine potential risks to human health and the environment. Thirteen of the 87 sites were evaluated prior to the FFA/CO under the COCA and were not part of an OU. The remaining 74 sites were assessed as CERCLA-type investigations. The CERCLA investigations included Track 1, Track 2, and Remedial Investigation/Feasibility Study (RI/FS) type investigations. A Track 1 investigation involved sites that were believed to have a low probability of risk and sufficient information available to evaluate the sites and recommend a course of action. A Track 2 investigation involved sites that did not have sufficient data available to make a decision concerning a level of risk; for these sites, collection of additional data was necessary. An RI/FS is the most extensive investigation and attempts to characterize the nature and extent of contamination, to assess risks to human health and the environment from potential exposure to contaminants, and to evaluate cleanup actions. In addition to the investigations performed for each site through a Track 1, Track 2, or RI/FS process, a comprehensive RI/FS was performed to assess the potential cumulative, or additive, effects to human health and the environment from all sites at NRF.

Table 1. List of WAG 8 Sites

Operable Unit	Site Number[1]	Site Name
None		
	NRF-04	Top Soil Pit Area
	NRF-05	West Landfill
	NRF-07	East Landfill
	NRF-24	Demineralizer and Neutralization Facility
	NRF-25	Chemical Waste Storage Pad
	NRF-27	Main Transformer Yard
	NRF-30	Gatehouse Transformer
	NRF-34	Old Parking Lot Landfill
	NRF-39	Old Radiography Area
	NRF-46	Kerosene Spill
	NRF-57	S1W Gravel Pit
	NRF-60	Old Incinerator
	NRF-67	Old Transformer Yard
8-01		
	NRF-03	ECF Gravel Pit
	NRF-06	Southeast Landfill
	NRF-08	North Landfill
	NRF-33	South Landfill
	NRF-40	Lagoon Construction Rubble
	NRF-41	East Rubble Area
	NRF-63	A1W Construction Debris Area
8-02		
	NRF-09	Parking Lot Runoff Leaching Trenches
	NRF-37	Old Painting Booth
	NRF-38	ECF French Drain
	NRF-42	Old Sewage Effluent Ponds
	NRF-47	Site Lead Shack (Building #614)
	NRF-52A	Old Lead Shack (Location #1)
	NRF-52B	Old Lead Shack (Location #2)
	NRF-54	Old Boilerhouse Blowdown Pit
	NRF-55	Miscellaneous NRF Sumps and French Drains
	NRF-61	Old Radioactive Materials Storage and Laydown Area
	NRF-64	South Gravel Pit
	NRF-68	Corrosion Area Behind BB11
8-03		
	NRF-10	Sand Blasting Slag Trench
	NRF-15	S1W Acid Spill Area
	NRF-18A	S1W Spray Pond #1
	NRF-18B	S1W Spray Pond #2 and A1W Cooling Tower
	NRF-20	A1W Acid Spill Area
	NRF-22	A1W Painting Locker French Drain
	NRF-23	Sewage Lagoons
	NRF-45	Site Incinerator
	NRF-56	Degreasing Facility
8-04		
	NRF-28	A1W Transformer Yard
	NRF-29	S5G Oily Waste Spill
	NRF-31	A1W Oily Waste Spill

Operable Unit	Site Number[1]	Site Name
8-04 (con't)		
	NRF-44	S1W Industrial Wastewater Spill Area
	NRF-58	S1W Old Fuel Oil Tank Spill
	NRF-62	ECF Acid Spill Area
	NRF-65	Southeast Corner Oil Spill
	NRF-69	Plant Service Underground Storage Tank (UST) Diesel Spill
	NRF-70	Boiler House Fuel Oil Release
	NRF-71	Plant Service UST Gasoline Spill
	NRF-72	NRF Waste Oil Tank
	NRF-73	NRF Plant Services Varnish Tank
	NRF-74	Abandoned UST's Between the NRF Security Fences
	NRF-75	Fuel Oil Revetment Oil Releases
	NRF-76	Vehicle Barrier Removal
	NRF-77	A1W Fuel Oil Revetment Oil Releases
8-05		
	NRF-01	Field Area North of S1W
	NRF-51	West Refuge Pit #4
	NRF-59	Original S1W Refuse Pit
8-06		
	NRF-35	Lagoon Landfill #1
	NRF-36	Lagoon Landfill #2
	NRF-48	West Refuse Pit #1
	NRF-49	West Refuse Pit #2
	NRF-50	West Refuse Pit #3
	NRF-53	East Refuse Pits and Trenching Area
8-07		
	NRF-26	Industrial Waste Ditch
8-08		
	NRF-02	Old Ditch Surge Pond
	NRF-11	S1W Tile Drain Field and L-shaped Sump
	NRF-12A	Underground Piping to Leaching Pit
	NRF-12B	S1W Leaching Pit
	NRF-13	S1W Temporary Leaching Pit
	NRF-14	S1W Leaching Beds
	NRF-16	Radiography Building Collection Tanks
	NRF-17	S1W Retention Basins
	NRF-19	A1W Leaching Bed
	NRF-21A	Old Sewage Basin
	NRF-21B	Sludge Drying Bed
	NRF-32	S5G Basin Sludge Disposal Bed
	NRF-43	Seepage Basin Pumpout Area
	NRF-66	Hot Storage Pit
	NRF-79	ECF Water Pit Release
	NRF-80	A1W/S1W Radioactive Line Near BB19
	NRF-81	A1W Processing Building Area Soil
8-09		
	None	Interior Industrial Waste Ditch
New Sites		
	NRF-82	Evaporator Bottoms Tank Release
	NRF-83	ECF Hot Cells Release Area

(1) NRF-78 was not assigned

The nine OUs at NRF were identified such that each OU contains one or more sites that have similar releases and involve the same type of CERCLA investigation. OUs 8-01, 02, 03, and 04 were Track 1 investigation sites. OUs 8-05, 8-06, and 8-09 were Track 2 investigation sites. OUs 8-07 and 8-08 were RI/FS units. Each site was investigated prior to the NRF Comprehensive RI/FS with the exception of the OU 8-08 sites and two newly identified sites. The OU 8-08 sites were investigated as part of the NRF Comprehensive RI/FS. The two new sites were investigated after the Comprehensive RI/FS using Track 1 investigations.

2.3 Summary of Past CERCLA Decisions

Thirteen of the 87 sites at NRF were evaluated prior to the FFA/CO under the COCA and were not part of an OU. These 13 sites were identified as no action sites in the FFA/CO.

In September 1994, a Record of Decision (ROD) was issued for ten sites in OUs 8-05 and 8-06, Landfill Areas, and OU 8-07, Exterior Industrial Waste Ditch. OUs 8-05 and 8-06 consist of nine sites and OU 8-07 is a single site. The decision for six sites in OUs 8-05 and 8-06 (NRF-35, 36, 48, 49, 50, and 59) and OU 8-07 was no action. The selected remedy for NRF-01, 51, and 53 within OUs 8-05 and 8-06 was the presumptive remedy for CERCLA municipal landfill sites, which consisted of containment of landfill contents with an engineered cover and monitoring of soil gas and groundwater.

2.4 Summary of Past CERCLA Response Actions

The construction of landfill covers for NRF-01, 51, and 53, as discussed above, were completed in September 1996. Seven rounds of soil gas and groundwater samples have been collected. The soil gas and groundwater samples are collected quarterly.

Two small removal actions were performed at sites NRF-20, A1W Acid Spill Area, and NRF-22, A1W Painting Locker French Drain. Soil contaminated with lead was removed from NRF-20 in August 1994 and sediment contaminated with various heavy metals was removed from NRF-22 in September 1994. NRF-22 was filled in with concrete eliminating any potential exposure pathway. NRF-20 and NRF-22 are part of OU 8-03.

2.5 Scope and Role of the NRF Comprehensive RI/FS

Eight of the nine operable units had been investigated prior to the NRF Comprehensive RI/FS. OU 8-08 represented the last OU to be investigated. The FFA/CO Action Plan describes OU 8-08 as the WAG 8 (NRF) Comprehensive RI/FS. OU 8-08 also included 18 potential radiological sites that were not assessed in any previous OU. The primary purposes of the NRF Comprehensive RI/FS were as follows: (1) investigate the 18 radiological OU 8-08 sites, which were not previously assessed; (2) evaluate the cumulative, or additive, effects of all sites at NRF on human health and the environment; and (3) address the contamination associated with those sites that had unacceptable, or potentially unacceptable, risks, which were identified as sites of concern.

OU 8-08 includes 18 sites that were not previously investigated under other OUs. These sites were grouped under OU 8-08 because of similar constituents, release mechanisms, and migration paths. The OU 8-08 sites represent areas where past controlled releases of low-level radioactive water were discharged and areas where inadvertent releases to the environment occurred because of leaks from corroded piping, leaks in underground concrete basins, surface releases, and cross-contamination of non-radiological systems with radiological systems.

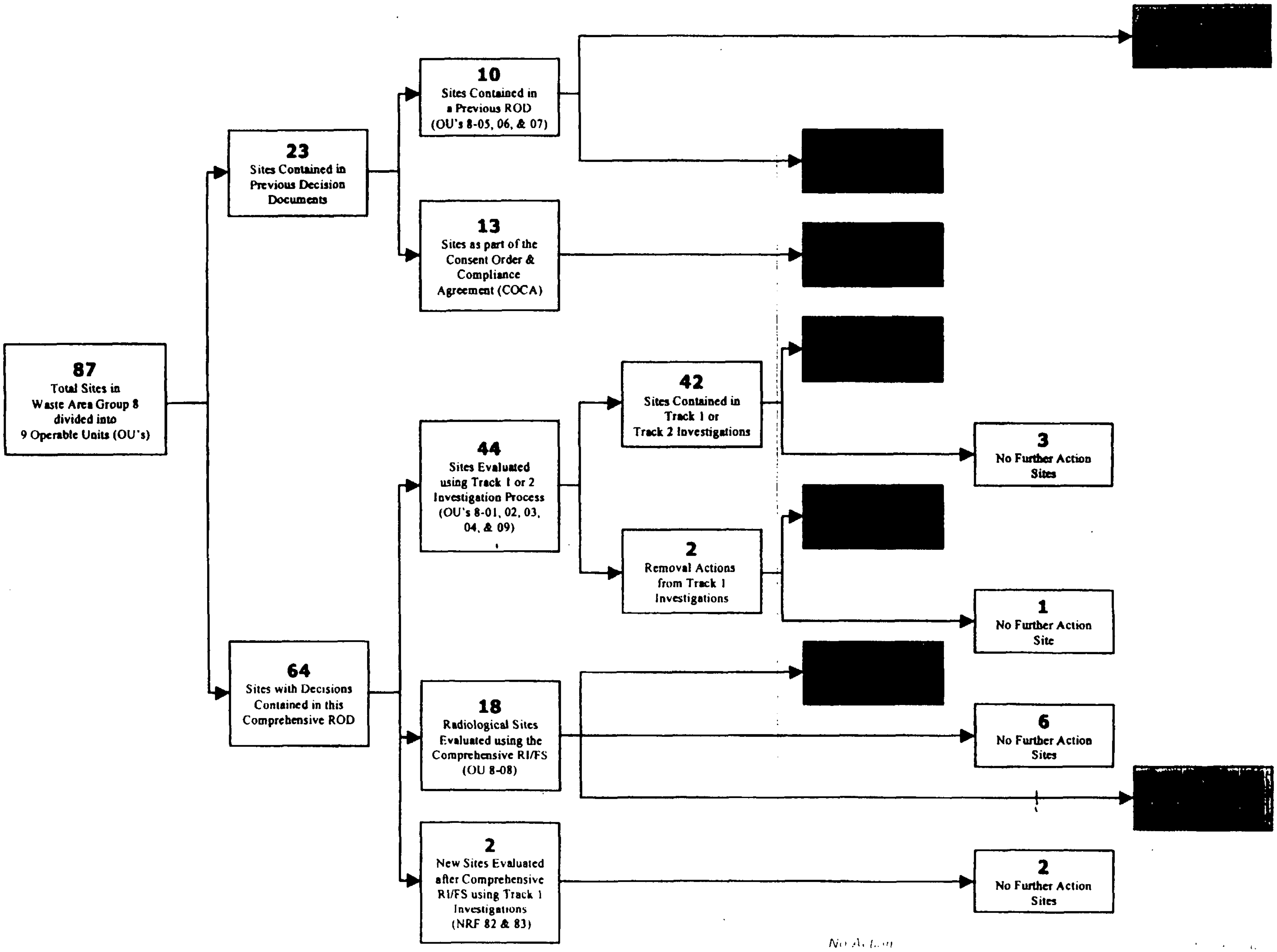

Figure 2. Synopsis of CERCLA Sites at NRF

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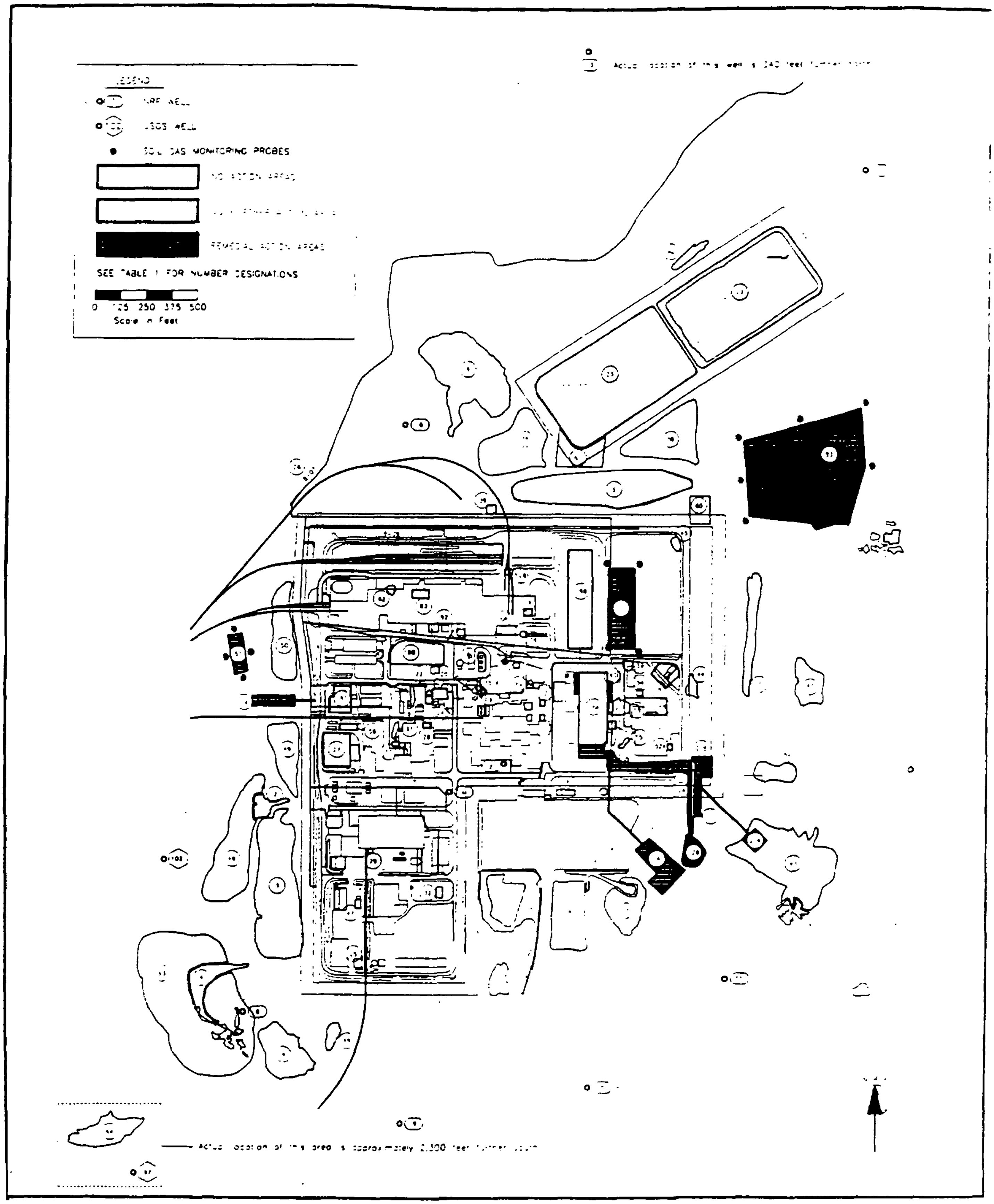

Figure 3. CERCLA Sites Associated with NRF

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The primary purpose of the radiological site assessments in OU 8-08 was to evaluate potential human health risks present at each site through various exposure pathways. Media which could create potential exposure pathways included soil, air, and groundwater. Contaminants of potential concern were determined based on risks from exposure pathways such as ingestion of soil or groundwater and direct exposure to radionuclides. Scenarios for current and future workers and future residents were considered.

The cumulative, or additive, assessment associated with the NRF Comprehensive RI/FS addressed the risks posed to human health and the environment from all identified NRF sites including the radiological areas in OU 8-08. The comprehensive assessment included reviewing all past site investigations. Sites were screened based on the presence of a contaminant source at the site. Contaminants of potential concern (COPCs) were identified and exposure pathways that could result in a cumulative risk were determined. Exposure pathways were limited to air and groundwater exposure routes, since soil exposure routes were generally site specific and not cumulative. The comprehensive assessment also included an ecological assessment to evaluate potential impacts to ecological receptors.

2.6 Purpose of this Record of Decision

This ROD addresses 64 of the 87 sites identified at NRF. (No action determinations were made for 13 sites identified in the FFA/CO. A previous ROD addressed ten sites in OUs 8-05, 8-06, and 8-07.) The Comprehensive RI/FS included 85 sites in the comprehensive cumulative risk assessment; two new sites (NRF-82 and -83) were identified after the RI/FS, and were determined to have no effect on the cumulative risk. The NRF Comprehensive RI/FS also concluded that the remedies selected for the prior 13 No Action sites, and for the ten sites addressed by a previous ROD, are protective of human health and the environment from a cumulative evaluation.

Based on evidence compiled in the NRF Comprehensive RI/FS, 55 of the 64 sites included in this ROD do not have risks or have acceptable risks to human health and the environment and require no remedial action. This includes the two new sites identified after the Comprehensive RI/FS. These 55 sites have been defined as No Action or No Further Action sites (these designations are discussed in detail in Section 8.0). Nine of the 64 sites were determined in the NRF Comprehensive RI/FS to have unacceptable or potentially unacceptable risks that must be addressed. The nine sites were all radiological areas associated with OU 8-08. These nine sites of concern were included in a screening, development, and detailed analysis of remedial action alternatives and resulted in the selection of a preferred alternative.

The remainder of this ROD summarizes the NRF Comprehensive RI/FS, the public's role in the ROD decisions, and the conclusions and decisions made to remediate the NRF site.

3.0 Summary of Site Characteristics

This section provides an overview of the site characteristics for the 64 sites being addressed by this ROD. The first part of this section discusses the characteristics of sites in OUs 8-01, 02, 03, 04, and 09. These OUs were investigated through either Track 1 or Track 2 processes prior to the NRF Comprehensive RI/FS. The second part of this section discusses OU 8-08 sites and the two new sites identified after the NRF Comprehensive RI/FS. These sites are discussed in more detail because the OU 8-08 sites were investigated as part of the NRF Comprehensive RI/FS and the new sites were not part of any other OU. (OUs 8-05, 06, and 07 are not discussed because previous decision documents have been issued for these OUs.)

A total of 44 sites are associated with OUs 8-01, 02, 03, 04, and 09. Eighteen sites are associated with OU 8-08. NRF-23, Sewage Lagoons, was originally part of OU 8-03 but was included with the OU 8-08 sites as a recommended conclusion of the site's Track 1 investigation. The two new sites were not associated with any OU.

3.1 Site Characteristics (Previous Investigations)

As stated, OUs 8-01, 02, 03, 04, and 09 were investigated prior to the NRF Comprehensive RI/FS. Each OU represents a site or group of sites with similar releases and migration pathways. The Track 1 or Track 2 investigation for each of these 44 sites resulted in a determination that enough information was available to allow a recommended decision without collecting additional data. These OUs and associated sites are briefly explained below.

3.1.1 Operable Unit 8-01

OU 8-01 consists of seven construction rubble sites. These sites contain rubble from past construction projects at NRF. Each site was evaluated in a Track 1 investigation.

NRF-03 is an excavated pit that provided clean fill for construction projects. The east end of the pit has been used for disposal of construction debris such as gravel, concrete, metal, and wood. The southeast portion of the pit was used for 3 months in 1985 for routine nonhazardous discharge water. The pit has also been used as a gunnery range for security personnel. Soil sampling showed only slightly elevated amounts of metals. The risk was estimated to be low based on the Track 1 evaluation.

NRF-06, 08, 33, 41, and 63 are rubble piles from past construction projects. The rubble piles consist primarily of soil, concrete, metal, and wood. No hazardous source is present.

NRF-40 is a soil pile from an expansion project to enlarge the current sewage lagoons. No hazardous source is present.

3.1.2 Operable Unit 8-02

OU 8-02 consists of 12 miscellaneous sites that were initially designated as Track 1 low priority sites. Each site was evaluated in a Track 1 investigation.

NRF-09 is comprised of three parking lot runoff trenches that allow water from spring thaws and heavy rainfall to drain from the parking lot. Soil sampling showed elevated amounts of lead and silver; however, the risk was estimated to be low based on the Track 1 evaluation.

NRF-37 is the former location of a temporary painting booth and storage area. The area was used from approximately 1963 to 1970. Soil sampling showed no detectable solvents or elevated amounts of metals, therefore, it was determined that no hazardous source is present.

NRF-38 is a precast manhole that received steam condensate from the site steam system. The condensate would evaporate or infiltrate into the soil. The manhole was likely used from 1958 to the 1980s. No hazardous source is present.

NRF-42 is the location of a former temporary sewage pond used in the 1950s. There is no evidence that a hazardous source exists at the site, but elevated amounts of metal, semi-volatile organic, and low-level radionuclide contaminants may be present based on sampling performed in the current sewage lagoons. Based on groundwater sample results and using average concentration data from the current sewage lagoons, this site does not represent a significant groundwater threat. The site is currently covered with a 10 foot layer of soil, thus limiting ingestion or direct contact with any contaminants, if present. Based on current conditions (i.e., 10 foot soil cover), the risk was estimated to be low based on the Track 1 evaluation.

NRF-52A, 52B, and 47 represent three locations of a lead casting and storage building. NRF-52A and 52B consist of two former locations where the soil was disturbed during past construction activities after the building was relocated. Soil samples collected near the original building location (NRF-52A) showed elevated levels of lead; however, the levels were still below the EPA recommended screening level for lead cleanup of 400 ppm. The risk for the original building location was estimated to be low based on the Track 1 evaluation. The building was moved in 1956. There was no evidence of elevated lead levels at this second location (NRF-52B). No hazardous source is present at this second building location. The building was again moved in 1982 to its current location (NRF-47). Although the building is no longer used for lead casting, samples collected from the current building location showed the building siding and drainage system did not have elevated lead levels; thus, no hazardous source was determined to be present.

NRF-54 is a steam boiler blowdown pit that was used for several years in the 1950s. The pit has reinforced concrete walls and a dirt floor. The condition of the pit is not known since the pit and access to the pit are presently covered by grass. The pit received water from blowdown of the boilers to prevent scale buildup in the system. No hazardous source is present.

NRF-55 consists of 17 french drains located around NRF. Eleven of the drains are used for steam condensate, five for storm water, and one receives water from occasional washing of vehicles. The french drains are gravel filled excavations to promote infiltration. These drains would not have received hazardous constituents, and therefore were determined to not contain a hazardous source.

NRF-61 is a former location of a radioactive material storage and laydown area that was used from 1954 to 1960. Soil sampling showed detectable amounts of cesium-137. The risk assessment assumed an institutional control period for the future residential scenario. The risk was estimated to be low based on the Track 1 evaluation.

NRF-64 is a gravel pit that has been used as a construction rubble pile. The rubble pile consists of concrete, metal, wood, and asphalt. A piece of asbestos was found at the site in 1989. A burn pile exists near the gravel pit and the ground appears stained with petroleum hydrocarbons. It is hypothesized that petroleum products were used to facilitate burning combustible waste. Soil sampling showed elevated total petroleum hydrocarbons. The risk was estimated to be low based on the Track 1 evaluation.

NRF-68 is an area that has been used for vehicle parking and construction pipe staging and cutting operations. This site was erroneously titled a "corrosion" area. Soil sampling showed detectable total petroleum hydrocarbons in the area. Small amounts of chlorobenzene were also detected in the soil. The risk was estimated to be low based on the Track 1 evaluation.

3.1.3 Operable Unit 8-03

OU 8-03 consists of eight miscellaneous sites that were initially designated as Track 1 high priority sites. Each site was evaluated in a Track 1 investigation.

NRF-10 is an area where sandblast grit from paint removal operations in the 1950s was deposited. The sandblast grit was removed in 1990. Verification sampling performed in 1991 showed elevated levels of several metals in the soil. Arsenic, chromium, and lead were detected at concentrations above background levels. A Track 1 risk assessment was performed that calculated risk-based soil concentrations for the residential and occupational scenarios. Although chromium and arsenic were detected in individual samples above risk-based soil concentrations, the risk assessment used very conservative estimates and a risk management decision was made that actual risks are acceptable.

NRF-15 and 20 are acid spill areas. Elevated levels of metals are present at each site. NRF-20 included lead contaminated soil above the EPA recommended screening level for lead cleanup. A soil removal action was performed at NRF-20 after receiving public comment on the proposed action. The only contaminants remaining at elevated levels after the removal action are mercury and lead (which is now below the screening level goal of 400 ppm). Sampling at NRF-15 showed elevated levels of chromium, lead, mercury, and nickel. The concentrations of contaminants at both sites were determined to be below risk-based concentrations. A risk assessment for each site estimated risks to be low based on the Track 1 evaluations.

NRF-18A and NRF-18B are the S1W Spray Ponds, A1W Cooling Tower, and portions of the fire protection system, and were originally designated as one site, NRF-18. At one time, a chromium based corrosion inhibitor was used in the water. The spray ponds are large concrete structures that contained cooling water for S1W plant operations. The A1W Cooling Tower served a similar function for the A1W prototype plant. Leakage and overspray from the ponds, tower, and fire protection system caused elevated chromium concentration in the surrounding soil. The Track 1 risk assessment assumed the spray ponds would remain in place, limiting exposure to the soil below the basins if any contamination was present. The resulting risk assessment estimated a low risk based on the Track 1 evaluation, but additional evaluation of NRF-18 in the NRF Comprehensive RI/FS concerning the groundwater pathway was considered appropriate.

The A1W Cooling Tower was demolished in 1995. In 1997, a decision was made to demolish the S1W Spray Pond #2. Subsequent to the Comprehensive RI/FS, NRF-18 was split into two sites: NRF-18A, S1W Spray Pond #1, and portions of the fire protection system; and NRF-18B, S1W Spray Pond #2 and A1W Cooling Tower. Additional data was collected at Spray Pond #2 after the NRF Comprehensive RI/FS in preparation of demolishing the spray pond. Twenty-four boreholes drilled through the bottom of the spray pond and twenty boreholes outside the perimeter of the spray pond were used to collect additional samples. Sample results showed slightly elevated amounts of chromium. The risk associated with Spray Pond #2 was determined to be low with much less uncertainty than the initial assessment because of the additional data. Spray Pond #1 was not included in this evaluation since no additional data were collected from Spray Pond #1 and, therefore, Spray Pond #1 was given a separate site designation (NRF-18A).

NRF-22 is the location of a former french drain that may have received paints, solvents, and possibly mercury. A removal action was performed after receiving public comment on the proposed action. Sampling performed after the removal action showed elevated levels of lead and mercury remained. The excavated hole was 12 feet deep and was grouted to the surface eliminating all exposure pathways. The risk assessment after the removal action estimated the risk to be low based on the Track 1 evaluation. Although no exposure route is present, a source remains at the site.

NRF-45 is the former location of an incinerator used to burn outdated documents. The incinerator was used at this location from 1985 to 1992. Barium, silver, and zinc were detected at elevated levels during sampling of the ash from the incinerator. The concentrations were determined to be below risk-based concentrations for the occupational and residential scenarios. The risk for the site was estimated to be low based on the Track 1 evaluation.

NRF-56 is a former location of a pipe degreasing and pickling facility used between 1957 and 1961. The facility was replaced with a railroad car shed which was used as a pipe fitter and welder training shop and is currently a records storage building. The original facility was likely completely removed when the railroad car shed was placed at this location. No hazardous source is present.

3.1.4 Operable Unit 8-04

OU 8-04 consists of sixteen sites where spills, primarily petroleum products, have occurred. Each site was evaluated in a Track 1 investigation.

NRF-28, 29, 31, 58, 65, 69, 70, 71, 72, 74, 75, 76, and 77 represent sites of past petroleum product releases. Most of the sites were oil release areas with the exception of NRF-69 (diesel) and NRF-71 (gasoline). These spill areas were generally cleaned up, but some residual contamination exists. The contaminants of concern include polychlorinated biphenyls (PCBs), total petroleum hydrocarbons, benzene, toluene, ethylbenzene, and xylene. Each contaminant was determined to be below risk-based concentrations. A risk assessment for each site estimated the risk to be low based on the Track 1 evaluations.

NRF-44 is an area where wastewater was discharged between 1954 and 1959. The discharges included surface water runoff, steam condensate, cooling water, and water from an oil-water separator. No hazardous source is present.

NRF-62 is the location of a past nitric acid spill. Around 1960, 2,460 gallons of acid was spilled. The area has since been disturbed and covered by ECF expansion construction activity. No remaining hazardous source is present.

NRF-73 is a former varnish tank. The varnish tank was used from 1970 to 1980 and was removed in 1991. Xylene was the primary component of the varnish. There was no evidence of tank leakage when the tank was removed in 1991. No hazardous source is present.

3.1.5 Operable Unit 8-09

OU 8-09 consists of the interior industrial waste ditch system. The interior waste ditch system is comprised of a network of culverts, pipes, and uncovered drainage ditches with a combined length of 23,000 feet. The system collected discharges from prototype operations, support operational activities, and storm water. Various modifications to the ditch system have been made throughout the years. The ditch may have received small amounts of hazardous constituents from cooling systems, photographic operations, and laboratory operations between 1953 and 1985. No hazardous constituents have been discharged since 1985. Contaminants of concern included various metals, organics, and radionuclides (cesium-137 and cobalt-60). A Track 2 assessment was performed on this unit. The calculated risks were within the target risk range and are considered by the agencies to be acceptable.

3.2 Site Characteristics (Operable Unit 8-08 Sites)

OU 8-08 sites were investigated as part of the NRF Comprehensive RI/FS. OU 8-08 included several radiological areas and was the last OU investigated. The 18 sites associated with OU 8-08 are discussed in more detail below. The investigation of the radiological sites in OU 8-08 was one of the primary purposes of the NRF Comprehensive RI/FS.

3.2.1 Background

Low-level radioactive effluent, primarily water with small amounts of radioactivity, was generated by each prototype facility as a result of past operations. Between June 1953 and April 1979, this low-level radioactive effluent was discharged to several leaching beds in accordance with established regulations at the time. These leaching beds are also referred to as leaching pits, ponds, lagoons, basins, or drainfields. These discharges were discontinued in 1979 when a water reuse system was established.

Beginning in 1953, low-level radioactive effluent from the S1W prototype was sent to a drainfield known as the S1W Tile Drainfield (NRF-11). This drainfield was also likely used for sewage discharges. In 1955, the sewage system and radioactive system were separated. NRF-11 was no longer used and radioactive effluent went to an underground perforated pipe drainfield (NRF-12A). Around 1957, a pit was dug at the end of the drainfield to allow the water to pond. The pit is known as the S1W Leaching Pit (NRF-12B).

A special basin or pit was constructed in 1956 for a one-time discharge of radioactive effluent that contained some oil. This basin was referred to as the S1W Temporary Leaching Pit (NRF-13). The pit was used to prevent the drainfields from receiving oily effluent thereby reducing their efficiency. The temporary pit was filled in with the soil immediately after the one-time discharge.

A1W began operation in 1958, with ECF beginning shortly thereafter. The A1W Leaching Bed (NRF-19) was constructed on the west side of NRF. The bed received effluent from A1W and ECF. The leaching bed was used sporadically through 1972.

In 1960, a new leaching bed known as the S1W Leaching Bed (NRF-14) was constructed south of the S1W prototype to receive S1W prototype effluents. This bed was a ponding area to allow infiltration of liquid into the soil. A second pond was constructed adjacent to the first in 1963. These ponds primarily received effluent from S1W, but also received effluent from the other facilities (S5G, A1W, and ECF). The last discharge to the leaching beds was in 1979.

Most of the effluent associated with the S1W discharge areas (NRF-11, NRF-12B, and NRF-14) was stored in the S1W Retention Basins (NRF-17) prior to final discharge to the areas. The basins were constructed of concrete and were used from 1953 to 1972.

Approximately 417,000,000 gallons, containing 345.41 curies, were discharged to the various drainfields, pits, and beds at NRF between 1953 and 1979. Table 2 summarizes the curies and gallons released to each site. Table 3 gives a summary by year of the curies and gallons released to all the sites.

In addition to the controlled releases of low-level radioactive liquid, there have been occurrences of inadvertent releases to the environment because of leaks from underground piping (NRF-80) and concrete basins (NRF-17 and 79), surface releases (NRF-16, 66, and 81), and cross-contamination of non-radiological systems with radiological systems (NRF-02, 21A, 21B, 23, and 43). In most cases, these releases are small compared to the controlled discharges.

One site was used for a one-time sludge disposal area (NRF-32). This site represents the only site where potentially radioactive material (sludge) other than water may have been *deposited*.

Table 2. Total Controlled Discharges (gallons and curies) to Radiological Areas (1953-1979)

Unit	Volume (gallons)	Quantity (curies)[a]
NRF-11	17,500,000	5.33
NRF-12	64,102,650	67.861
NRF-13	28,000	0.003
NRF-14	249,809,113	131.35
NRF-19	85,500,310	140.866
Totals	416,940,073	345.41

(a) Based on discharge records from 1960 to 1979 to the S1W Leaching Beds (NRF-14), those radionuclides individually representing greater than 5% of the curie content include cobalt-60 (33%), tritium (28%), and cesium-137 (7.6%). Discharges to NRF-11 and NRF-12 would be similar to NRF-14. The discharge to NRF-13 was primarily strontium-90. Based on discharge records to the A1W Leaching Bed (NRF-19), those radionuclides individually representing greater than 5% of the curie content include tritium (54%), cobalt-60 (15%), and cesium-137 (5.8%).

The vast majority of the discharges to the radiological areas were water with small amounts of radioactivity. Metal and organic constituents were likely present in very small quantities. The metal and organic constituents would have been from processes associated with the prototype plants and ECF. These processes included radiochemical laboratory operations, component decontamination procedures, bilge drainage, oil-water separation, and decontamination showers and sinks.

Radionuclides of concern are primarily the longer-lived radionuclides from testing and operation of prototype nuclear reactors or from spent fuel examinations. Most of the radionuclides with a radioactive half-life less than five years would have naturally decayed to almost undetectable levels by today for any releases between 1953 and 1979. The primary radionuclides with half-lives greater than five years released at NRF are cesium-137, cobalt-60, strontium-90, and tritium. Tritium, which was part of the water molecules in the effluent, would have migrated or evaporated with the water. Tritium would not be expected in the soil near the discharge areas today, since water associated with the effluent is no longer present. Cesium-137 and strontium-90, with half-lives near 30 years, and cobalt-60, with a half-life slightly greater than 5 years, would be the primary radionuclides of concern present in the soil today.

3.2.2 OU 8-08 Site Assessments

Eighteen sites were identified as radiological areas requiring an individual assessment in the NRF Comprehensive RI/FS. The assessment included reviewing past historical information and past sample results. An initial list of contaminants of potential concern (COPCs) was established based on the discharges to the site and past sample data. This data included early monitoring data and characterization sample data collected between 1990 and 1992. The preliminary list of COPCs was compared to risk-based screening levels. These screening levels are concentrations resulting in an estimated increased cancer risk of 1 in 10,000,000 (1E-07) or a hazard quotient of 0.1. The development of risk-based screening levels is discussed in Section 4.1.2.1. Cancer risks and hazard quotients are discussed in more detail in Section 4.0. A conservative approach was used to establish the initial list of COPCs. Maximum contaminant levels from each site were used for screening purposes. Early monitoring data helped identify COPCs and the potential extent of contamination at some locations. The characterization data

Table 3. Yearly Controlled Radiological Discharges to Radiological Areas (NRF-11, 12, 13, 14, 19)

Year	Volume (gallons)	Quantity (curies)
1953	2,500,000	0.08
1954	10,000,000	2.25
1955	10,000,000	6.0
1956	10,928,000	3.467
1957	11,970,000	5.482
1958	15,260,000	31.29
1959	18,745,000	8.68
1960	24,373,000	31.104
1961	24,552,650	23.729
1962	28,118,770	40.893
1963	27,291,200	58.911
1964	27,328,598	32.4
1965	33,115,417	23.65
1966	36,904,836	18.49
1967	35,372,638	8.854
1968	37,987,954	13.453
1969	28,529,781	15.875
1970	20,399,951	12.263
1971	10,680,479	3.720
1972	1,232,098	0.696
1973	525,174	0.5165
1974	440,111	1.588
1975	276,852	1.002
1976	162,571	0.423
1977	194,298	0.303
1978	44,830	0.260
1979	5,865	0.028
Totals	416,940,073	345.408

from 1990-92 typically had the data quality currently required by the EPA for use in risk assessments.

The historical evaluation of the sites provided the basis for the remedial investigation sampling plans. The sampling served several different purposes depending on the area in which the sampling was being performed. In some cases, the determination of a contaminant source and the extent of contamination were the goals of the sampling. This allowed a risk assessment evaluation to be performed with a higher degree of certainty. For other areas, it was important to determine the potential volume of soil that may require a remedial action. In these areas, the nature of the contaminants was known from previous sampling, but a more definitive boundary was needed to provide accurate estimates of potential soil volumes requiring remedial actions. Enough past information was available for some areas that additional sampling during the remedial investigation was not required. After evaluating the historical and remedial investigation sample results, a final list of COPCs was established. These COPCs were used for risk assessments performed as part of the NRF Comprehensive RI/FS and are discussed in Section 4.0.

The following sections describe the characteristics associated with each of the OU 8-08 sites.

3.2.2.1 Old Ditch Surge Pond (NRF-02)

The surge pond area (NRF-02) was excavated in late 1958 or early 1959 as a gravel or soil pit for construction projects at NRF. The pit was approximately 110 feet in diameter and 12 feet deep. The pit was later connected to a drainage ditch and was likely used as a storm water drainage area for heavy precipitation events. Around 1963, the pit and drainage ditch were connected to the NRF interior waste ditch system. The pit, which then acted as a pooling place for water, was used as either an overflow or settling area. The pond area and a portion of the ditch were isolated from the waste ditch system in 1985 when portions of the ditch system were replaced with underground, corrugated piping.

This area was not included in the remedial investigation sampling. Surface soil samples have been collected in the area from 1986 to 1993. The samples were analyzed for cobalt-60 and cesium-137. Cobalt-60 was detected at a maximum activity of 11.28 picocuries per gram (pCi/g) in 1991 and cesium-137 was detected at a maximum activity of 4.7 pCi/g in 1992. Characterization sampling was performed at the pond in 1991. Samples were collected from a borehole in the middle of the ditch to a depth of three feet where the basalt was encountered. Samples were analyzed for pesticides, PCBs, organics and metals. The only COPCs detected were arsenic at 8.5 parts per million (ppm) and chromium at 90.2 ppm, which were both above background levels.

The extent of the contamination is limited to the pond area and attached ditch. The contamination is limited to the upper two feet of soil.

3.2.2.2 S1W Tile Drainfield and L-shaped Sump (NRF-11)

NRF-11 consists of a below-surface sump and various underground, perforated drainfield pipes downstream of the sump. The drainfield was likely used between 1953 and 1955 for sewage and radioactive liquid discharges. The drainfield is approximately 36 feet wide by 200 feet long and consists of four lateral perforated pipes buried six to ten feet deep. The drainfield was connected to the sump, which is a L-shaped concrete structure. Each leg of the sump is 11 feet long and three feet wide with a depth of 12-1/2 feet. The sump was isolated from the drainfield in 1955 and was used until 1960 as part of the sewage system.

An estimated 17,500,000 gallons of radioactive effluent containing 5.33 curies of radioactivity were discharged to the drainfield via the sump. Although discharge records during the timeframe NRF-11 was used did not specify radionuclides, discharges to the drainfield would be similar to later discharges to other facilities. Discharge records from 1960 to 1979 show cobalt-60 (33%), tritium (28%), and cesium-137 (7.6%) were the primary radionuclides released. By 1996, the radioactivity would have decayed to an estimated 0.33 curies. Cobalt-60, with a half-life of only five years, would have decayed to very small levels after 40 years. Tritium would have leached or evaporated with the water. Small amounts of chemicals and oil in the effluent may have been released to the drainfield.

The source of contamination around the L-shaped sump was the same as the drainfield. The sump may have leaked to surrounding soils. In addition, the sump was used until 1960 as part of the sewage system.

Characterization sampling efforts in 1991 collected samples to a depth of 22 feet from a borehole in the drainfield area. The samples were analyzed for pesticides, PCBs, organics, and metals. The only COPCs detected were arsenic (maximum of 7.6 ppm, which is slightly above background), dieldrin (a pesticide at 0.008 ppm in a single sample), cobalt-60 (maximum of 0.07 pCi/g), and cesium-137 (maximum of 0.3 pCi/g, which is actually below surficial soil background levels).

During the remedial investigation, attempts were made to locate the drainfield piping using geophysical methods, but these attempts were inconclusive. Samples were collected from 11 boreholes at the drainfield and around the sump. Due to uncertainties in the location of the drainfield piping, the samples may not have been located adjacent to the piping where contamination is suspected. Samples were collected to a depth of 12 feet and analyzed for radionuclides, organics, PCBs, pesticides, and metals. The only COPC detected in the drainfield area was cobalt-60 at 2.7 pCi/g in one borehole from an eight foot depth. Several COPCs were detected around the sump. Arsenic (maximum of 8.92 ppm at an eight foot depth) was the only non-radiological COPC detected. Americium-241 (0.42 pCi/g in a single sample at a 12 foot depth), americium-243 (0.5 pCi/g in a single sample at a 12 foot depth), cesium-137 (maximum of 45.98 pCi/g at an eight foot depth), cobalt-60 (maximum of 1.17 pCi/g at a 12 foot depth), manganese-54 (0.06 pCi/g in a single sample at a eight foot depth), and plutonium-244 (0.09 pCi/g in a single sample at a 12 foot depth) were the radiological COPCs detected.

The remedial investigation sampling indicates that any significant contamination at the drainfield is likely confined to a small volume of soil near the underground pipes. The extent of contamination is estimated to be an area one foot around the perimeter of the underground piping, which is six to ten feet deep. The contamination around the sump is expected to be within three feet of the sump walls. Past sampling from within the L-shaped sump confirm the presence of cesium-137 above risk-based levels at this site. Based on historical and process knowledge, uncertainty regarding the actual location of the drainfield piping, and sample results from the L-shaped sump located upstream of the drainfield, the agencies have made the presumption that soils at the drainfield are contaminated with cesium-137 above risk-based levels.

3.2.2.3 Underground Piping to Leaching Pit (NRF-12A)

In 1955, a drainfield was constructed south of S1W, adjacent to NRF-11 (S1W Tile Drainfield). The drainfield was an underground, perforated pipe that ran from a manhole to a location 400 feet south of the manhole. The pipe depth was eight feet. This drainfield was used for radiological discharges after NRF-11 was no longer used. In 1957, a pit was dug at the end of the underground pipe to allow pooling of the water. The pit is known as the S1W Leaching Pit (NRF-12B). The drainfield was used for discharges until 1960. NRF-12A includes the manhole and the underground piping from the S1W Retention Basins (NRF-17) to the manhole and from the manhole to the leaching pit.

An estimated 64,100,000 gallons of radioactive effluent containing 67.9 curies of radioactivity were discharged to the drainfield via the manhole. Cobalt-60 and cesium-137 were likely the primary radionuclides released. Most of the cobalt-60 will have decayed away leaving cesium-137 as the primary radionuclide of concern.

Samples were collected from 18 boreholes to a depth of 10 feet during pre-RI/FS sampling in October 1995 along the underground pipe from the retention basins to the manhole. Samples were analyzed for radionuclides and metals. The COPCs detected were chromium (maximum of 110 ppm at an eight foot depth), cesium-137 (maximum of 7,204 pCi/g at an eight foot depth), cobalt-60 (maximum of 70.8 pCi/g at a six foot depth), nickel-63 (maximum of 75.15 pCi/g at an eight foot depth), strontium-90 (maximum of 28.28 pCi/g at an eight foot depth), and plutonium-239 (a single sample of 0.0728 pCi/g at an eight foot depth).

The remedial investigation sampling included five boreholes along the underground pipe from the retention basins to the manhole, three boreholes around the manhole, and five boreholes along the underground, perforated pipe leading from the manhole. Samples were analyzed for PCBs, metals, and radionuclides. The following COPCs were detected: chromium (maximum of 97 ppm at a ten foot depth), mercury (maximum of 6.5 ppm at an eight foot depth), americium-241 (maximum of 0.60 pCi/g at a six foot depth), carbon-14 (maximum of 8.7 pCi/g at an eight foot depth), cesium-137 (maximum of 7,323 pCi/g at an eight foot depth), cobalt-60 (maximum of 104.9 pCi/g at an eight foot depth), nickel-63 (maximum of 329.06 pCi/g at an eight foot depth), plutonium-238 (maximum of 0.60 pCi/g at an eight foot depth), plutonium-239 (maximum of 0.20 pCi/g at an eight foot depth), plutonium-244 (maximum of 0.24 pCi/g at an eight foot depth), and strontium-90 (maximum of 35.35 pCi/g at an eight foot depth).

Most of the contamination at NRF-12A is within three to five feet of the underground pipe. Contamination exists along the entire 400 foot length of underground, perforated pipe from the manhole to the leaching pit location. Contamination is also present along approximately one-half the 500 foot length of underground pipe from the retention basins to the manhole. The contaminants are primarily present between the six and ten foot depth.

3.2.2.4 S1W Leaching Pit (NRF-12B)

In 1957, a pit was dug at the end of the underground, perforated pipe drainfield (NRF-12A). This pit was known as the S1W Leaching Pit (NRF-12B). The pit was used from 1957 until 1961 when it was filled in with soil. The pit was approximately eight feet wide, eight to ten feet deep, and 50 feet long. The releases to the pit were discussed in the previous section. Cesium-137 and cobalt-60 were the primary contaminants released. An asphalt cover was placed over the leaching pit location in 1978 and is present at the site today.

Historical sampling has shown elevated levels of radionuclides in the area of the leaching pit. Although the historical sampling did not meet modern data quality requirements for use in risk assessments, it did provide valuable information on the location of the pit and types of contaminants present. Characterization samples were collected in 1991 from a borehole near the leaching pit. Samples were collected to a depth of 18 feet and were analyzed for metals, radionuclides, organics, pesticides and PCBs. The COPCs detected were arsenic (maximum of 100 ppm at a three foot depth), lead (maximum of 1,140 ppm at a three foot depth), cesium-137 (maximum of 1.09 pCi/g at a three foot depth) and cobalt-60 (maximum of 0.11 pCi/g at a 15 foot depth). Because of the low level of radionuclides detected, the borehole was probably outside the boundary of the leaching pit.

The leaching pit was evaluated in the NRF Comprehensive RI/FS with the S1W Leaching Beds (NRF-14) because the pit is adjacent to NRF-14. The sampling plan identified the leaching beds and leaching pit as one sampling area, since they had similar discharges, were located next to each other, and had the same sampling goals. The purpose of the RI/FS sampling was to provide enough data to estimate the volume and level of contamination of the soil outside the known discharge areas.

Samples were collected from ten boreholes outside the leaching beds and leaching pit down to a depth of 20 feet. Samples were also collected from a borehole that was estimated to be over the leaching pit. From the boreholes at or near the leaching pit the following COPCs were detected: cesium-137 (maximum of 1,600 pCi/g at a 14 foot depth), cobalt-60 (maximum of 9.2 pCi/g at a 14 foot depth), plutonium-239 (maximum of 0.13 pCi/g at a 14 foot depth), and strontium-90 (maximum of 37.3 pCi/g at a 14 foot depth). Carbon-14 may also be present because it was detected in samples collected upstream of the leaching pit (NRF-12A).

The contamination at NRF-12B is primarily at the location of the former pit, which was estimated to be eight feet wide and 50 feet long. The radionuclide contamination was generally found at the 14 foot depth. Some metals were detected at a three foot depth during characterization sampling in 1991, but this is suspected to be from soil placed over the area after it was no longer used.

3.2.2.5 S1W Temporary Leaching Pit (NRF-13)

A temporary pit (NRF-13) was dug in 1956 for the one-time discharge of 28,000 gallons of oily contaminated radioactive liquid. The pit was used to prevent other radioactive discharge areas from receiving oily effluent and reducing their efficiency. The pit was 15 feet in diameter and 18 feet deep. The 28,000 gallons of effluent contained 0.003 curie of radioactivity. The only identified radionuclide was a maximum of 0.00024 curie of strontium-90. Other suspected radionuclides include cobalt-60 and cesium-137. The pit was used for the one-time discharge and then was filled in with the excavated soil.

Characterization sampling was performed in the area in 1991. Samples were collected from the suspected location of the pit to a depth of 25 feet. Samples were analyzed for radionuclides, metals, organics, pesticides, and PCBs. The only COPCs detected at the site were arsenic (maximum of 9.3 ppm at a 13 foot depth), cesium-137 (maximum of 0.15 pCi/g at a 20 foot depth) and cobalt-60 (maximum of 0.1 pCi/g at a 15 foot depth). The cesium-137 and cobalt-60 data were near minimum detectable levels. No additional sampling was performed in this area.

The extent of contamination at NRF-13 is the 15 foot diameter of the pit with a conservatively estimated depth starting at 13 feet and ending at 23 feet below the surface.

3.2.2.6 S1W Leaching Beds (NRF-14)

The first S1W Leaching Bed was constructed in 1960. The bed was an open pond that allowed the water to evaporate or infiltrate into the ground. A second bed was constructed in 1963 adjacent to the first bed. Each bed was about 75 feet by 125 feet at the water line and was 13 to 15 feet deep. The beds originally received radioactive effluent from the S1W prototype plant and later received effluent from the S5G and A1W prototypes and ECF. The beds were used from 1960 to 1979 and received approximately 250,000,000 gallons of water containing 131 curies of radioactivity. The primary radionuclides released were cesium-137, cobalt-60, and tritium. Tritium, which exhibits similar properties as water, would not be expected in the soil today. The cobalt-60 would have decayed to much smaller levels. Small amounts of chemicals and oil may have been released to the leaching beds.

This site includes the underground pipe leading to the leaching beds. The pipe was known to have leaked on one occasion; however, much of the contaminated soil was excavated at that time.

Characterization sampling of the beds was performed in 1992. Samples were collected from a borehole in each bed down to the basalt layer below the beds. The basalt layer is approximately 35 feet below the surface. The samples were analyzed for radionuclides, metals, organics, PCBs, and pesticides. The following nonradiological COPCs were detected during the sampling (All depths noted are from the bottom of the beds): aroclor-1260 (a PCB at 0.245 ppm in a single sample at a three foot depth), arsenic (maximum of 18.3 ppm at a 29-foot depth), chromium (maximum of 65.1 ppm at a three foot depth), and mercury (maximum of 3.9 ppm at a three foot depth). The following radiological COPCs were detected during the sampling: americium-241 (maximum of 5.9 pCi/g at a three foot depth), cesium-137 (maximum of 2,040 pCi/g at a three foot depth), cobalt-60 (maximum of 407 pCi/g at a three foot depth), nickel-63 (maximum of 730 pCi/g at a four foot depth), plutonium-238 (maximum of 5.9 pCi/g at a three foot depth), plutonium-239 (maximum of 0.5 pCi/g at a three foot depth), and strontium-90 (maximum of 83 pCi/g at a four foot depth). The americium-241 and plutonium-238 were not distinguished from each other, and therefore, the 5.9 pCi/g represents the potential maximum for either radionuclide.

The S1W Leaching Beds were evaluated with the S1W Leaching Pit (NRF-12B) during the NRF Comprehensive RI/FS as explained in the previous section. Since the 1992 sampling sufficiently characterized the soil below the leaching beds, the purpose of the RI/FS sampling was to define the lateral extent of contamination outside the leaching beds, which would allow the estimation of soil volume contaminated above risk-based levels. Samples were collected from 10 boreholes to a depth of 20 feet adjacent to the beds and pit. Samples collected from boreholes adjacent to the beds showed very little migration of contaminants in the upper 20 feet of soil. Cobalt-60 was the only COPC detected and was detected at a maximum concentration of 1.21 pCi/g at a 14 foot depth.

Three additional boreholes were drilled to the basalt on the north, west, and south side of the leaching beds where a historic perched water layer existed above the basalt. Small amounts of contaminants were found in these boreholes. The COPCs detected in these boreholes were arsenic (maximum of 8.61 ppm at a 30 foot depth), lead (maximum of 29.5 ppm at a 30 foot depth), cobalt-60 (maximum of 1.02 pCi/g at a 25 foot depth), neptunium-237 (0.79 pCi/g in a single sample at a 30 foot depth), nickel-63 (9.67 pCi/g in a single sample at a 25 foot depth), and strontium-90 (3.37 pCi/g in a single sample at a 25 foot depth).

The extent of contamination at NRF-14 is primarily within the soil directly below the leaching beds. The borehole sampling adjacent to the leaching beds showed only small amounts of contaminants. The contaminants are primarily retained within the top four feet of the bottom of the leaching beds. Contamination significantly drops off after the four foot depth.

The sampling performed at the historic perched water area showed no residual water and only minimal contamination with no exposure pathway available because of the significant depth of the residual contamination. Neptunium-237, which was not detected in the leaching beds, was detected at a very small concentration (0.79 pCi/g) in a single sample from the former perched water zone. It was the only contaminant detected at a higher concentration in the former perched water area than in leaching bed samples.

3.2.2.7 Radiography Building Collection Tanks (NRF-16)

The radiography building was constructed in 1954, north of the S1W prototype plant. The building was originally constructed to decontaminate radioactive equipment. Various solvents were likely used in the decontamination process. Two underground tanks were used to collect the solvents after the decontamination process. In 1960, the building was converted to perform radiography to find defects in various materials. The decontamination tanks were no longer used. The tanks and associated piping were removed in 1993. The tanks were in good condition with no apparent leaks from the tanks.

Historical sampling has been done around the tank and building area. Past spills of radioactive liquid occurred in this area and were generally cleaned up at the time of the spill. The historical sampling helped determine the likely location of past spills and establish an initial list of COPCs. Characterization sampling was performed in 1990. Soil samples were collected from a borehole to a depth of 22 feet adjacent to the underground tanks. The only COPC detected above risk-based concentration was arsenic, which was detected at a maximum concentration of 9.6 ppm at the 22 foot depth.

Soil samples were collected from 20 targeted locations during the NRF Comprehensive RI/FS to evaluate potential past spills in the area. Samples were collected from the surface, one foot depth, and two foot depth. The following COPCs were detected above background and risk-based concentrations near the radiography building: arsenic (maximum of 7.64 ppm at a ten foot depth), cesium-137 (maximum of 10.8 pCi/g at the surface), cobalt-60 (maximum of 0.36 pCi/g at the surface), and uranium-235 (0.18 pCi/g in a single sample at a one foot depth). Uranium-235 is a naturally occurring radionuclide, but background levels at the INEEL are not known. Samples were also collected from a borehole adjacent to a sump located next to the building and from the sediment present in the sump. The sump, which is the lowest point near the building, is the most likely location to detect past spills. Samples were collected to a depth of ten feet, which was below the sump depth. Additional COPCs were detected in the sump sediment. They were benz(a)anthracene (0.26 ppm), benzo(a)pyrene (0.26 ppm), benzo(b)fluoranthene (0.430 ppm) and indeno(1,2,3-CD)pyrene (0.18 ppm).

The extent of contamination at NRF-16 is expected to be limited to the upper few feet of soil as a result of past surface spills. Very little contamination has been found in the subsurface soil.

3.2.2.8 S1W Retention Basins (NRF-17)

The S1W Retention Basins (NRF-17) were constructed in 1951. The basins are two concrete structures 140 feet long by 34 feet wide. The basins received radioactive effluent from the S1W prototype plant and later received effluent from the S5G and A1W prototype plants and ECF. The basins were used as a radioactive liquid storage facility prior to discharging the liquid to the discharge areas (S1W Tile Drainfield, S1W Leaching Pit, and the S1W Leaching Beds). One of the basins is known to have leaked approximately 33,000 gallons in 1971. The leak was directly below the basins.

Because of the difficulty in collecting samples below the basins, sampling was deferred until the basins are demolished under decontamination and dispositioning activities associated with the remedial action at NRF. Samples were collected during the NRF Comprehensive RI/FS adjacent to the basins where past surface soil contamination was suspected. Samples were collected from four locations to a depth of one foot. Arsenic (maximum of 17 ppm) and lead (maximum of 89 ppm) were the only constituents detected above background levels.

The extent and level of contamination below the S1W Retention Basins is unknown. However, soil sampling performed at downstream sites from the basins within the same disposal system showed an unacceptable risk for cesium-137 and strontium-90 to a potential 100-year future resident. It is also known that one of the basins leaked on at least one occasion and the leakage was capable of contaminating soils below the basins. Therefore, a presumptive decision was made that some of the soils beneath the retention basins are contaminated with cesium-137 and strontium-90 at concentrations which exceed risk-based levels.

3.2.2.9 A1W Leaching Bed (NRF-19)

The A1W Leaching Bed (NRF-19) was constructed west of NRF in 1957. The bed was not an open pond like the S1W Leaching Beds. The A1W Leaching Bed was similar to a drainfield with underground, perforated pipes distributing the liquid to an area constructed of gravel and sand. The bed was 200 feet long and 50 feet wide. The bed was used continually from 1958 to 1964 for effluent discharges from the A1W prototype and ECF. The bed was used sporadically from 1964 until 1972, when use of the bed was discontinued.

A total of 85,500,000 gallons of water containing 141 curies of radioactivity was discharged to the leaching bed. The primary contaminants released were cesium-137, cobalt-60, strontium-90, and tritium. Cobalt-60 would have decayed to much smaller levels. Tritium, which exhibits similar properties as water, would not be expected in the leaching bed today. The leaching bed may have received small quantities of chemicals and oil associated with various processes at A1W and ECF.

Characterization sampling was performed at NRF-19 in 1991-92. Samples were collected from a borehole in the center of the leaching bed. The borehole depth was ten feet where the basalt layer was encountered. Arsenic (maximum of 8.0 ppm at a nine foot depth) and chromium (maximum of 298 ppm at a five foot depth) were the only nonradiological COPCs detected. The radiological COPCs detected were americium-241 (maximum of 20 pCi/g at a five foot depth), cesium-137 (maximum of 1,390 pCi/g at a five foot depth), cobalt-60 (maximum of 129 pCi/g at a six foot depth), nickel-63 (maximum of 730 pCi/g at a five foot depth), plutonium-238 (maximum of 20 pCi/g at a five foot depth), plutonium-239 (maximum of 1.18 pCi/g at a five foot depth), strontium-90 (maximum of 750 pCi/g at a five foot depth), and uranium-234 (maximum of 4.7 pCi/g at a five foot depth). The estimated depth of the underground, perforated pipe is five feet. The americium-241 and plutonium-238 results were not distinguished from each other. and therefore, the 20 pCi/g represents the potential maximum for either radionuclide.

Sampling was performed during the NRF Comprehensive RI/FS around the perimeter of the A1W Leaching Bed. Four boreholes were drilled adjacent to the bed. The only COPCs detected above background and risk-based screening levels were carbon-14 (maximum of 6.73 pCi/g from a ten foot depth), cobalt-60 (maximum of 2.12 pCi/g from a 14 foot depth), and strontium-90 (maximum of 24.86 pCi/g from a 14 foot depth).

The RI/FS sampling also included three boreholes drilled northwest, north, and northeast of the leaching bed down to the basalt. These boreholes were in an area of a historic perched water layer. The only COPCs detected above background and risk-based concentrations in these samples were carbon-14 (3.35 pCi/g in a single sample at a ten foot depth) and cobalt-60 (maximum of 0.43 pCi/g at an 18 foot depth). Background levels for carbon-14 are unknown.

The extent of contamination at the A1W Leaching Bed is limited to the soil within and directly below the leaching bed. Very little migration of the contaminants was found. This represents an area 200 feet by 50 feet with a depth of 10 feet.

3.2.2.10 Old Sewage Basin (NRF-21A)

In 1956, a sewage basin (NRF-21A) was constructed to the southeast of NRF. The sewage basin was an open pond that was originally 72 feet by 72 feet and 11 feet deep. The basin was cross-contaminated with the radiological discharge system in 1956. The basin was enlarged in

1957 to approximately double the original length and was used until 1960. The basin has since been filled in with soil.

Soil samples were collected from a borehole in the estimated location of the basin during characterization sampling in 1991 to a depth of 20 feet. Samples were analyzed for radionuclides, metals, organics, pesticides, and PCBs. Arsenic (maximum of 8.5 ppm at a three foot depth) and n-nitrosodi-n-propylamine (0.92 ppm in a single sample at a 20 foot depth) were the only nonradiological COPCs detected above background and risk-based concentrations. Cesium-137 (maximum of 0.18 pCi/g at a one foot depth) and cobalt-60 (maximum of 0.13 pCi/g at a 20 foot depth) were the radiological COPCs detected.

Soil samples were collected during the NRF Comprehensive RI/FS from two boreholes at the basin. One borehole was near the expected discharge point, while the second borehole was near the center of the basin. Samples were collected to a depth of 14 feet and were analyzed for radionuclides, metals, and organics. No COPCs were detected in the second borehole. In the first borehole, the nonradiological COPCs detected above background and risk-based concentrations were antimony (maximum of 180 ppm at a 14 foot depth), cadmium (maximum of 13 ppm at a 14 foot depth), chromium (maximum of 1,000 ppm at a 14 foot depth), mercury (maximum of 10 ppm at a 14 foot depth), and silver (maximum of 55 ppm at a 14 foot depth). The radiological COPCs detected above risk-based concentrations were cesium-137 (maximum of 229 pCi/g at a 14 foot depth) and cobalt-60 (maximum of 2.6 pCi/g at a 14 foot depth). The 14 foot depth corresponds to the original depth of the basin and includes a three foot layer of soil that was mounded over the basin when it was filled.

Soil samples were also collected from 40 random sample locations over the basin and an adjacent area (NRF-43) that was used for a one-time pumpout of the basin. The soil over the basin was sampled because, when the basin was filled in, a three foot layer of soil was placed over the basin that likely came from the pumpout area. Samples were collected from the surface, one foot depth, and two foot depth. Samples were analyzed for cesium-137 and cobalt-60 and no detectable amounts were found at the one and two foot depths over the basin. Cesium-137 was detected at a maximum of 1.9 pCi/g at the surface.

The extent of contamination at NRF-21A is estimated to be a two foot layer of soil at the bottom of the original basin prior to the basin being elongated in 1957. The second borehole sampled during the RI/FS was in the location of the expanded basin and no COPCs were detected.

3.2.2.11 Sludge Drying Bed (NRF-21B)

The sludge drying bed (NRF-21B) was constructed in 1951 as part of the sewage system at NRF. The bed was a concrete slab that was 25 feet by 25 feet and slab was approximately five feet below surrounding ground elevation. The bed received sludge from the sewage system. The bed was suspected to have been contaminated with radionuclides when the sewage system was cross-contaminated with the radiological discharge system in 1956. The bed has since been filled in with soil to surrounding surface elevation.

The only sampling performed at NRF-21B was during the NRF Comprehensive RI/FS. Samples were collected from four boreholes at the bed down to the concrete slab. Samples were analyzed for radionuclides, metals, organics, and PCBs. The following nonradiological COPCs were detected above background and risk-based concentrations: antimony (maximum of 55 ppm), cadmium (maximum of 4 ppm), chromium (maximum of 420 ppm), mercury (maximum of 13.9 ppm), silver (maximum of 52 ppm), benzo(a)pyrene (0.1 ppm in a single sample), and benzo(b)fluoranthene (maximum of 0.19 ppm). The following radiological COPCs were detected: cesium-137 (maximum of 43.6 pCi/g), cobalt-60 (maximum of 1.06 pCi/g), and uranium-235 (0.17 pCi/g in a single sample). All the sample results above were from the four foot depth.

The extent of contamination at NRF-21B is limited to the 25 foot by 25 foot concrete slab. The depth of contamination is between four to six feet.

3.2.2.12 Sewage Lagoons (NRF-23)

The NRF Sewage Lagoons (NRF-23) are located northeast of NRF. The lagoons were constructed in 1960 and were expanded in 1972. The lagoons are open ponds measuring 425 feet by 725 feet at water level. The lagoon bottoms are clay lined. The southwest lagoon has only been used for occasional overflow from the northeast lagoon since 1984. The northeast lagoon is still in use.

Past sampling has shown organics, metals, and radionuclides present in the sediment of the lagoons. Sufficient sample results were available to calculate a 95% upper confidence limit (UCL) for most metal and radionuclide constituents. The following COPCs were detected during past sampling: arsenic (25.6 ppm, 95% UCL), cadmium (5.1 ppm, 95% UCL), chromium (571 ppm, 95% UCL), mercury (2.5 ppm, 95% UCL), silver (180 ppm, maximum concentration), benz(a)anthracene (0.22 ppm, maximum concentration), cesium-137 (3.6 pCi/g, 95% UCL), and cobalt-60 (0.39 pCi/g, 95% UCL). The cesium-137 and cobalt-60 data were from environmental monitoring sampling performed in 1994 and 1995, which is the most current reliable data available and represents randomly collected samples over the lagoon. The metal and organic data is from samples collected in 1988. The silver is shown as a maximum concentration since the 95% UCL for silver was much higher because of the wide range of silver concentrations detected during the sampling. All sample results are from the southwest lagoon although similar concentrations would be expected in the northeast lagoon.

Perched water is known to exist approximately 20 feet below the northeast sewage lagoon. The extent of this perched water zone is limited to within 50 feet of the edge of the lagoon. Other minor perched water zones were discovered at various depths, 300 to 500 feet from the lagoon. This information suggests that a stair-step migration pattern exist at the sewage lagoon. Perched water sampling has shown slightly elevated levels of nitrates and several anions (e.g., chloride) and cations (e.g., sodium) associated with the sewage lagoons. Groundwater monitoring data indicates that the sewage lagoon is the primary source of nitrate to the aquifer near NRF. Other contaminants contained within the sewage lagoon sediment appear to remain bound in those sediments.

The vertical extent of contamination present at the sewage lagoons is estimated to be 12 inches, which represents the average sediment layer thickness on the bottom of the lagoons. The horizontal extent of contamination is the area of the sediment on the bottom of the lagoons. This represents an area approximately 360 feet by 680 feet for each lagoon.

3.2.2.13 S5G Basin Sludge Disposal Bed (NRF-32)

In 1967, sludge from a cleaning effort at the S5G prototype was disposed of to an area south of S5G. The S5G hull basin at one time held water to allow simulation of sea conditions. The contaminants present in the sludge were not known and may have contained small quantities of radionuclides. The volume of sludge disposed of to the area was conservatively estimated at a maximum of 3,000 cubic feet.

Sampling was performed during the NRF Comprehensive RI/FS at this site. Samples were collected from three boreholes where the sludge was buried. Samples were analyzed for radionuclides, organics, metals, and PCBs. The only COPC detected was arsenic at a maximum concentration of 8.49 ppm from a 10 foot depth.

3.2.2.14 Seepage Basin Pumpout Area (NRF-43)

A sewage basin (NRF-21A) was pumped out to the surrounding area (NRF-43) in August 1958. The basin had been cross-contaminated with the radioactive discharge system in 1956, and therefore, the basin contents likely contained some radioactivity. The volume or amount of radioactivity released from the basin is not known. Historic sampling has shown some detectable levels of radioactivity in the pumpout area. This sampling helped determine the location of the pumpout area and identify potential COPCs.

Characterization sampling was performed in the area in 1991. Soil samples were collected to a depth of five feet and analyzed for metals, organics, radionuclides, pesticides, and PCBs. The COPCs detected above background and risk-based concentrations were arsenic (maximum of 7.8 ppm at a five foot depth) and cesium-137 (maximum of 1.08 pCi/g at a three foot depth).

Soil samples were also collected from 40 random sample locations over the basin and the pumpout area during the NRF Comprehensive RI/FS. Samples were collected from the surface, one foot depth, and two foot depth. Sufficient samples were collected and analyzed for cesium-137 that a 95% upper confidence limit for cesium-137 was calculated to be 1.31 pCi/g. Other COPCs detected above risk-based screening levels were carbon-14 (36.71 pCi/g in a single sample) and plutonium-239 (0.94 pCi/g in a single sample). This sampling showed that, where radioactivity was detected, most of the activity was in the upper two feet and only small activity levels were detected at the two foot depth.

The extent of contamination at NRF-43 is limited to the upper two feet of soil, which is a result of the one time pumpout of the sewage basin (NRF-21A). NRF-43 represents an area of approximately 97,000 square feet.

3.2.2.15 Hot Storage Pit (NRF-66)

NRF-66 was misidentified as a hot storage pit. The area was a waste tanker loading area where radioactive liquid waste was collected for processing at other INEEL facilities. Various inadvertent releases may have occurred in the tanker loading area. The releases would have been cleaned up to established standards at the time of the release. Contaminated soil was removed from the area in 1980.

Sampling was performed at NRF-66 during the NRF Comprehensive RI/FS. Soil samples were collected from 14 shallow boreholes to a two foot depth. The purpose of the sampling was to evaluate potential residual contamination in the soil from past surface spills in the area. The samples were analyzed for radionuclides. The only COPC detected above background and a risk-based concentration was cesium-137 at a maximum activity of 1.88 pCi/g.

The extent of contamination at NRF-66 is limited to a two foot depth. The area is approximately 10 foot by 45 foot.

3.2.2.16 ECF Water Pit Release (NRF-79)

A maximum one-time release of 62,500 gallons of water from ECF occurred in late 1991 and early 1992. The ECF water contained small amounts of carbon-14, cesium-137, cobalt-60, manganese-54, nickel-63, strontium-90, and tritium. A very conservative assumption was made for the risk assessment calculations discussed in Section 6.0 that the entire volume of water immediately migrated to the aquifer without any dilution and was available for consumption. No soil sampling was performed because contaminants, if present, would be 30 feet below the surface and unavailable for exposure to any receptors.

3.2.2.17 A1W/S1W Radioactive Line near BB19 (NRF-80)

During the construction of A1W, a pipe was installed from the A1W prototype to the S1W Retention Basins that allowed radioactive effluents from A1W to be sent to the S1W radioactive discharge system. The pipe was buried approximately six feet below the surface. The pipe is known to have leaked on one occasion (NRF-80). During decontamination and dispositioning work at NRF in 1995, portions of the pipe were removed and contamination was detected in the soil. Cobalt-60 was detected up to 1,600 pCi/g and cesium-137 was detected up to 7 pCi/g.

Sampling was performed during the NRF Comprehensive RI/FS in an area likely to have been contaminated from a past pipe leak. Samples were collected from six boreholes to a depth of ten feet. The only COPC detected above risk-based concentrations was cobalt-60, which was detected at a maximum level of 14.56 pCi/g at an eight foot depth.

Some uncertainty exists with this site. The extent of contamination at NRF-80 is unknown. Past contamination is known to be present in the soil, but the contamination probably is sporadic making characterization sampling of the site very difficult. Process knowledge of the waste stream and sampling performed at discharge areas associated with this site suggest that the sampling performed in 1995 is not representative of all the contamination present at this site. Cesium-137 and strontium-90 have been detected above risk-based levels at other discharge areas associated with NRF-80. Therefore, a presumption is made that cesium-137 and stontium-90 are present in soils immediately beneath the depth of the remaining pipe at concentrations that exceed acceptable risk-based levels for a future 100-year resident.

3.2.2.18 A1W Processing Building Area Soil (NRF-81)

The A1W processing building area (NRF-81) is located west of the A1W prototype plant. The area contains several tanks and associated piping systems that were used to process radioactive effluent from the A1W plant. Several historical inadvertent releases have occurred in the area from past operations. Two known releases occurred in 1980 and 1982. Soil samples were collected from the area after the releases were cleaned up. In 1994, underground radioactive piping was removed from the processing building area during decontamination and dispositioning work at NRF. Soil samples were collected frequently during the excavation work and analyzed for radioactivity. No elevated radioactivity levels were found.

Sampling was not performed during the NRF Comprehensive RI/FS in this area because evidence suggests that past spills in the area were cleaned up and the area is very similar to other areas where surface spills occurred. Cesium-137 was detected at a maximum of 2.1 pCi/g and cobalt-60 was detected at a maximum of 1.4 pCi/g during past sampling. A conservative assumption was made that the maximum concentrations of other radionuclides detected at similar sites were present at this site. This includes 36.71 pCi/g of carbon-14, 0.94 pCi/g of plutonium-239, and 0.18 pCi/g of uranium-235.

The maximum extent of contamination at NRF-81 would be the upper three feet of soil and an area approximately 100 feet by 130 feet. The area represents a fenced in location around the processing building and the estimated size is considered conservative.

3.3 Site Characteristics (New Sites)

NRF-82 (Evaporator Bottom Tank Release) was an area identified after the NRF Comprehensive RI/FS was completed. This site consists of the soil surrounding an underground storage tank vault. The tank and its contents will be managed under other regulatory actions. One spill was known to have occurred at the area in 1972. The spill was cleaned up to the standards at that time and additional construction has occurred in the area. Slightly elevated amounts of radioactivity were reported after the cleanup was performed in 1972. Additional cleanup was performed in 1977. This site was evaluated in a Track 1 investigation and the risk was estimated to be low based on the Track 1 evaluation. This site had no impact on the cumulative risk assessment.

NRF-83 (ECF Hot Cells Release Area) was also an area identified after the NRF Comprehensive RI/FS was completed. The site is the location of a radioactive liquid release that occurred in 1972. Radioactive liquid was released from a pipe to a concrete trench. The soil below and adjacent to the trench became contaminated. Cleanup actions taken in 1972 did not include the soil below the trench. The contaminated soil was discovered in 1997 when a concrete pad adjacent to the concrete trench was removed during ECF Hot Cell upgrade work. Cobalt-60 and cesium-137 were present in the soil. An estimated 28 cubic meters of soil is contaminated with cobalt-60 and cesium-137 below the trench. This soil remains in place to preserve the structural integrity of the trench. All accessible contaminated soils adjacent to the south side of the trench were removed during the construction project and replaced with clean soil. A new concrete pad was poured at the location of the old concrete pad excavation as part of the Hot Cell upgrade work. The contaminated soil beneath the trench is not presently accessible and no exposure route is available. The site was evaluated in a Track 1 investigation and the risk was estimated to be low based on the Track 1 evaluation. This site had no impact on the cumulative risk assessment.

3.4 Groundwater Characteristics

The remedial investigation included a hydrogeologic study. This study consisted of a review of past hydrogeologic data from multiple studies, review and interpretation of seven years of groundwater data collected near NRF, groundwater flow modeling of the Snake River Plain Aquifer (SRPA), modeling of contaminant fate and transport, and developing groundwater contour, flow direction and contaminant migration maps. Information from the study was used in the risk assessments (summarized in Section 4) for evaluating the groundwater ingestion pathway. Several specific conclusions of the hydrogeologic study are highlighted below.

Groundwater modeling at NRF confirmed that NRF is located over a portion of the SRPA that possesses a lower gradient than the surrounding aquifer. The lower gradient (i.e., flatter water table) and accompanying slower water flow through the aquifer, both consequences of a less permeable aquifer, allow surface recharge from NRF operations to increase the elevation of the water table under NRF. The result is a lobed-shaped high in the water table on the east side of NRF. The high extends from the north side of NRF to the south side of NRF.

In 1994, a well fitness evaluation was performed at NRF to determine the quality of the wells used in the NRF groundwater monitoring network. At nearly the same time, NRF performed groundwater modeling, as outlined above, to assess aquifer flow paths near NRF and the optimal placement of groundwater monitoring wells. As a result of the fitness evaluation and modeling work, six new groundwater monitoring wells were constructed and were included in the NRF groundwater monitoring network. As of January 1996, the wells used in the groundwater monitoring network included five United States Geological Survey (USGS) wells and eight NRF wells. Of these wells, two are used to assess the general upgradient quality of the SRPA, two are used to assess the affects on groundwater of effluent discharged to the industrial waste ditch, and six are located in a semi-circular arc just south of NRF, and are used to sample the local SRPA water downgradient of NRF. The remaining three wells are located south of NRF and are used to sample the regional characteristics of the SRPA downgradient of NRF.

Samples have been collected from the NRF groundwater monitoring network since 1989. The recently constructed groundwater monitoring wells were specifically designed to monitor the upper 50 feet of the SRPA. Results obtained from analyses of samples collected from the USGS wells are primarily used for screening purposes, and verify that the new monitoring wells are sufficiently spaced so as to detect contaminants emanating from past or current activities at NRF.

Based on samples collected from nine downgradient wells, chromium, nitrates, tritium, and various salts were detected at slightly elevated levels. The average concentrations of these constituents occurring in groundwater monitoring wells downgradient of the source are as follows: chromium at 0.05 ppm, nitrates at 2.3 ppm, tritium at 308 picocuries per liter (pCi/l), and chloride (salt) at 226 ppm. Based on samples collected from 1989 to 1998, the chromium, nitrate, tritium, and salt concentrations show no apparent increasing trend.

Fate and transport modeling was performed using the GWSCREEN computer program. All contaminants detected at OU 8-08 sites above risk-based concentrations in the soil were included in modeling runs to assess their potential migration to the aquifer. No contaminants were predicted to reach the aquifer within 100 years under normal precipitation conditions. Additional fate and transport analyses of past and current aquifer recharge points (e.g., industrial waste ditch) were performed and concluded that the industrial waste ditch, active NRF sewage lagoon, and potential deep perched water associated with past discharges to the S1W Leaching Beds are the only NRF sites with appreciable quantities of contaminants currently migrating. Contaminants include trivalent chromium (industrial waste ditch), tritium (S1W Leaching Beds), nitrates (active sewage lagoon), and various salts (industrial waste ditch and active sewage lagoon).

Perched water was found to be present at several locations beneath NRF. Perched water is almost universally associated with substantial recharge due to infiltration associated with surface discharge. A perched water zone is currently found beneath the industrial waste ditch and another is located under the NRF sewage lagoon. The contaminants present in the perched water zones are reflective of their source. The industrial waste ditch perched water zone contains elevated levels of salts and chromium. Perched water beneath the sewage lagoon contains slightly elevated levels of nitrates, cations (e.g., sodium), and anions (e.g., chloride). Two former shallow perched water zones (approximately 20 to 30 feet) were known to exist (early 1960s) beneath the S1W and A1W Leaching Beds, but sampling performed during the remedial investigation show these perched water zones are no longer present.

Deep perched water (in excess of 100 feet) may currently exist beneath the S1W Leaching Beds. The elevated levels of tritium currently detected in samples from the groundwater monitoring wells nearest to the S1W Leaching Beds are probably due to residual deep perched water which contains small amounts of tritium. Tritium migrates in the environment as water; therefore, the majority of tritium released to the leaching beds has long since evaporated or migrated and dispersed into the SRPA. The remaining tritium associated with this deep perched water is gradually dispersing into the SRPA. This dispersion is slow because the recharge source (i.e., discharge to the leaching beds) is no longer present. Dispersion processes further lower tritium levels to below background in groundwater downgradient of NRF. Tritium levels found and monitored in wells located near the S1W Leaching Beds since 1996 are expected to decrease over time from decay, dilution, and depletion of the source.

The hydrogeologic study concluded that NRF has had a limited impact on the SRPA, primarily due to slightly elevated levels of chromium, nitrates, tritium, and various salts. Additionally, these constituents have not shown an increasing trend and are not expected to increase in the future.

4.0 Summary of Site Risks

Several different risk assessments were performed to evaluate the potential human health and environmental risks posed by the identified sites at NRF. Track 1 and Track 2 investigations were performed for OUs 8-01, 02, 03, 04, and 09 prior to the NRF Comprehensive RI/FS. The following risk assessments were performed as part of the NRF Comprehensive RI/FS: risk assessments for OU 8-08 sites not previously investigated, a cumulative risk assessment of all NRF sites, and an ecological risk assessment. The OU 8-08 site assessments evaluated the human health risk associated with contaminants present at each site. The cumulative risk assessment evaluated the potential cumulative, or additive, human health risks for receptors based on their proximity to multiple sites and potential for exposure from more than one site at a time. The ecological risk assessment evaluated the potential risk to ecological receptors.

The following sections describe the three different types of risk assessments performed at NRF. In addition, two new sites were identified after the NRF Comprehensive RI/FS and Track 1 risk assessments were performed on these sites.

4.1 Individual Site Risk Assessments

4.1.1 OUs 8-01, 02, 03, 04, and 09 Site Risk Assessments

A Track 1 or Track 2 investigation was performed for each site associated with OUs 8-01, 02, 03, 04, and 09 prior to the NRF Comprehensive RI/FS. The Track 1 investigations, including the determination of the level of risk (semi-quantitative), were performed using INEEL guidance manuals for conducting Track 1 and Track 2 investigations. These guidance manuals were developed under the direction of DOE, State of Idaho, and EPA Region 10 personnel and provide general guidance on toxicity assessment, exposure assessment, risk characterization, default exposure parameter, etc. Typical default exposure parameters used during the Track 1 or Track 2 risk assessments would be the same as those shown in Section 4.1.2.2.2, which discusses the exposure parameters used to assess OU 8-08 sites in the NRF Comprehensive RI/FS. The completed Track 1 or Track 2 investigation documents, which provide details of the risk assessments, are part of the Administrative Record (Appendix A provides a current list of documents available in the Administrative Record).

The risk assessments typically resulted in a low estimated risk or no hazardous source being present. The low estimated risk was due to the small amounts of contaminants present at the site or because an exposure to contaminants under current site conditions was not likely. Table 4 summarizes the risk assessments performed for the sites associated with OUs 8-01, 02, 03, 04, and 09. The table indicates if a source is present and the result of the risk assessment (identified as no risk, low risk, or acceptable risk). The table also shows if the resulting risk was due to no source being present, a small contaminant source being present, or current site conditions limiting exposure to contaminants at the site.

For those sites with no risk because no source is present or with a low or acceptable risk because the contaminant source is small, no remedial actions would be expected. For those sites with a low or acceptable risk because of current site conditions (contaminants inaccessible because of structures, soil covers, or administrative controls), maintaining those site conditions would be expected.

Table 4. Risk Assessment Summary Table for OUs 8-01, 02, 03, 04, and 09

Operable Unit	Site Number	Source Present	Estimated Risk	Basis for Risk Determination
OU 8-01				
	NRF-03	Yes	Low	Small Contaminant Source
	NRF-06	No	None	No Source
	NRF-08	No	None	No Source
	NRF-33	No	None	No Source
	NRF-40	No	None	No Source
	NRF-41	No	None	No Source
	NRF-63	No	None	No Source
OU 8-02				
	NRF-09	Yes	Low	Small Contaminant Source
	NRF-37	No	None	No Source
	NRF-38	No	None	No Source
	NRF-42	Yes	Low	Site Conditions
	NRF-47	No	None	No Source
	NRF-52A	Yes	Low	Small Contaminant Source
	NRF-52B	No	None	No Source
	NRF-54	No	None	No Source
	NRF-55	No	None	No Source
	NRF-61	Yes	Low	Site Conditions
	NRF-64	Yes	Low	Small Contaminant Source
	NRF-68	Yes	Low	Small Contaminant Source
OU 8-03				
	NRF-10	Yes	Acceptable	Small Contaminant Source
	NRF-15	Yes	Low	Small Contaminant Source
	NRF-18A	Yes	Low	Site Conditions
	NRF-18B	Yes	Low	Small Contaminant Source
	NRF-20	Yes	Low	Small Contaminant Source
	NRF-22	Yes	Low	Site Conditions
	NRF-45	Yes	Low	Small Contaminant Source
	NRF-56	No	None	No Source
OU 8-04				
	NRF-28	Yes	Low	Small Contaminant Source
	NRF-29	Yes	Low	Small Contaminant Source
	NRF-31	Yes	Low	Small Contaminant Source
	NRF-44	No	None	No Source
	NRF-58	Yes	Low	Small Contaminant Source
	NRF-62	No	None	No Source
	NRF-65	Yes	Low	Small Contaminant Source
	NRF-69	Yes	Low	Small Contaminant Source
	NRF-70	Yes	Low	Small Contaminant Source
	NRF-71	Yes	Low	Small Contaminant Source
	NRF-72	Yes	Low	Small Contaminant Source
	NRF-73	No	None	No Source
	NRF-74	Yes	Low	Small Contaminant Source
	NRF-75	Yes	Low	Small Contaminant Source
	NRF-76	Yes	Low	Small Contaminant Source
	NRF-77	Yes	Low	Small Contaminant Source
OU 8-09				
	None	Yes	Acceptable	Small Contaminant Source

4.1.2 OU 8-08 Site Risk Assessments

A human health risk assessment was performed for each of the 18 radiological areas that were not assessed in a previous investigation before the NRF Comprehensive RI/FS except for NRF-17 (S1W Retention Basins). The assessment included identifying COPCs for each site, an exposure assessment, a toxicity assessment, and a risk characterization. A risk assessment was not performed for NRF-17 because sampling was not done below the basins in the suspected area of potential contamination.

4.1.2.1 Identification of Contaminants of Potential Concern

Past sampling, process knowledge, discharge records, and sampling during the NRF Comprehensive RI/FS were used to develop a list of COPCs. Since soil is the media of concern, a soil concentration term was established for each COPC at each site. The concentration term was typically the maximum concentration detected during characterization sampling performed in 1991-92, recent sampling from the Environmental Monitoring Program, or RI/FS sampling. These sampling evolutions provided data with the proper data quality for use in risk assessment calculations. In a few cases where sufficient sample results existed, the concentration term was the 95% upper confidence limit of the mean, which provides a more balanced depiction of the contaminant concentrations present at a site. Historical sampling prior to 1990 was not generally used because the data collected did not meet CERCLA quality assurance requirements needed for risk assessment calculations. Data prior to 1990 was used if it was the only data available and sufficient quality control of the samples could be determined. The historical data did, however, provide valuable information on site locations and COPCs.

The concentration terms were compared to risk-based soil screening levels and background levels. Risk-based levels were based on concentrations in the soil corresponding to an increased cancer risk of 1 in 10,000,000 (1E-07) or a hazard quotient of 0.1. The terms increased cancer risk and hazard quotient are discussed later in this section. The risk-based screening levels for non-radiological constituents were obtained from the EPA Region III Risk-Based Concentration Table. The table contains reference doses and carcinogenic potency slopes (discussed in Section 4.1.2.3) which were taken from the Integrated Risk Information System (IRIS), Health Effects Assessment Summary Tables (HEAST), and other EPA sources. These toxicity constants are combined with "standard" exposure scenarios to calculate risk-based concentrations. The risk-based level for lead is the EPA recommended screening level for lead cleanup (400 ppm). For radiological constituents, standard INEEL default exposure parameters were used and concentrations were calculated using standard INEEL Track 2 risk assessment equations given in the INEEL Track 2 guidance document. Background soil concentrations are INEEL published values. Those COPCs with a concentration term greater than background and risk-based levels were retained for evaluation in the risk assessment. Those contaminants with a concentration term less than background or risk-based levels were removed as COPCs.

4.1.2.2 Exposure Assessment

The exposure assessment estimates the magnitude of actual and/or potential receptor exposures, the frequency and duration of these exposures, and the pathways by which receptors are potentially exposed to various COPCs.

4.1.2.2.1 Exposure Scenarios

The human health risk assessment for each site evaluated residential and occupational scenarios. For the residential scenario, assessments were made for a receptor residing at the site 30 years and 100 years in the future. The future residential scenario assumes the site remains under Federal government control for at least 30 or 100 years. An assumption is also made that the contaminants present at the site are available to the residential receptor for exposure regardless of the depth. This takes into consideration the construction of a residence with a basement and the availability of the excavated soil for exposure.

A current and 30-year occupational scenario is also evaluated. Again, it is assumed that the contaminants are available for exposure regardless of the depth. The occupational scenario assumes that no controls are in place to prevent exposure to COPCs.

Soil ingestion, inhalation of fugitive dust, and external radiation exposure are the potential exposure pathways considered for the occupational and residential scenarios. In addition, the groundwater ingestion and food crop ingestion pathways are considered only for the residential scenario. For the occupational scenario, the food crop ingestion pathway is not a concern and, since the drinking water is continuously monitored, the groundwater ingestion pathway is not a concern. The dermal absorption pathway was qualitatively evaluated for the residential scenario.

4.1.2.2.2 Quantification of Exposure

Adult exposures were evaluated for all scenarios and pathways. Child exposures were considered separately only for the soil ingestion pathway in the residential scenario, because children are likely to ingest more soil than are adults.

The exposure parameters used in the risk assessment were obtained from EPA and DOE guidance. The exposure parameter default values used in the risk assessment are designed to estimate the reasonable maximum exposure at a site. Using this approach may tend to over-estimate the risk. Exposure duration and frequency are used to determine the total time of exposure. Exposure duration would be the number of years residing or working at a site, and exposure frequency is the number of hours per day and days per year that a receptor may be exposed to the site during the exposure duration period. The exposure parameters used in the risk assessment were:

Body Weight:
- Adult: 70 kilograms → 154 pounds
- Child: 15 kilograms → 33 pounds

Exposure Duration:
- Occupational: 25 years
- Residential: 30 years
  - Adult: 24 years
  - Child: 6 years

Exposure Frequency:
- Occupational: 8 hours per day, 250 days per year
- Residential: 24 hours per day, 350 days per year

Ingestion/Inhalation Rate:
- Soil Ingestion:
  - Occupational: 50 milligrams per day → size of ¼ aspirin tablet
  - Residential:
    - Adult: 100 milligrams per day → size of ½ aspirin tablet
    - Child: 200 milligrams per day → size of 1 aspirin tablet

Inhalation:
Occupational: 20 cubic meters per work day → equivalent to the volume of air in an 8 by 11 foot room by 8 foot high.
Residential: 20 cubic meters per day
Water Ingestion:
Residential: 2 liters per day

4.1.2.3 Toxicity Assessment

A toxicity assessment was conducted to identify potential adverse effects to humans from contaminants at NRF. A toxicity value is the numerical expression of the substance dose-response relationship used in the risk assessment. Toxicity values (slope factors and reference doses) for the sites were obtained from the EPA's IRIS database and EPA's HEAST. The reference dose is the toxicity value used to evaluate noncarcinogenic effects that result from exposure to chemicals, and is based on the concept that there is a threshold that must be reached before adverse effects occur. The slope factor is the toxicity value used to evaluate potential human carcinogenic effects. The slope factors have been derived based on the concept that for any exposure to a carcinogenic chemical, there is some risk of a carcinogenic response. The slope factor is used in a risk assessment for the purpose of estimating an upper bound lifetime probability of an individual developing cancer from the exposure to a specific level of a carcinogen.

4.1.2.4 Risk Characterization

Carcinogenic effects are calculated as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen. Generally, CERCLA cleanup decisions are based on carcinogenic excess risk levels slightly greater than 1 chance in 10,000 (1E-04) where excess risk is the possibility of contracting cancer above the national average. The target risk range for CERCLA sites is between 1E-04 and 1E-06 and represents an upper and lower risk level where a remedial action may be required if the agencies determine an action is justified. A remedial action is likely at risk levels greater than 1E-04. A risk less than 1E-06 is usually considered acceptable. A risk management decision on whether a remedial action is appropriate is made by the agencies when the calculated risk is between 1E-04 and 1E-06.

The potential for a noncarcinogenic effect is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a toxicity reference dose derived for a similar exposure period. The reference dose is a toxicity value representing the acceptable upper limit of a substance as determined by the Agencies based on various scientific studies. The ratio of exposure to the reference dose is called a hazard quotient. A hazard quotient less than one is considered acceptable, while a hazard quotient greater than one indicates a risk management decision is needed to determine if a remedial action is justified. The sum of all hazard quotients associated with a particular area is a hazard index. The calculation of the hazard index involves the use of uncertainty factors to ensure a large safety margin is present.

Table 5 summarizes the human health risk assessments performed for each site showing the contaminant, exposure pathway, and calculated risk or hazard quotient if the increased cancer risk was greater than or equal to 1E-06 or the hazard quotient was greater than or equal to 1. Some contaminants have both carcinogenic risks and noncarcinogenic effects, and therefore may have an increased carcinogenic risk and a hazard quotient (noncarcinogenic). Those constituents identified as COPCs during the site characterization for each site (Section 3.2.2), but which did not show a risk greater than 1E-06 or a hazard quotient greater than 1.0, are shown on Table 6 and were eliminated as COPCs.

Table 5. OU 8-08 Individual Site Risk Assessment Summary

Unit/Constituent	Current Occupational		30-year Occupational		30-year Residential		100-year Residential		Pathway[a]
	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	
NRF-02 – Old Ditch Surge Pond (No Further Action site)									
Arsenic	2e-06	--	2e-06	--	3e-05	--	3e-05	--	Ingestion of Soil[b] Ingestion of Food Crops[b]
Cesium-137	5e-05	NA	3e-05	NA	1e-04	NA	3e-05	NA	External Exposure[b] Ingestion of Food Crops[b]
Cobalt-60	4e-04	NA	7e-06	NA	4e-05	NA	--	NA	External Exposure
NRF-13 - S1W Temporary Leaching Pit (No Action site)									
No risks greater than 1e-06 or HQ greater than 1.0									
NRF-23 – Sewage Lagoons (No Further Action site)									
Arsenic	7e-06	--	7e-06	--	8e-05	--	8e-05	--	Ingestion of Soil[b] Ingestion of Food Crops[b]
Mercury[c]	NA	--	NA	--	NA	6.6	NA	6.6	Ingestion of Food Crops[b]
Cesium-137	4e-05	NA	2e-05	NA	1e-04	NA	2e-05	NA	External Exposure[b] Ingestion of Food Crops[b]
Cobalt-60	2e-05	NA	--	NA	2e-06	NA	--	NA	External Exposure
NRF-79 - ECF Water Pit Release (No Action site)									
Cesium-137	NA	NA	NA	NA	1e-05	NA	3e-06	NA	Ingestion of Groundwater[b]
Cobalt-60	NA	NA	NA	NA	7e-06	NA	--	NA	Ingestion of Groundwater
Tritium	NA	NA	NA	NA	5e-05	NA	--	NA	Ingestion of Groundwater
Nickel-63	NA	NA	NA	NA	3e-06	NA	2e-06	NA	Ingestion of Groundwater[b]
Strontium-90	NA	NA	NA	NA	3e-06	NA	--	NA	Ingestion of Groundwater

Unit/Constituent	Current Occupational		30-year Occupational		30-year Residential		100-year Residential		Pathway[a]
	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	
NRF-81 - A1W Processing Building Area Soil (No Further Action site)									
Cesium-137	3e-05	NA	1e-05	NA	7e-05	NA	1e-05	NA	External Exposure[b] Ingestion of Food Crops[b]
Cobalt-60	8e-05	NA	2e-06	NA	8e-06	NA	--	NA	External Exposure
Uranium-235	--	NA	--	NA	1e-06	NA	1e-06	NA	External Exposure[b]
NRF-14 - S1W Leaching Beds[d] NRF-12B - S1W Leaching Pit (Remedial Action sites)									
Arsenic	3e-05	--	3e-05	--	3e-04	1.6	3e-04	1.6	Ingestion of Soil[b] Ingestion of Food Crops[b]
Mercury	NA	--	NA	--	NA	10	NA	10	Ingestion of Food Crops[b]
Americium-241	--	NA	--	NA	5e-06	NA	5e-06	NA	Ingestion of Soil[b] Ingestion of Food Crops[b]
Cesium-137	2e-02	NA	1e-02	NA	7e-02	NA	1e-02	NA	Ingestion of Soil[b] Ingestion of Food Crops[b] External Exposure[b]
Cobalt-60	2e-02	NA	4e-04	NA	2e-03	NA	--	NA	Ingestion of Soil Ingestion of Food Crops External Exposure
Neptunium-237	--	NA	--	NA	1e-05	NA	1e-05	NA	Ingestion of Food Crops[b]
Nickel-63	--	NA	--	NA	7e-06	NA	5e-06	NA	Ingestion of Food Crops[b]
Plutonium-238	--	NA	--	NA	3e-06	NA	2e-06	NA	Ingestion of Soil[b]
Strontium-90	1e-06	NA	--	NA	1e-03	NA	9e-04	NA	Ingestion of Soil Ingestion of Food Crops[b]

Unit/Constituent	Current Occupational		30-year Occupational		30-year Residential		100-year Residential		Pathway[a]
	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	
NRF-19 - A1W Leaching Bed (Remedial Action site)									
Arsenic	2e-06	--	2e-06	--	3e-05	--	3e-05	--	Ingestion of Soil[b] Ingestion of Food Crops[b]
Americium-241	3e-06	NA	2e-06	NA	2e-05	NA	2e-05	NA	Ingestion of Soil[b] Ingestion of Food Crops[b] External Exposure[b]
Cesium-137	2e-02	NA	8e-03	NA	4e-02	NA	9e-03	NA	Ingestion of Soil[b] Ingestion of Food Crops[b] External Exposure[b]
Cobalt-60	7e-03	NA	1e-04	NA	7e-04	NA	--	NA	External Exposure[b]
Plutonium-238	2e-06	NA	1e-06	NA	9e-06	NA	5e-06	NA	Ingestion of Soil[b] Ingestion of Food Crops[b]
Nickel-63	--	NA	--	NA	7e-06	NA	5e-06	NA	Ingestion of Food Crops[b]
Strontium-90	1e-05	NA	6e-06	NA	9e-03	NA	2e-03	NA	Ingestion of Soil[b] Ingestion of Food Crops[b]
NRF-12A – Underground Piping Leading to S1W Leaching Pit (Remedial Action site)									
Mercury	NA	--	NA	--	NA	17	NA	17	Ingestion of Food Crops[b]
Cesium-137	9e-02	NA	4e-02	NA	2e-01	NA	4e-02	NA	Ingestion of Soil[b] Ingestion of Food Crops[b] External Exposure[b]
Cobalt-60	6e-03	NA	1e-04	NA	6e-04	NA	--	NA	External Exposure
Nickel-63	--	NA	--	NA	3e-06	NA	2e-06	NA	Ingestion of Food Crops[b]
Plutonium-244	1e-06	NA	1e-06	NA	7e-06	NA	7e-06	NA	External Exposure[b]
Strontium-90	--	NA	--	NA	4e-04	NA	7e-05	NA	Ingestion of Soil Ingestion of Food Crops[b]

Unit/Constituent	Current Occupational		30-year Occupational		30-year Residential		100-year Residential		Pathway[a]
	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	
NRF-11[e] - S1W Tile Drainfield (Remedial Action site)									
Arsenic	2e-06	--	2e-06	--	3e-05	--	3e-05	--	Ingestion of Soil[b] Ingestion of Food Crops[b]
Cesium-137	4e-06	NA	2e-06	NA	1e-05	NA	2e-06	NA	External Exposure[b]
Cobalt-60	2e-04	NA	3e-06	NA	1e-05	NA	--	NA	External Exposure
NRF-11 (continued) L-Shaped Sump[f] (Remedial Action site)									
Arsenic	2e-06	--	2e-06	--	3e-05	--	3e-05	--	Ingestion of Soil[b] Ingestion of Food Crops[b]
Cesium-137	5e-04	NA	3e-04	NA	1e-03	NA	3e-04	NA	Ingestion of Soil Ingestion of Food Crops[b] External Exposure[b]
Cobalt-60	7e-05	NA	1e-06	NA	6e-06	NA	--	NA	External Exposure
Manganese-54	1e-06	NA	--	NA	--	NA	--	NA	External Exposure
Plutonium-244	--	NA	--	NA	3e-06	NA	3e-06	NA	External Exposure[b]
NRF-21A – Old Sewage Basin (Remedial Action site)									
Arsenic	2e-06	--	2e-06	--	3e-05	--	3e-05	--	Ingestion of Soil[b] Ingestion of Food Crops[b]
Antimony	NA	--	NA	--	NA	1.8	NA	1.8	Ingestion of Soil[b]
Mercury	NA	--	NA	--	NA	27	NA	27	Ingestion of Food Crops[b]
N-nitrosodi-n-propylamine	1e-06	NA	1e-06	NA	1e-05	NA	7e-04	NA	Ingestion of Soil[b] Ingestion of Groundwater[b]
Cesium-137	3e-03	NA	1e-03	NA	8e-03	NA	1e-03	NA	Ingestion of Soil[b] Ingestion of Food Crops[b] External Exposure[b]
Cobalt-60	1e-04	NA	3e-06	NA	1e-05	NA	--	NA	External Exposure

Unit/Constituent	Current Occupational		30-year Occupational		30-year Residential		100-year Residential		Pathway[a]
	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	
NRF-43 - Seepage Basin Pump Out Area (No Further Action site)									
Arsenic	2e-06	--	2e-06	--	3e-05	--	3e-05	--	Ingestion of Soil[b] Ingestion of Food Crops[b]
Cesium-137	2e-05	NA	8e-06	NA	4e-05	NA	9e-06	NA	Ingestion of Food Crops External Exposure[b]
NRF-21B - Sludge Drying Bed (Remedial Action site)									
Mercury	NA	--	NA	--	NA	37	NA	37	Ingestion of Food Crops[b]
Benzo(a)pyrene	--	NA	--	NA	1e-06	NA	1e-06	NA	Ingestion of Soil
Cesium-137	5e-04	NA	3e-04	NA	1e-03	NA	3e-04	NA	Ingestion of Food Crops[b] External Exposure[b]
Cobalt-60	6e-05	NA	1e-06	NA	6e-06	NA	--	NA	External Exposure
Uranium-235	--	NA	--	NA	1e-06	NA	1e-06	NA	External Exposure[b]
NRF-16 - S1W Radiography Building Collection Tanks (No Further Action site)									
Arsenic	2e-06	--	2e-06	--	3e-05	--	3e-05	--	Ingestion of Soil[b] Ingestion of Food Crops[b]
Benzo(a)pyrene	--	NA	--	NA	3e-06	NA	3e-06	NA	Ingestion of Soil[b]
Cesium-137	1e-04	NA	6e-05	NA	3e-04	NA	8e-05	NA	Ingestion of Food Crops[b] External Exposure[b]
Cobalt-60	2e-05	NA	--	NA	2e-06	NA	--	NA	External Exposure
Uranium-235	--	NA	--	NA	1e-06	NA	1e-06	NA	External Exposure[b]
NRF-66 - Hot Storage Pit (No Further Action site)									
Cesium-137	2e-05	NA	1e-05	NA	3e-05	NA	2e-06	NA	Ingestion of Food Crops External Exposure[b]

Unit/Constituent	Current Occupational		30-year Occupational		30-year Residential		100-year Residential		Pathway[a]
	Risk	HQ	Risk	HQ	Risk	HQ	Risk	HQ	
NRF-80[e] - A1W/S1W Radioactive Line Near BB19 (Remedial Action site)									
Cesium-137	8e-05	NA	4e-05	NA	2e-04	NA	4e-05	NA	Ingestion of Food Crops[b] External Exposure[b]
Cobalt-60	9e-02	NA	2e-03	NA	9e-03	NA	--	NA	Ingestion of Soil Ingestion of Food Crops External Exposure
NRF-32 - S5G Basin Sludge Disposal Bed (No Action site)									
Arsenic	2e-06	--	2e-06	--	2e-05	--	2e-05	--	Ingestion of Soil[b] Ingestion of Food Crops[b]
NRF-17[e] – S1W Retention Basins (Remedial Action Site)									
No risk assessment was performed for this site.									

a) Pathways that showed a carcinogenic risk of 1×10^{-6} or greater risk or a hazard quotient of 1.0 or greater. If no single pathway showed greater than 1×10^{-6} risk or a hazard quotient of 1.0, the pathway that contributes most to the constituent overall risk is shown.
b) These pathways show a risk greater than 1×10^{-6} or a hazard quotient greater than 1.0 at the 100-year residential scenario.
c) A risk management decision was made, based on the conservative nature of the risk assessment, to eliminate mercury as a contaminant of concern for this site even though the hazard quotient was calculated as greater than 1.0. (See discussion in Section 4.1.2.6)
d) NRF-14 and NRF-12B were evaluated as one area because of their close proximity to each other and similar history and discharges.
e) An unacceptable risk is presumed to exist at these sites based on process knowledge and sampling results from downstream units.
f) S1W Tile Drainfield and L-Shaped Sump were evaluated separately.

NA Not Applicable
HQ Hazard Quotient
-- Risk was below 1×10^{-6} or hazard quotient was less than 1.0.

Table 6. Contaminants Eliminated as Contaminants of Potential Concern

Site	Contaminant with Risk < 1E-06 or HQ < 1.0
NRF-02	Chromium
NRF-11 (S1W Tile Drainfield)	Dieldrin
NRF-11 (L-Shaped Sump)	Americium-241
	Americium-243
NRF-12A	Chromium
	Americium-241
	Carbon-14
	Plutonium-238
	Plutonium-239
NRF-12B, 14	Aroclor-1260
	Carbon-14
	Plutonitum-239
	Chromium
NRF-13	Arsenic
	Cesium-137
	Cobalt-60
NRF-16	Benz(a)anthracene
	Benzo(b)fluoranthene
	Indeno(1,2,3-CD)pyrene
NRF-19	Chromium
	Carbon-14
	Plutonium-239
	Uranium-234
NRF-21A	Cadmium
	Chromium
	Silver
NRF-21B	Antimony
	Cadmium
	Chromium
	Silver
	Benzo(b)fluoranthene
NRF-23	Cadmium
	Chromium
	Silver
	Benz(a)anthracene
NRF-43	Carbon-14
	Plutonium-239
NRF-79	Carbon-14
	Manganese-54
NRF-81	Carbon-14
	Plutonium-239

4.1.2.5 Risk Assessment Uncertainties

There are many uncertainties associated with the risk assessment calculations. Uncertainties are associated with all estimates of carcinogen and noncarcinogen health hazards. These uncertainties result from incomplete knowledge of many physical and biological processes and assumptions made on such items as land usage and availability of contaminants. Where specific information is not available, it is necessary to make assumptions and/or use predictive models to compensate for lack of information. The assumptions, models, and calculations are chosen so that the resulting risk and hazard estimates are protective of human health. However, these assumptions usually result in a conservative estimate of risk. Table 7 shows the uncertainties associated with various aspects of the risk assessment performed for the individual sites.

Table 7. Uncertainties Associated with Individual Site Risk Assessments

Area	Uncertainties	Effect on Risk
Sampling and Analysis	All constituents, or their maximum values, may not have been identified.	Underestimate
	A representative concentration may not have been obtained where limited sampling was performed.	Overestimate or Underestimate
Concentration Terms	Maximum values are used in the risk assessments.	Overestimate
	All risk assessments use one-half the detection limits when the constituent is not detected.	Overestimate
Fate and Transport	Use of generic modeling parameters may not be truly representative of NRF.	Overestimate
	Distribution coefficient values have wide ranges for various soil types.	Overestimate
	Chemical compounds are indeterminate.	Underestimate or Overestimate
	Physical parameters of soil on which analysis performed not known.	Underestimate or Overestimate
	The presence of oil and organics in the effluent complicate fate and transport determination.	Underestimate or Overestimate
GWSCREEN Modeling (used for assessing groundwater pathway)	Peak concentration times of constituents that occur over 10,000 years in the future are not included in the risk assessments.	Underestimate
	GWSCREEN input parameters (i.e., contaminant solubility limit, distribution coefficient (K_d), and infiltration rate) are considered conservative, but contain some uncertainty.	Underestimate or Overestimate
	Maximum source term concentrations are assumed for the entire volume modeled for each site.	Overestimate

Area	Uncertainties	Effect on Risk
Exposure Assessment	Assumes residences could be established in areas that are uninhabitable due to physical or administrative limitations.	Overestimate
	Default exposure values assume maximum possible exposure times, particularly for the occupational scenario where exposure times were 8 hours per day rather than more realistic times of a maximum of a few hours a week.	Overestimate
	The dermal absorption pathway was not included in the risk assessment calculations.	Underestimate
	Withdrawn values from IRIS or HEAST are used in the risk assessments.	Underestimate or Overestimate
	Assumes that maximum constituent concentrations are present for all pathways.	Overestimate
Toxicity Assessment	Use of parent nuclide slope factor plus daughter (D) rather than adding slopes for both.	Underestimate
	Extrapolation of values from nonhuman studies to humans, from high doses to low doses.	Overestimate or Underestimate
	Route-to-route extrapolations are used.	Underestimate or Overestimate
	Lead was not included in the risk assessment calculations.	Underestimate
	Chromium was assumed, based on sample data, to be present in the trivalent state and not the more toxic hexavalent state.	Underestimate
	An assumption is made of the chemical form.	Underestimate or Overestimate
Risk Characterization	Risks are added across constituents and pathways, although they may not affect the same target organ or mechanisms of damage.	Underestimate or Overestimate
	Assumption that constituents are evenly distributed at maximum concentrations throughout the source volume.	Overestimate
	Toxicity values for some constituents (chromium, silver) are based on industrial conditions.	Overestimate
	Reference doses and slope factors were not adjusted from oral to dermal toxicity for the dermal pathway.	Underestimate

4.1.2.6 Individual Site Risk Assessment Conclusions

The INEEL future land use document states that the most likely land use scenario for the area around NRF will be industrial for the next 100 years. Land use is a consideration when determining the appropriate level of risks within an area of concern. NRF maintains strict control over the radiological areas identified in OU 8-08. Adequate management and operational controls are in place to control exposure at sites that show a potential risk to a current or 30-year occupational receptor. Cobalt-60 was one of the primary COPC for the occupational scenarios. However, with a half-life of near five years, the cobalt-60 will have decayed to insignificant amounts within 100 years which would be the earliest ~~a~~residence at NRF could be expected. Most of the sites that show an elevated risk are subsurface soil contaminated areas and excavation would be required for exposure to contaminants. NRF-12B, 19, and 14 are outside the NRF security fence, but have separate surrounding fences to prevent any human contact with the contaminants even though the contaminants are primarily subsurface. The risk assessments used default exposure parameters to determine the likely risk to an occupational receptor. These default parameters assume the receptor will be in the area for eight hours a day and 250 days a year. The default values are conservative compared to the actual time an occupational receptor would be at the OU 8-08 sites. The typical occupational receptor at NRF would rarely visit these sites (i.e., annual environmental monitoring and sampling, which requires two to four individuals less than eight hours per year, are the only times individuals enter the areas). Based on the above information, the 100-year residential scenario is the scenario of concern.

The contaminants of concern (COCs) are those constituents that show a risk above the NCP target risk range of 1E-04 to 1E-06 or a hazard quotient greater than 1.0 for the 100-year residential scenario. Those constituents that show a carcinogenic risk above 1E-06 or a hazard quotient above 1.0 for the individual site risk assessments include: arsenic, antimony, mercury, benzo(a)pyrene, n-nitrosodi-n-propylamine, americium-241, cesium-137, neptunium-237, nickel-63, plutonium-238, plutonium-244, strontium-90, and uranium-235.

Groundwater risks were evaluated using the GWSCREEN modeling program and by evaluating samples collected from a network of groundwater monitoring wells (Figure 3). The GWSCREEN modeling assessed residual contamination in the soil and the ability of the contaminants to migrate toward the aquifer. GWSCREEN modeling did not show any contaminants reaching the groundwater during the 100-year residential scenario, with the exception of n-nitrosodi-n-propylamine (at 114 years), for the individual OU 8-08 sites that do not have a current water source to drive contaminants toward the groundwater. GWSCREEN used very conservative modeling parameters, however, many of the radiological contaminants were shown to decay to below risk-based concentrations prior to reaching the aquifer.

Groundwater samples were also evaluated to assess those contaminants that may have reached the aquifer because a driving force is currently present (e.g., industrial waste ditch) or was present at one time (e.g., S1W Leaching Beds). Although some elevated levels of contaminants have been detected during sampling (see Section 3.4), none of the average concentration of contaminants were found to be above the stringent maximum contaminant levels (MCLs) of federal drinking water standards. These MCLs are based on allowable risk levels established by the EPA. The GWSCREEN and groundwater sampling show the groundwater pathway is not a pathway of concern at NRF.

Arsenic, antimony, mercury, benzo(a)pyrene, and n-nitrosodi-n-propylamine were eliminated as COCs for various reasons during risk management decisions. Risk assessment calculations for all five contaminants were very conservative in nature and likely overestimated the risks. The maximum detected concentration for each contaminant was generally used for risk assessments and it was assumed the entire area was contaminated at that level. Antimony and n-nitrosodi-n-propylamine were COPCs at one site based on one sample collected below a 10 foot depth, which is the depth that would eliminate most exposure pathways. Mercury was assumed to be in the most toxic form (methylmercury) even though this is very unlikely at NRF. Benzo(a)pyrene risks were calculated to be equal to or slightly greater than 1E-06 at two sites and sample results may not have been representative of the areas sampled (e.g., sample results from sediment in a concrete enclosed sump were used to estimate surrounding soil contamination even though there was no evidence of sump leakage). There was no known process release of arsenic at NRF and the background levels, which are used to screen potential contaminants, may be higher than published. In addition, the site with the highest calculated arsenic risk is an area where remedial action was anticipated (NRF-12B).

A risk assessment was not performed for lead, which was detected at one location (NRF-12B) above EPA recommended screening levels for lead cleanup. Lead was retained as a COC.

Those sites that contain or potentially contain one or more COC above the target risk range are identified as sites of concern. The sites of concern include:

- NRF-11, S1W Tile Drainfield and L-shaped Sump
- NRF-12A, Underground Piping to Leaching Pit
- NRF-12B, S1W Leaching Pit
- NRF-14, S1W Leaching Beds
- NRF-17, S1W Retention Basins
- NRF-19, A1W Leaching Bed
- NRF-21A, Old Sewage Basin
- NRF-21B, Sludge Drying Bed
- NRF-80, A1W/S1W Radioactive Line Near BB19

NRF-17, NRF-80, and the drainfield portion of NRF-11 were the only sites that did not show a risk above 1E-04. They are retained as sites of concern because of their potential to contain COCs above risk-based levels. NRF-80 is an underground pipe and NRF-17 is a concrete basin and both may have leaked in the past. The drainfield portion of NRF-11 was used for radioactive discharges in the early 1950s. A risk assessment for the soil below NRF-17 (S1W Retention Basins) was not performed because of the lack of sample data and the difficulty associated with collecting samples in this area. Sampling results from NRF-80 and NRF-11 (drainfield portion) may not be representative of present site conditions because NRF-80 represents potential sporadic contamination, making characterization sampling very difficult, and the underground piping at NRF-11 could not be found using geophysical surveys prior to sampling. NRF-17 and NRF-80 are retained as sites of concern because of the uncertainty associated with the potential leaks. The drainfield portion of NRF-11 is also retained as a site of concern because of the uncertainty with the location of the underground piping and associated contaminated soil. At each location, contamination above risk-based concentrations is presumed based on process knowledge and sampling performed downstream of sites NRF-17 and NRF-80.

For sites NRF-13, 32, and 79, the low risks are due to the small amounts of contaminants present. For sites NRF-02, 16, 23, 43, 66, and 81 the low risks are due to the relatively small amounts of contaminants present, the protective nature of present site conditions (contaminants inaccessible because of structures, soil covers, or administrative controls), and the assumption of 100 years of industrial control.

4.1.3 New Site Risk Assessments

Track 1 investigations were performed for sites NRF-82 and NRF-83. The assessments determined that a source was present at each site, but current site conditions limit exposure to the sources. For NRF-82, industrial control for 100 years is assumed and this results in a low estimated risk. For NRF-83, no exposure route is present from the contaminant to a receptor because the contamination is presently below a concrete pad. Since the assessment of these two areas was made after the NRF Comprehensive RI/FS, an additional evaluation was made to determine the potential impact of these two sites to the cumulative risk assessment of NRF. Each site was determined not to impact the cumulative risk assessment because of the small amount of contamination present at NRF-82 and the lack of an available exposure route at NRF-83.

4.2 Ecological Risk Assessment

A Screening Level Ecological Risk Assessment (SLERA) evaluated the known or potential sites at NRF where previous investigations and sampling had determined that a source of contamination remained. Risks were calculated for six representative wildlife species based on an INEEL guidance manual for performing SLERAs. Organic, inorganic, and radiological constituents were evaluated through the ingestion and external exposure pathways. Assessment results were used to compare risks. Calculated screening level quotients were not considered to be additive because of the potential for compounding the uncertainty.

Based on the results of samples collected since 1987 and toxicity values used at other INEEL facilities, the metals arsenic, lead, and mercury were the risk drivers for ecological receptors at NRF. Radionuclides and organics were also contributors to the overall ecological risk, but the risks were very low. No additional ecological risk assessment was deemed necessary for radionuclide and organic compounds. NRF-23 (Sewage Lagoons) presented the highest potential ecological risk based on accessibility, attractiveness, number of constituents present, and associated risk.

The results of the SLERA were also used to select receptors for additional ecological risk assessment. Receptors were selected on the basis of potential exposure and perceived value to society. The SLERA determined that deer mice, bald eagles, and mallard ducks were the primary receptors of concern. Deer mice were calculated to receive some of the highest exposures in the vicinity of NRF. Bald eagles were selected because they prey upon deer mice, are a threatened species, and are perceived as a valued species by the general public. Mallards were a receptor of concern because they breed in the vicinity of the sewage lagoon, can be prey for bald eagles, and are a game species.

The ecological risk assessment addressed the effects of arsenic, lead, and mercury on the three receptors identified in the SLERA. Exposure values for these metals were calculated for each receptor and compared to a range of exposure values that resulted in no observable adverse effects to laboratory test animals. These comparisons were qualitatively assessed, since no studies were found that directly measured the effects of arsenic, lead, and mercury on the receptor species. The weighted average concentration for each of these constituents at NRF was also compared to background levels. The risks associated with the exposures to the ecological receptors are characterized as low. Although there are uncertainties associated with this screening assessment, the results indicate that no additional actions are required due to estimated risks to ecological receptors.

4.3 Cumulative Risk Assessment

A cumulative risk assessment was performed to determine if there are additional risks due to the cumulative, or additive, effects associated with having several individual sites near one another. The cumulative risk assessment evaluated all sites previously assessed and the OU 8-08 sites assessed during the NRF Comprehensive RI/FS. This included the 13 COCA sites evaluated prior to the FFA/CO and the 10 sites in OUs 8-04, 05, and 07 associated with a previous ROD. Each site was evaluated and screened out of the process if no constituent source was present or if the constituent concentrations were below screening levels. Screening levels corresponded to an excess cancer risk of 1E-07 or a hazard quotient of 0.1.

The 100-year future occupational worker and 100-year future resident were the scenarios considered for the cumulative risk assessment. The exposure pathways considered were inhalation of fugitive dust, ingestion of groundwater, and direct radiation exposure. The soil ingestion and food crop ingestion pathways were not considered because they are not likely to occur from more than one release site at a time.

The cumulative risk assessment identified that chromium, n-nitrosodi-n-propylamine, and cesium-137 are the only constituents that showed a calculated risk value greater than 1E-06 or a hazard quotient greater than 1.0 for the scenarios evaluated. Although chromium and n-nitrosodi-n-propylamine showed elevated risk values during the 100 year scenarios, they are not considered COCs at NRF. A hazard quotient of 3.5 through the inhalation pathway was calculated for chromium. The concentration source term used for chromium was very conservative (i.e., maximum values from most sites). Considering the conservative nature of the cumulative risk assessment and the fact that the hazard quotient for chromium was less than an order of magnitude greater than 1.0, a risk management decision was made that chromium is not a COC. N-nitrosodi-n-propylamine was detected at only one location at the 20 foot depth. It was eliminated as a COC during the individual site risk assessment. The estimated risk value for cesium-137 through the direct exposure pathway is 2E-4 for the occupational scenario and 1E-3 for the residential scenario. Cesium-137 was identified as a COC in the individual site risk assessments.

In addition to the uncertainties identified in Section 4.1.2.5 for the individual site risk assessments, there are uncertainties associated with the cumulative risk assessment. To assess cumulative effects, theoretical areas were defined that represented the total area of sites. The concentration for each constituent in the theoretical area (the source term) was then estimated using a weighted average of the highest concentration found in each area. This is a very conservative source term estimate. Additionally, the groundwater transport model tends to overestimate the groundwater concentration that further adds to the conservatism of the risk assessment calculations. The estimated risk values are believed to overestimate the risk from these areas.

The cumulative risk assessment shows that the individual risk assessments do not underestimate the risk. No additional COCs were identified when considering cumulative effects from the many individual sites at NRF that would impact decisions made on a site by site basis. Actions taken on individual sites will be adequate for WAG 8 as a whole. The cumulative assessment also determined that the decisions made for the 13 COCA sites (all No Action) and the 10 sites associated with a previous ROD (three landfill covers and seven No Actions) were appropriate and no additional action is necessary for the sites.

4.4 Risk Assessment Conclusions

The risk assessment process described above identified nine sites of concern (all of which are OU 8-08 sites) that have or potentially have unacceptable risks to human health. In addition, 55 sites were found to have no risk or an acceptable risk. Sixteen of the 55 sites had no hazardous source present and, therefore, no risk. Twenty-seven of the 55 sites have a low or acceptable risk because of the small amount of contaminants present or potentially present. Twelve of the 55 sites have a low risk primarily because of site conditions (industrial control assumed for 100 years or no exposure route from contaminants to receptors are present). The cumulative assessment did not identify any additional sites of concern and concluded that the decisions made for 23 sites (13 COCA sites and 10 sites from a previous ROD) were appropriate. The ecological risk assessment determined that risks associated with exposures to ecological receptors are low, indicating no additional actions are required due to estimated risks to ecological receptors. The sites of concern are shown on Figure 4 with respect to NRF.

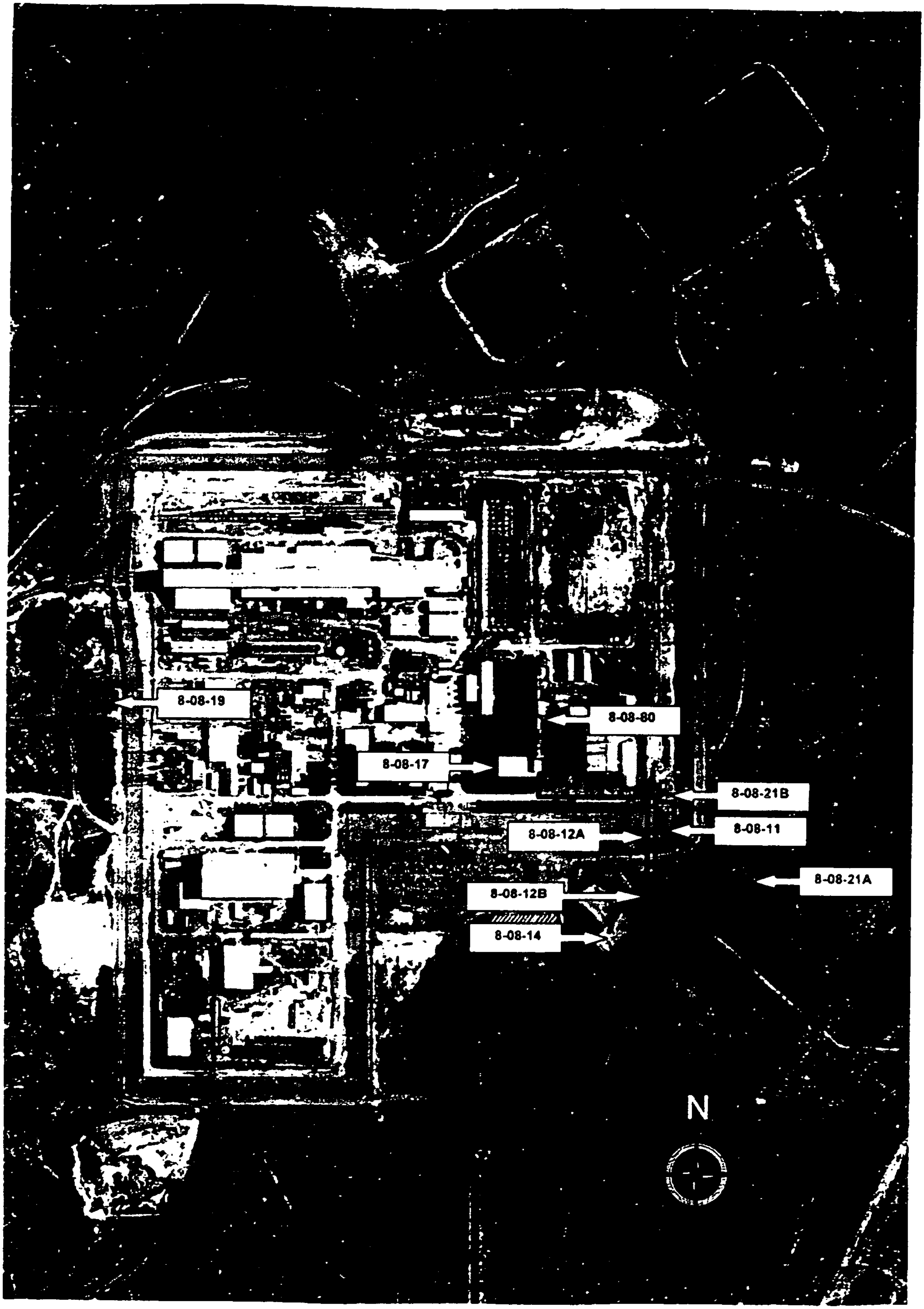

Figure 4. Overhead Photograph of Sites of Concern at the Naval Reactors Facility

5.0 Description of Alternatives

Sections 5.0 and 6.0 of this ROD are applicable to the nine sites of concern identified in Section 4.0. This section describes the alternatives considered to address the risks associated with the nine sites of concern. Section 6.0 gives a summary of the comparison of the alternatives.

5.1 Remedial Action Objectives

Remedial Action Objectives (RAOs) are medium-specific goals established to protect human health and the environment. Medium-specific means soil, air, or groundwater. The RAOs include contaminants of concern (COCs), exposure routes and receptors, and an acceptable risk for each exposure route. The RAOs are used to help identify potential remedial action alternatives. The RAOs for OU 8-08 are protective of ecological receptors as well as human health. The media of concern for OU 8-08 is soil. Infiltration of contaminants to the groundwater is not a pathway of concern. The 100-year future residential scenario was used for the development of RAOs because controls are presently in place to protect current and future occupational workers and NRF is expected to remain an industrial site for at least the next 100 years. The rationale for the 100-year future residential scenario being the scenario of concern is given in Section 4.1.2.6. The RAOs for OU 8-08 are as follows:

For Human Health Protection

- Prevent external gamma radiation exposure from all radionuclides of concern that exceed a total exposure pathway excess cancer risk of 1 in 10,000 for the future 100-year residential receptor.

- Prevent ingestion of soil and food crops contaminated with radionuclides of concern that exceed a total pathway excess cancer risk of 1 in 10,000 for the future 100-year residential receptor.

- Prevent exposure to soil contaminated with lead that exceeds the EPA recommended screening level of 400 ppm for lead cleanup.

For Environmental Protection

- Prevent erosion or intrusion by resident plant or animal species in contaminated soils that could cause the release of contaminated soils.

- Prevent exposure to COCs that may cause adverse effects on resident species populations.

Specific remediation goals for the COCs were established based on the RAOs. The RAOs provide a target risk from which risk-based concentrations can be established. Generally, CERCLA risk management decisions are based on carcinogenic excess risk levels in the range of 1 chance in 10,000 to 1 chance in 1,000,000. Because of the conservative nature of the risk assessment assumptions used to calculate a corresponding soil concentration, a risk management decision was made to use the 1 in 10,000 excess carcinogenic risk as the target risk for calculating risk-based soil concentrations. Table 8 shows the COCs, the exposure routes of concern, and the soil concentration for each constituent corresponding to a 1 in 10,000 excess carcinogenic cancer risk (except for lead which reflects a corresponding soil concentration that is an EPA recommended screening level for lead cleanup) for the future 100-year residential scenario. Other exposure routes are available for the COCs shown on Table 8, but only those routes with an excess risk greater than 1 in 1,000,000 (1E-06) are shown since a risk less than 1E-06 would not significantly contribute to the overall risk associated with the COC.

Table 8 also shows the maximum concentration of each COC detected at each site of concern during characterization sampling performed in 1991 and 1992 or NRF Comprehensive RI/FS sampling performed in 1996. The bold numbers on Table 8 represent those contaminants present above a risk-based concentration. Although NRF-11 (S1W Tile Drainfield portion), NRF-17, and NRF-80 do not show the presence of contaminants above risk-based concentrations, indirect evidence suggests that contaminants are present above risk-based concentrations.

The three primary contaminants of concern are lead, cesium-137, and strontium-90, which were the only contaminants detected above risk-based concentrations. Remediating the soil to specific lead, cesium-137, and strontium-90 soil concentrations would reduce the risk associated with those constituents and in all likelihood would reduce the other contaminants' risk values. For example, the maximum detected concentrations of americium-241, nickel-63, plutonium-238, and plutonium-244 all occurred in areas where cesium-137 was above cleanup levels.

Remediation goals, which generally refer to a specific contaminant concentration, are established to meet the RAOs and are based on lead, cesium-137, and strontium-90 concentrations. The remediation goals for OU 8-08 are 16.7 pCi/g of cesium-137, 45.6 pCi/g of strontium-90, and 400 ppm lead. The remediation goals are based on human health risks and are also protective to ecological receptors. As stated in Section 4.2, the ecological risk assessment concluded no additional action above those actions taken for protection of human health was necessary due to estimated risks to ecological receptors.

5.2 Summary of Alternatives

The NRF Comprehensive Feasibility Study identified four remedial action alternatives to be considered for detailed analysis. These alternatives, with the exception of the No Action alternative, meet the RAOs, provide overall protection of human health and the environment, meet ARARs, and are cost effective. The four remedial action alternatives are as follows:

- Alternative 1: No Action
- Alternative 2: Limited Action
- Alternative 3: Limited Excavation, Disposal, and Containment
- Alternative 4: Complete Excavation and Off-site Disposal

5.2.1 Alternative 1: No Action

The National Contingency Plan (NCP) requires consideration of a no action alternative to serve as a baseline for evaluation of other remedial alternatives. No land-use restrictions, controls, or active remedial measures are implemented at the site under this alternative beyond the projected Federal government 100-year institutional control period. Thus, contamination is attenuated only through radioactive decay processes. Current monitoring and radiological controls would continue during the institutional control period, which is the time frame that NRF remains an industrial site.

Table 8. Risk-based Soil Concentrations and Maximum Concentrations (pCi/g or ppm) of COCs Detected at Sites of Concern

Risk-based Soil Concentrations[a]	Lead[b]	Am-241	Cs-137	Np-237	Ni-63	Pu-238	Pu-244	Sr-90	U-235
Direct Contact	400[c]	NA	NA	NA	NA	NA	NA	NA	NA
External Exposure	NA	895	16.7	NA	NA	NA	3.3	NA	13.2
Ingestion of Soil	NA	283	24,860	NA	NA	590	NA	15,418	NA
Food Crop Ingestion	NA	301	164	19.8	15,846	1,153	NA	45.6	NA
Site of Concern									
NRF-11 S1W Tile Drainfield	11.1	ND	0.3	ND	9.96	ND	ND	ND	ND
L-Shaped Sump	13.0	0.42	**45.98**	ND	ND	ND	0.09	ND	ND
NRF-12A	13.0	0.60	**7,323**	ND	329.06	0.60	0.24	35.35	ND
NRF-12B	**1,140**	0.15	**1,600**	ND	171.40	0.15	ND	37.30	ND
NRF-14	31.5	5.9	**2,040**	0.79	730	5.9	ND	**83**	ND
NRF-17[d]	89	ND	1.1	ND	ND	ND	ND	ND	ND
NRF-19	18.4	20	**1,390**	ND	730	20	ND	**750**	ND
NRF-21A	150	ND	**229**	ND	7.74	ND	ND	2.02	ND
NRF-21B	75	ND	**43.9**	ND	4.59	ND	ND	ND	0.17
NRF-80	14	ND	ND	ND	5.48	ND	ND	ND	ND

Bold indicates concentration of contaminant detected above a risk-based concentration.
ND – Not Detected
NA – Not Applicable

(a) Concentrations correspond to a 1 x 10^{-4} carcinogenic risk.
(b) Lead results derived from total metals analysis.
(c) EPA recommended screening level for lead cleanup.
(d) Sample results were from soil adjacent to the retention basins and not from suspected contamination below the basins.

The no action alternative would be easily implemented without any additional costs. However, the risk assessment performed for the OU 8-08 sites of concern indicates the presence of unacceptable risks to human health and the environment and therefore, the no action alternative is ineffective and does not meet the RAOs.

5.2.2 Alternative 2: Limited Action

Alternative 2 consists of the following institutional controls to protect human health and the environment against potential risks associated with OU 8-08 sites of concern:

- Long-term monitoring
- Fencing and/or other barriers
- Land use restrictions
- Existing cover inspection and maintenance
- Erosion control

Long-term monitoring would be performed at all sites. Monitoring would include continued sampling of soils near the sites of concern and groundwater sampling. Specific monitoring parameters would be established during the remedial design phase, but would likely include radiological groundwater sampling from present monitoring wells. Such monitoring activities would be performed concurrently with any other ongoing monitoring programs at NRF and the INEEL. The monitoring would continue through the institutional control period, which is the time frame that NRF remains an industrial site.

Access to the INEEL is currently restricted for purposes of security and public safety. Since the location of all the OU 8-08 sites are within the boundaries of the INEEL, site-wide access restrictions would limit accessibility. In addition, the existing double security fence surrounding NRF encloses all of NRF-17, 21B, and 80, and portions of NRF-11 and 12A. The existing security fence would be maintained as necessary during the control period. Installation of additional fences or relocation of existing fences may also be necessary. Other access control measures may include (but are not limited to) warning signs, property border signs, land use restrictions, and establishing training requirements for persons allowed access. A description of the areas where access would be restricted, the specific controls (e.g., fences, signs) that would be used to ensure that access would be restricted, the types of activities that would be prohibited in certain areas (e.g., excavation), and the anticipated duration of such controls, would be determined during the remedial design phase and would be incorporated into the Bettis Atomic Power Laboratory Site Development Plan (SDP). This information would be submitted to the EPA and IDHW once it has been placed in the SDP. As appropriate, NRF would also provide the Bureau of Land Management or other Federal agencies the detailed description of the controls identified above.

Maintenance of surface integrity, including repairing effects of subsidence and erosion, would be performed as necessary to prevent exposure of subsurface contaminants. Maintenance crews would use the same type of native soil presently at NRF. Erosion control would be maintained by grading surface areas to provide drainage and runoff control, and revegetation may prevent erosion of existing cover materials.

The limited action alternative is considered to be easily implemented for both the short- and long-term, since the specified actions are essentially a continuation of the existing management practices conducted at the OU 8-08 sites of concern. The costs associated with this alternative are primarily due to environmental monitoring activities. Soil cover maintenance, fence maintenance, and erosion control would be performed only on an as-needed basis.

This alternative is generally considered to be effective for the protection of human health and the environment. However, after the institutional control period of the INEEL is discontinued, risks to human health and the environment would be dependent on access restrictions placed around the sites of concern. Assuming access restrictions are maintained even after the end of the institutional control period and the ability to enforce the access restrictions exists, Alternative 2 is considered effective for protection of human health if there is no degradation of the existing cover material. Alternative 2 may not be as effective to the protection of ecological receptors, since small animals may burrow into the soil or plants may establish residence in the cover material. The approximated time to implement this alternative would be one year.

5.2.3 Alternative 3: Limited Excavation, Disposal, and Containment

Alternative 3 consists of the following actions to isolate the contaminated soil at OU 8-08 sites of concern:

- Excavation using standard techniques
- Verification sampling
- Transportation
- Contamination control
- On-site consolidation
- Containment with engineered earthen cover
- Site restoration
- Institutional controls
  - Short-term monitoring
  - Long-term monitoring
  - Fencing and/or other barriers
  - Land use restrictions
  - Cover inspection and maintenance
  - Erosion control

This alternative removes soil and debris from six sites and consolidates the soil at NRF-14 (S1W Leaching Beds). An estimated 133,000 cubic feet of soil would be excavated of which an estimated 58,000 cubic feet would be contaminated above remediation goals and placed in NRF-14. Approximately 3,130 linear feet of underground piping would be removed. An engineered cover would be placed over NRF-14 and NRF-12B, which are adjacent to each other. Another cover would be placed over NRF-19. This alternative requires excavating contaminated soil, pipes, and concrete structures from the following sites: NRF-11, 12A, 17, 21A, 21B, and 80. Conventional excavation equipment has been demonstrated to be effective in retrieving radioactive soil and debris in other INEEL remedial responses. After excavation, these sites would be filled with clean soil. In addition, the pipes leading to NRF-14 and 19 would be excavated. The pipe and concrete structures, which would have been removed during decontamination and dispositioning work regardless of remedial actions, would be managed and disposed of under current NRF radioactive waste management policies. Presently, this involves disposal at the Radioactive Waste Management Complex (RWMC) for radiologically contaminated debris or disposal per the INEEL Site Treatment Plan for mixed radiological and hazardous debris. NRF-12B (S1W Leaching Pit), NRF-14 (S1W Leaching Beds), and NRF-19 (A1W Leaching Bed) represent the sites with the greatest volumes and concentrations of contaminated soil. The soil at NRF-12B, 14, and 19 would not be removed.

A single area of contamination (AOC) will be defined to include the areal extent of contiguous contamination which will encompass both the excavation and consolidation sites. The specific boundaries of the AOC would be identified and refined in subsequent documents such as the Remedial Design/Remedial Action Scope of Work and the Remedial Action Work Plan. Under this alternative, contaminated soils are not expected to be removed from the AOC. Movement and stock-piling of contaminated soils within the AOC for purposes of consolidation during remedy construction is not intended to trigger Idaho Hazardous Waste Management Act/Resource Conservation and Recovery Act land disposal restrictions. However, in the unlikely event that the volume of contaminated soils exceeds the capacity of the leaching beds, contingency actions could include disposal of contaminated soils outside of the AOC (i.e., probably away from the NRF). In such a case, the soils would be subject to the same waste management requirements that pertain to the contaminated debris leaving the AOC.

Real time gamma surveys could be used to delineate the extent of contamination to be removed as the excavation proceeded. Sodium iodide or germanium detectors could be calibrated to detect radiological contamination present at concentrations above remediation goals. Cesium-137, which is a gamma emitter, is the primary COC at each site. As deemed necessary in the remedial design phase, laboratory analysis of an agreed upon number of representative grab samples would be required to verify the real-time assessment. Real-time surveys can reduce the volume of clean soil removed and mixed with contaminated soil.

Current radiological controls practices could be used to reduce radiation exposure to the operator. Radiological controls could consist of limiting the amount of time an operator can work in the area, using containment structures around the contaminated material to prevent the spread of contaminants, ensuring containment structures around the contaminated material have a negative pressure to prevent airborne release of contaminants, wearing personnel protective equipment, and using distance and shielding to reduce radiation exposure.

Debris would be sampled during excavation for characterization purposes to ensure it is not RCRA hazardous. No RCRA hazardous debris is expected at any of the sites of concern. If sampling shows the debris to be RCRA hazardous and radiologically contaminated, then the debris will be disposed of as mixed waste per the INEEL Site Treatment Plan. The debris would be packaged according to the Site Treatment Plan requirements.

During excavation, dump trucks would most likely be positioned near the excavation site such that backhoes can place the contaminated soil directly into the dump truck. Possible dust suppression techniques used during excavation include: keeping the soil wetted during excavation activities, performing excavation in tented enclosures, halting excavation work during windy conditions, and keeping man-made covers over contaminated soils. The dump truck may contain tarps to prevent the release of soil in transit. The dump truck will then transport the soil to the S1W Leaching Beds (NRF-14) for on-site consolidation. The leaching beds contain dirt ramps to allow the dump truck to drive to the bottom of the leaching beds and empty the soil. Other means of transporting the soil, such as directly with a backhoe or in boxed containers, would be considered during the remedial design phase of the action. The estimated contaminated soil volume from all the proposed excavation areas would fit into the present leaching beds. All actions will require radiological controls as discussed above. Contingency actions would include off-site (away from NRF) disposal of soil that exceeds the capacity of the leaching beds or continued consolidation at the beds above surface level, although these are unlikely to be necessary.

Verification sampling, consisting of radiation surveys and soil sampling and analysis, would be performed to confirm that all contamination exceeding remediation goals was removed from the site of concern. Following the removal of the contaminated soil from the sites, contouring to conditions of the surrounding landscape and filling excavated areas with clean materials would restore each site. Backfilled areas would be compacted to prevent future subsidence. Sites would be revegetated as appropriate.

The engineered cover could consist of geologic materials including native soil, gravel, basalt cobbles, and rip-rap. Variations from this conceptual design are possible based on layer thickness, layer material, layer order, location of a potential biobarrier in the cap profile, and other considerations. The conceptual design would be developed during the remedial design and modified as needed to meet defined functional and operational requirements, with the concurrence of regulatory agencies. The engineered barrier will be designed for use in arid climates, but may include designs limiting infiltration.

Specific performance goals (as given in 10 CFR 61, Licensing Requirements for Land Disposal of Radioactive Waste) are established for the cover and include:

- Installation of covers that are designed to discourage any individual from inadvertently intruding into the contaminated soil, or from contacting the contaminated soil at any time after active institutional controls over the sites are removed, up to the design life of the covers.
- Application of maintenance and surface monitoring programs for the containment systems capable of providing early warning of releases of radionuclides from the sites, before they leave the site boundary.
- Institution of restrictions limiting land use to industrial applications for at least 100 years.
- Implementation of surface water controls to direct surface water away from the contaminated soil.
- Elimination, to the extent practicable, of the need for ongoing active maintenance of the sites following closure so that only surveillance, monitoring, or minor custodial care are required.
- Placement of adequate cover to inhibit erosion by natural processes for the specified design lives of the cap.
- Incorporation of features to inhibit biotic intrusion into the contaminated soil areas.

Institutional controls would be implemented after the construction of the covers. Long-term monitoring, fencing and/or other barriers, land use restrictions, cover inspection and maintenance, and erosion control as explained for Alternative 2, Limited Action, would be applicable. A description of the areas where access would be restricted, the specific controls (e.g., fences, signs) that would be used to ensure that access would be restricted, the types of activities that would be prohibited in certain areas (e.g., excavation), and the anticipated duration of such controls, would be determined during the remedial design phase and would be incorporated into the SDP. This information would be submitted to the EPA and IDHW once it has been placed in the SDP. As appropriate, NRF would also provide the Bureau of Land Management or other Federal agencies the detailed description of the controls identified above.

Radiation surveys would be required at the covered sites. Additional surveys across and around the sites would be performed to detect radionuclides potentially mobilized by burrowing animals, erosion, or other natural processes. Cover integrity monitoring would be performed across and around the cover sites to assess maintenance requirements due to erosion, cracking, or other observable deterioration of the cover.

Maintenance to the protective cover would be performed based on the results of routine cover inspections. The protective cover would likely be inspected monthly during the first 12 months because potential problems (such as settling or subsidence) are most likely to occur within this period. After the initial 12 month period, cover inspection may be performed annually. Maintenance requirements may include periodic removal of undesirable vegetation and burrowing animals and filling animal burrows. In addition, unacceptable erosion or subsidence would require repair of the affected area. Operations and maintenance goals will be defined during remedial design.

The short-term effectiveness of this alternative for protecting human health is judged to be moderate. Equipment operators and site personnel could receive minor radiological exposures during removal activities, however, these exposures could readily be controlled using standard radiation control measures. Short-term protection of the environment is expected to be high because adequate contamination control measures are specified. Toxicity and volume of contaminants would not be reduced by this alternative.

This alternative is considered to be highly effective in preventing long-term exposure at the covered areas. The shielding effects of the various layers of natural media would reduce surface radiation exposure. The covers are designed for long-term isolation with minimal maintenance requirements. The engineered cover for this alternative would be effective in preventing biointrusion and add a high level of inadvertent human or animal intruder protection, by both the mass and impenetrability of material overlying contaminated soils.

Installation costs of this engineered cover are financially feasible. Construction materials are readily available on-site. Long-term inspection and maintenance requirements are considered minimal. Long-term monitoring requirements, including radiation surveys, would be easily implemented during the institutional control period. The approximate time to implement this alternative would be three years.

5.2.4 Alternative 4: Complete Excavation and Off-site Disposal

Alternative 4 consists of the following actions to isolate the contaminated soil at OU 8-08 sites of concern:

- Excavation using standard techniques
- Verification sampling
- Transportation
- Contamination control
- Off-site (away from NRF) disposal
- Site restoration

This alternative would require excavating contaminated soil, pipes, and concrete structures from all the OU 8-08 sites of concern and disposing of the soil and debris to an off-site (away from NRF) location. An estimated 1,171,000 cubic feet of soil would be excavated of which an estimated 447,000 cubic feet would be contaminated above remediation goals requiring off-site disposal. Approximately 3,130 linear feet of pipe would be removed. The procedures and equipment used for excavating, surveying, and sampling soil would be the same as Alternative 3. Since NRF-12B, 14, and 19 would also be excavated, additional excavating, surveying, and sampling of the soil would be required. In addition, the soil would be characterized as described for the debris in the Alternative 3 discussion since the soil would be removed from the area of contamination (AOC). Filling excavated sites with clean soil, disposing of contaminated debris, and using currently practiced radiological controls would be the same as Alternative 3.

Similar to Alternative 3, dump trucks could be used to transport the contaminated soil. The dump truck would transport the soil to a transfer station or the disposal location. Actual shipping methods and packaging requirements would be determined during remedial design. Packaging may include placement of the soil in 4 foot wide by 4 foot deep by 8 foot long box prior to transportation away from NRF or the soil may be directly transported to the disposal facility by truck.

Disposal may occur at a proposed INEEL soil repository. The status of this facility is uncertain. The facility is currently projected to be south of the Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant (ICPP)), which is only a few miles from NRF. The projected facility has not yet received funding or approval from DOE or regulatory agencies. A decision on the proposed disposal facility is expected in 1999. This alternative would require a secondary plan if the facility were not approved or available for remedial actions occurring at NRF. Secondary disposal options include the RWMC, Test Reactor Area (TRA) Warm Waste Pond, or an off-INEEL disposal facility such as Envirocare in Utah.

The short-term effectiveness of this alternative for protecting human health is judged to be moderate. Complete excavation, which includes excavating all sites of concern rather than the limited excavation of Alternative 3 that does not excavate all sites of concern, would require the operators to be on-site longer and potentially exposed to contaminants for a longer duration. Equipment operators and site personnel could receive minor radiological exposures during removal activities, however, these exposures could readily be controlled using standard radiation control measures. Short-term protection of the environment is expected to be high because adequate contamination control measures would be specified. Long-term protection of human health and the environment is judged to be highly effective because contaminated soil would no longer exist at any NRF site. Toxicity and volume of contaminants would not be reduced by this alternative.

Short-term technical implementability of this alternative is considered moderate if the proposed INEEL soil repository is approved and available for NRF soil generated from remedial actions. Proposed excavation equipment is currently available. Characterization, packaging, and transportation of the contaminated material can be performed using currently available technology. Long-term implementability is considered high, since the contamination is removed. Long-term inspection and maintenance are considered minimal. Long-term environmental monitoring other than what is currently performed would not be required because the contaminant source would be removed.

The short-term costs of this alternative would be high. Significant costs would be incurred for safety analysis, satisfying ARARs, and operational and capital costs. The primary capital costs associated with this alternative would be disposal facility fees and transportation costs. Compared to other disposal options, the potential INEEL soil repository disposal costs are considered moderate. Operations and maintenance costs would be high during the excavation and disposal period primarily because of the radiological considerations. Long-term monitoring costs would be low assuming all contamination could be removed from the sites of concern. The approximate time to implement this alternative would be five years.

6.0 Summary of Comparative Analysis of Alternatives

The alternatives discussed above were evaluated using the nine criteria as specified by CERCLA:

- **Overall Protection of Human Health and the Environment** addresses whether a remedy provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** addresses whether a remedy will meet all of the ARARs under federal and state environmental laws and/or justifies a waiver.

- **Long-term Effectiveness and Permanence** refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

- **Short-term Effectiveness** addresses any adverse impacts on human health and the environment that may be posed during the construction and implementation period and the period of time needed to achieve cleanup goals.

- **Reduction of Toxicity, Mobility, or Volume through Treatment** addresses the degree to which a remedy employs recycling or treatment that reduces the toxicity, mobility, or volume of the contaminants of concern, including how treatment is used to address the principal threats posed by the site.

- **Implementability** is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- **Cost** includes estimated capital and operation and maintenance costs, expressed as net present-worth costs.

- **State Acceptance** reflects aspects of the preferred alternative and other alternatives that the state favors or objects to and any specific comments regarding state ARARs or the proposed use of waivers.

- **Community Acceptance** summarizes the publics general response to the alternatives described in the proposed plan and in the RI/FS, based on public comments received.

Each of the four alternatives were evaluated against the nine evaluation criteria identified above. The criteria are subdivided into three categories: (1) threshold criteria that mandate overall protection of human health and the environment and compliance with ARARs; (2) primary balancing criteria that include long- and short-term effectiveness, implementability, reduction in toxicity, mobility, or volume through treatment, and cost; and (3) modifying criteria that measure the acceptability of alternatives to state agencies and the community. The selected remedial action alternative must meet the threshold criteria. The balancing criteria are used in refining the selection of the candidate alternatives for the sites. The modifying criteria are used in the final evaluation of remedial alternatives and factors include the elements of the alternatives that are supported, not supported, or have strong opposition. The following sections summarize the detailed analysis of the four alternatives against the nine evaluation criteria.

6.1 Overall Protection of Human Health and the Environment

Alternative 1 (No Action) does not meet the RAOs. There would be no reduction in long-term risk to the public. The risk assessment performed in the NRF Comprehensive RI/FS shows that the no action alternative would not meet the criteria for overall protectiveness because some of the calculated risk values represent an increased cancer risk greater than the NCP upper limit of 1 in 10,000. With this alternative, the potential exists for direct exposure to humans. No surface water controls would exist to prevent erosion and exposure of contaminants to the environment.

Alternative 2 (Limited Action) initially meets the human health protection RAOs by providing restrictions on access and land use to prevent direct contact with the soil. This alternative would also provide early detection of potential contaminant migration although this is not expected. Alternative 2 would also restrict access to the areas by larger animals such as deer and antelope, but may not restrict contact with the soil by smaller animals that could easily navigate through the established barriers. This alternative would also not prevent erosion or intrusion by plant species unless additional care is taken to repair erosion and prevent plants from establishing residence at the sites. No short-term effects would be created if Alternative 2 is implemented, because there would be no disturbance of the soil to affect the workers or the community. Long-term effectiveness would depend on the enforcement of land use restrictions, the effectiveness of posted signs, and continued maintenance operations to repair existing covers.

Alternative 3 (Limited Excavation, Disposal, and Containment) would meet all RAOs and provides a barrier (cover) against direct contact of contaminants by human and ecological receptors. This alternative also restricts access to the areas by fencing or other barriers and places land use restrictions while providing early detection of potential contaminant migration although this is not expected. The short-term effects would be limited to disturbance of the soil and potential effects to the construction workers but not the community. Proper engineering controls along with personal protective equipment will reduce exposure hazards to the workers. Long-term effectiveness will depend on land use restrictions and adherence to posted signs. Long-term effectiveness would also depend on the continued maintenance of the cover. In addition, long-term monitoring would provide meaningful data to measure this alternative's overall effectiveness.

Alternative 4 (Complete Excavation and Off-site Disposal) would meet all RAOs. The off-site (away from NRF) disposal area would provide a barrier (cover) against direct contact of contaminants by human and ecological receptors. The short-term effects would be limited to disturbance of the soil and potential effects to the construction workers but not the community. Proper engineering controls along with personal protective equipment will reduce exposure hazards to the workers. There will be no long-term consequences at the excavation sites because all contaminants would be removed, but long-term effectiveness at the off-site disposal area will depend on the enforcement of institutional controls and continued maintenance of the cover at the off-site disposal area.

Alternatives 3 and 4 equally satisfy the criteria of overall protection of human health and the environment. These alternatives cover the contaminants preventing direct contact with the soil, restrict future land use, minimize infiltration, and provide an early indication of contaminant migration although migration is not expected. Although Alternative 2 meets the general criteria of overall protection of human health, it does not prevent direct contact of contaminated soil by ecological receptors. It also does not prevent erosion or intrusion by plant species unless additional care is given to repair erosion conditions and prevent plants from establishing residence at the sites.

6.2 Compliance with ARARs

Alternative 1 (No Action) would not meet DOE orders regarding protection of current or future receptors. Because Alternative 1 and Alternative 2 (Limited Action) do not provide containment of contaminants, they may not meet applicable rules regarding fugitive dust or control of air pollution, although there is no evidence that specific regulatory levels would be violated. No specific action would be taken to control fugitive dust or air pollution, which is possible for surface soil contaminated areas; however, sampling and institutional controls for Alternative 2 would monitor the media of concern and prevent access to the sites of concern. Alternatives 3 and 4 would meet all ARARS and To-Be-Considered criteria provided proper engineering controls for dust suppression and emissions control are followed during excavation. If RCRA characteristic waste is encountered, which is not expected, those ARARs associated with RCRA requirements would be met.

6.3 Long-term Effectiveness and Permanence

The No Action alternative does not prevent future occupants from coming into direct contact with the contaminated soil or prevent exposure to contaminated soil through erosion by wind or water. This alternative does not maintain long-term effectiveness or permanence.

Limited Action (Alternative 2) would prevent future occupants from coming into direct contact with contaminated soils by establishing fencing or other barriers and by land use restrictions, but does not prevent exposure to contaminated soil through erosion by wind or precipitation. The long-term effectiveness depends on the ability to enforce the land use restrictions and maintain existing covers. Long-term monitoring of groundwater and soil would provide early warning of potential contaminant migration, although this is not expected.

Limited Excavation, Disposal, and Containment (Alternative 3) consolidates most of the soil at NRF-14. An engineered earthen cover would be placed over NRF-14 and the adjacent area, NRF-12B. Another cover would be placed over NRF-19. This alternative would prevent the dispersion of contaminants through erosion by wind or precipitation and direct exposure by contact, and would limit infiltration from precipitation. The long-term effectiveness of this alternative depends on the durability of the designed cover and effectiveness of the engineered layers. Long-term effectiveness would also be achieved by using institutional controls, maintenance, and monitoring. Institutional controls (land use restrictions and fencing or other barriers) would be used to restrict residential development of this land, which could breach the covers and expose the contaminated materials. In addition, long-term maintenance, including inspections and cover repairs, would prevent a breach of the cover. Long-term monitoring of the groundwater and soil would be initiated to provide early warning of contaminant migration, although this is not expected.

Complete Excavation and Off-site Disposal (Alternative 4) removes contaminated soil from NRF and transports the soil to a proposed INEEL soil repository or similar licensed facility. Since the contaminants are removed from NRF, long-term effectiveness is achieved at the removal areas. The residual risk remaining at NRF would result from soil containing contaminants below the cleanup levels, which were established based on risk-based concentrations. Long-term effectiveness at the off-site (away from NRF) disposal area would depend on the institutional controls, maintenance, and monitoring performed at the off-site disposal area. Alternative 4 provides the best long-term effectiveness and permanence of all the alternatives because it removes the contaminant source.

6.4 Short-term Effectiveness

Alternative 1 does not perform a remedial action and therefore there is no increased short-term risk for this alternative. The short-term risks associated with Alternative 2 would be minimal since contaminants are not disturbed. Construction activities, such as building fences, would increase direct exposure to radionuclides, but this would be small compared to excavating activities.

Alternatives 3 and 4 would not pose an increased risk to the community because the remedial actions would occur at a remote location from the community. Alternative 4 would likely involve the transportation of soil along highways within the INEEL boundary, but this would still be isolated from public highways. Protecting site personnel from potential hazards arising from construction activities would be a concern under both alternatives. The primary concerns would be radiation exposure to the workers and the inhalation or ingestion of contaminants caused by the disturbance of soil. These risks would be mitigated by the use of appropriate personnel protective equipment or other engineered controls used during the construction. Preplanning work evolutions would also minimize the time exposed to radionuclides.

Some impacts to the environment during excavation and capping activities for Alternatives 3 and 4 would be unavoidable during construction. Overall, construction activities represent a controllable risk and would not present a significant negative impact to site flora and fauna in the vicinity of the excavation or cover construction. There are no known rare or endangered plants or animals in the vicinity of the excavation or cover areas. The area around NRF has been surveyed and some areas of archeological or historical value were found and identified as culturally sensitive. The excavation areas do not occur in these identified areas and, therefore, these known cultural areas would be excluded from remedial action activities. Although unlikely, the potential exists that unknown culturally sensitive areas could be disturbed during construction activities.

Since Alternative 3 excavates and handles less radioactive soil, it has better short-term effectiveness than Alternative 4, which requires much more soil to be excavated, packaged, and transported. Alternative 2 has the best short-term effectiveness, since only minimal time is spent at the sites of concern.

6.5 Reduction of Toxicity, Mobility, and Volume through Treatment

Treatment technologies were determined not to be practicable because they were ineffective, difficult to implement, and/or very costly. None of the alternatives use treatment as a remedial action and, therefore, do not reduce toxicity, mobility, or volume through treatment. Alternatives 3 and 4 do reduce mobility through containment.

6.6 Implementability

Each alternative is considered implementable. The remedial technologies of excavating, cover construction, land use restrictions, fencing, and monitoring have a proven reliability. The technologies associated with the alternatives are readily available, relatively simple, and easily constructed and maintained. The necessary equipment and specialized personnel would be available for any of the alternatives. The excavation, covering, and monitoring activities associated with Alternatives 3 and 4 can be conducted using common construction techniques. Alternatives 3 and 4 would have some limited impact on current site operations, increasing the difficulty in implementing the actions. These impacts include limiting access to portions of NRF during excavation and construction activities, the disruption of the NRF security fence, and modification of traffic patterns to implement the remedial actions. None of the actions would be expected to impact future operations. Alternative 2 would be the easiest to implement since only minimal construction activities involving a small number of personnel and equipment would be necessary. Alternative 2 would have little impact on present site operations, but may have the greatest impact on future site operations, since various areas would be fenced off to prevent access. Alternative 4 would be the most difficult to implement because of the uncertainty in the availability of the various off-site (away from NRF) disposal options. Additional concerns with Alternative 4 include packaging and transportation to the disposal site.

6.7 Cost

Alternative 1 (No Action) would not entail any additional costs. The costs associated with Alternatives 2 and 3 include 30 years of monitoring. Most of the 30 year monitoring cost (approximately $2.8 million) is attributed to groundwater monitoring that is presently part of the Groundwater Monitoring Program at the NRF. This program was established in the ROD for OUs 8-05 and 8-06, Landfill Areas, and the identified cost does not necessarily represent an increased cost.

Alternative 2 would not require any excavation work. Alternative 3 would excavate an estimated total volume of 133,000 cubic feet of soil compared to 1,171,000 cubic feet for Alternative 4. Alternative 3 would excavate an estimated 58,000 cubic feet of contaminated soil compared to 447,000 cubic feet for Alternative 4. Each alternative would remove approximately 3,130 linear feet of pipe.

Alternative 4 represents the highest cost. Although Alternative 4 does not require long-term monitoring, significantly more contaminated soil (over seven times more) would be excavated in Alternative 4 than Alternative 3. Additional packaging and transportation of the soil would be required. These activities and the associated radiological controls represent the primary cost increase of Alternative 4 over Alternative 3. In addition, if disposal occurred away from NRF, disposal fees including overhead costs may be charged to NRF. Table 9 provides a summary of the costs in Net Present Value (in 1997 dollars) associated with each of the alternatives.

6.8 State Acceptance

The IDHW has been involved in the development and review of the NRF Comprehensive RI/FS, the Proposed Plan, and this ROD. All comments received from IDHW on these documents have been resolved and incorporated into these documents accordingly. In addition, IDHW has participated in public meetings where public comments and concerns have been received and responses offered.

The IDHW concurs with the selected remedial alternative for the sites contained in this ROD and is signatory to the ROD with DOE and EPA.

6.9 Community Acceptance

Community participation in the remedy selection process included participation in the public meetings held in January 1998 and review of the Proposed Plan during the public comment period of January 12 through March 12, 1998. Community acceptance is summarized in Section 7 and the Responsiveness Summary presented in Part III of this document. The Responsiveness Summary includes comments received either orally or in writing from the public, and the agencies' responses to these comments.

Table 9. Cost Summary for Each Alternative

OU 8-08 Alternative 2 Limited Action, Monitoring Cost Estimate

Cost Elements		Estimated Costs
RD/RA Management and Documentation Costs		
Overall Westinghouse Project Management[(a)]		$ 285,191
RA Construction Project Management (contractor)		$ 5,468
	Subtotal	**$ 290,659**
Construction Costs		
Access Restriction Fencing		$ 47,099
Contractor General Conditions (Includes Mobilization & Demobilization Costs)		$ 39,016
Contractor Overhead and Profit		$ 9,660
	Subtotal	**$ 95,775**
Operations and Maintenance Costs		
Oversite Management		$ 436,709
Operation & Maintenance[(b)]		$ 2,127,480
	Subtotal	**$ 2,564,189**
Net Present Value Cost (in 1997 dollars)		**$ 2,950,623**

(a) - RA Project Management and Oversight, Remedial Action Documents Preparation.

(b) - Includes 30 year Monitoring Costs. (Annual Net Present Value cost of $72,500 in 1997 dollars)

OU 8-08 Alternative 3 Limited Removal Capping Cost Estimate

Cost Elements		Estimated Costs
RD/RA Management and Documentation Costs		
Overall Westinghouse Project Management[(a)]		$ 572,325
RA Construction Project Management (contractor)		$ 334,730
	Subtotal	**$ 907,055**
Construction Costs		
Excavation		$ 267,674
Load and Haul		$ 59,642
Demolition, Pipes		$ 97,942
Demolition, Catch Basins/Manholes		$ 10,734
Demolition, Buildings		$ 70,207
Cap Construction		$ 551,604
Sampling and Analysis		$ 60,920
Access Restriction Fencing		$ 100,332
Additional Costs Incurred during Work involving Radiological Controls[(b)]		$ 2,075,530
Contractor General Conditions[(c)]		$ 776,113
Contractor Overhead and Profit		$ 441,437
	Subtotal	**$ 4,512,135**
Operations and Maintenance Costs		
Oversite Management		$ 1,359,081
Operation & Maintenance[(d)]		$ 2,127,480
	Subtotal	**$ 3,486,561**
Net Present Value Cost (in 1997 dollars)		**$ 8,905,751**

(a) - RA Project Management and Oversight, Remedial Design/Remedial Action Documents Preparation.

(b) - Work involving radiological controls includes excavation, demolition, loading and hauling, unloading and controlling soil in consolidation area, and decontamination. Additional costs associated with work involving radiological controls include labor costs (due to lower labor efficiency, additional manpower requirements, and additional training requirements), equipment costs (due to special or additional equipment required, decontamination of equipment, loss of equipment), and material costs (personnel protective equipment, containment materials, etc.).

(c) - Costs include mobilization and demobilization, subcontractor project management, various office equipment and personnel, safety equipment and clothing, sales tax, per diem, insurance, temporary office structures, construction signs, photography, and equipment rental. This generally represents a percentage of construction task costs, which for this alternative is 24%.

(d) - Includes 30 year Monitoring Costs. (Annual Net Present Value cost of $72,500 in 1997 dollars)

OU 8-08 Alternative 4 Removal/Offsite Disposal Cost Estimate

Cost Elements		Estimated Costs
RD/RA Management and Documentation Costs		
Overall Westinghouse Project Management[(a)]		$ 1,848,997
RA Construction Project Management (contractor)		$ 758,929
	Subtotal	**$ 2,607,926**
Construction Costs		
Excavation		$ 890,778
Landfill disposal fees[(b)]		$ 1,906,264
Landfill waste preparation and transportation costs[(c)]		$ 5,718,791
Demolition, Pipes		$ 98,138
Demolition, Catch Basins/Manholes		$ 10,755
Demolition, Buildings		$ 70,348
Sampling and Analysis		$ 163,392
Additional Costs Incurred during Excavation Work involving Radiological Controls		$ 3,301,286
Contractor General Conditions[(d)]		$ 2,955,332
Contractor Overhead and Profit		$ 1,327,085
	Subtotal	**$ 16,442,169**
Operations and Maintenance Costs		
Oversite Management		$ 4,037
Operation & Maintenance		$ 7,799
	Subtotal	**$ 11,836**
Net Present Value Cost (in 1997 dollars)		**$ 19,061,931**

(a) - RA Project Management and Oversight, Remedial Design/Remedial Action Documents Preparation.

(b) - Assumed disposal fee of approximately $100 per cubic yard. This is based on site experience and is an anticipated average cost associated with various disposal options away from NRF including an INEEL soil repository or off-INEEL commercial facility

(c) - The actual transportation costs are estimated to be small compared to the waste preparation, packaging, sampling, etc., costs. This cost includes the additional costs associated with work involving radiological controls during preparation, packaging, sampling, etc. These additional costs include labor costs (due to lower efficiency, additional manpower requirements, and additional training requirements), equipment costs (due to special or additional equipment required, decontamination of equipment, loss of equipment), and material costs (personnel protective equipment, containment materials, etc.).

(d) - Costs include mobilization and demobilization, subcontractor project management, various office equipment and personnel, safety equipment and clothing, sales tax, per diem, insurance, temporary office structures, construction signs, photography, and equipment rental. This generally represents a percentage of construction task costs, which for this alternative is 24%.

6.10 Summary

The comparative analysis assesses the relative performance of the alternatives against the first seven evaluation criteria. Each alternative is evaluated individually against the threshold criteria and the primary balancing criteria. The modifying criteria was not used for the comparative analysis since the modifying criteria evaluates the state and public acceptance of the selected remedial action alternative after the comparative analysis is made. A comparative analysis summary indicates a relative ranking for each alternative in order to aid in identifying the recommended alternative. Alternative 1, which does not meet the threshold criteria of protection of human health and the environment and may not meet the threshold criteria of compliance with ARARs, and as such was eliminated from consideration. A comparison was not made for reduction of toxicity, mobility, or volume through treatment since none of the alternatives included treatment as an action.

Each of the alternatives, with the exception of the no action alternative, would meet the RAOs associated with the protection of human health. Alternative 2, Limited Action, may not meet the RAOs for protection of environmental receptors. The risk assessment given in the NRF Comprehensive RI/FS showed that preventing access to and direct contact with the contaminated soil would be protective of human health. Preventing access to the areas of concern would place the receptor at a sufficient distance that external exposure to radionuclides would not be a pathway of concern. These restrictions on access to the area would also prevent soil ingestion and food crop ingestion associated with the contaminated soil. Alternative 2 was determined that it may not meet the ARAR requirements associated with controlling fugitive dust and air pollution, although there is no evidence that specific regulatory levels would be violated. Alternatives 3 and 4 meet all RAOs and provide overall protection of human health and the environment. Both alternatives meet all ARARs established for each alternative. Based on the criteria given in Section 6.0, Alternative 3 (Limited Excavation, Disposal, and Containment) was ranked higher than Alternative 4 (Complete Excavation and Off-site Disposal) because of more favorable comparative ratings due to lower costs, easier implementation, and better short-term effectiveness. Based on the above information and comparative analysis, Alternative 3 was the recommended selected remedial action for the sites of concern.

7.0 Highlights of Community Participation

In accordance with CERCLA §113(k)(2)(B)(i-v) and §117, a series of opportunities for public information and participation in the investigation and decision process for WAG 8 was provided to the public from September 1995 through March 1998. The opportunities to obtain information and provide input included *INEEL Reporter* newsletter articles (a publication on the INEEL's Environmental Restoration Program); Citizens' Guide supplemental updates; a proposed plan; focus group interactions, which included teleconference calls, briefings, and presentations to interest groups; and public meetings. In addition, several public involvement activities were conducted during previous investigations including an RI/FS and two small removal actions. The ROD for the Industrial Waste Ditch (OU 8-07) and Landfill Areas (OUs 8-05 and 8-06) contains a summary of the public involvement activities that were associated with these former investigations at NRF.

Regular reports concerning the status of the project were included in bimonthly issues of the *INEEL Reporter* and were mailed to those on the mailing list. Reports also appeared in two issues of a *Citizen's Guide* to environmental restoration at the INEEL in early 1996 and 1997 and one issue of *Environmental Restoration Progress, A Status Report of Environmental Cleanup at INEEL* in February 1998. Both of these reports are supplements to the *INEEL Reporter.*

On January 12, 1998, DOE issued a news release to more than 100 contacts concerning the beginning of a 30-day public comment period pertaining to the NRF Comprehensive Proposed Plan. This comment period began on January 12, 1998. In response to a request from the public, the comment period was extended 30 days and ended on March 12, 1998. Many of the news releases resulted in a short note in community calendar sections of newspapers and public service announcements on radio stations. The news release gave notice to the public that NRF investigative documents would be available from the beginning of the comment period. These documents were available in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library in Idaho Falls and public libraries in Fort Hall and Moscow.

The types of public participation used in the decision-making process for the public included receiving the proposed plan, receiving telephone calls, attending the availability sessions one-half hour before public meetings to informally discuss the issues, and submitting oral and written comments to the agencies during the 60-day public comment period. At the request of the Shoshone-Bannock Tribes, a briefing on the proposed plan was given to Tribal members and their technical staff at Fort Hall in January 1998. A briefing of the proposed plan was also given to a subcommittee of the Idaho National Engineering and Environmental Laboratory Citizens Advisory Board in December 1997 and was followed up with a presentation to the whole board in January 1998. The advisory board is made up of individuals representing the citizens of Idaho who make recommendations to DOE, EPA, and the State of Idaho regarding environmental activities at the INEEL.

Copies of the proposed plan were mailed on January 6, 1998 to 700 members of the public on the INEEL Community Relations mailing list and approximately 50 people not on the mailing list, urging citizens to comment on the proposed plan and to attend public meetings. Display advertisements announcing the availability of the proposed plan, the locations of public meetings, and comment period extensions appeared in six regional newspapers during the weeks of January 11 and February 8 in Boise, Fort Hall, Idaho Falls, Moscow, Pocatello, and Twin Falls. Large display advertisements appeared in the following newspapers: the Idaho Statesman (Boise); the Sho-Ban News (Fort Hall); the Post Register (Idaho Falls); the Daily News (Moscow); the Idaho State Journal (Pocatello); and the Times News (Twin Falls).

A series of three news releases and newspaper advertisements, including the notice of the extension of the comment period, provided public notice of these public involvement activities. Offerings for briefings and the 30-day public comment period (including the 30-day extension of the comment period) that was to begin January 12 and end March 12, 1998 were also announced. Personal telephone calls were made to stakeholders in Idaho Falls, Pocatello, Boise, and Moscow areas the weeks of January 5 and 12 to remind individuals about the meetings and to see if a briefing was desired.

Written comment forms (including a postage-paid business-reply form) were available to those attending the public meetings. The forms were used to submit written comments either at the meeting or by mail. The reverse side of the meeting agenda contained a form for the public to use in evaluating the effectiveness of the meetings. A court reporter was present at each meeting to record discussions and public comments. The meeting transcripts were placed in the Administrative Record section for WAG 8, OU 8-08, in three INEEL Information Repositories. For those who could not attend the public meetings, but wanted to make formal written comments, a postage-paid written comment form was attached to the proposed plan.

Public meetings were held on January 20 in Boise, January 21 in Moscow, and January 22, 1998 in Idaho Falls. Also on January 21, a briefing was given to a risk assessment class at the University of Idaho. Approximately 80 people not associated with the project attended the public meetings. Overall, 12 citizens provided formal comments; of these, three citizens provided oral comments, and 11 provided written comments (two citizens provided oral and written comments). All comments received on the proposed plan were specifically considered during the development of this ROD. The agencies appreciate the public's participation in this process and acknowledge the value of public comment. A Responsiveness Summary has been prepared as part of the ROD. The formal oral comments presented at the public meetings and written comments are included in Part III of this ROD and in the Administrative Record for NRF.

8.0 Selected Remedy

The results of the NRF Comprehensive RI/FS identified nine sites of concern where an unacceptable or potentially unacceptable risk to human health exists. Those sites that contain or potentially contain contaminants resulting in an increased cancer risk greater than 1 in 10,000 to a future 100-year resident or lead concentrations above suggested screening levels for cleanup represent an unacceptable risk. There are 55 other sites that have no risk or an acceptable risk and do not require a remedial action. Based on the consideration of the requirements of CERCLA, the detailed analysis of alternatives, and public comments, DOE, EPA, and IDHW have selected the alternatives as described in the following sections.

8.1 No Action/No Further Action Sites

Based on Track 1 and Track 2 investigations and the RI/FS evaluation, a No Action decision is made by the agencies for those sites with no source present or a source present that represents an acceptable risk for unrestricted use. This "No Action" decision means no future evaluations or followups are required.

Based on the same information, a No Further Action decision is made by the agencies for those sites with a source or potential source present, but for which an exposure route is not available under current conditions. This "No Further Action" decision means that the site will be included in a CERCLA review performed at least every five years to ensure that site conditions used to evaluate the site have not changed and to verify the effectiveness of the No Further Action decision. All monitoring data collected from the No Further Actions sites will be included in the CERCLA five year review. Although no additional remedial action is required at this time, present institutional controls, such as current fencing and administrative controls on excavation, will be maintained. If site conditions change, including present institutional controls, additional sampling, monitoring, or action will be considered.

The following sites are defined as No Action or No Further Action sites.

NO ACTION SITES:

Operable Unit 8-01

- NRF-03, ECF Gravel Pit
- NRF-06, Southeast Landfill
- NRF-08, North Landfill
- NRF-33, South Landfill
- NRF-40, Lagoon Construction Rubble
- NRF-41, East Rubble Area
- NRF-63, A1W Construction Debris Area

Operable Unit 8-02

- NRF-09, Parking Lot Runoff Leaching Trenches
- NRF-37, Old Painting Booth
- NRF-38, ECF French Drain
- NRF-47, Site Lead Shack (Building #614)
- NRF-52A, Old Lead Shack (Location #1)
- NRF-52B, Old Lead Shack (Location #2)
- NRF-54, Old Boilerhouse Blowdown Pit
- NRF-55, Miscellaneous NRF Sumps and French Drains

- NRF-64, South Gravel Pit
- NRF-68, Corrosion Area Behind BB11

Operable Unit 8-03

- NRF-10, Sand Blasting Slag Trench
- NRF-15, S1W Acid Spill Area
- NRF-18B, S1W Spray Pond #2 and A1W Cooling Tower
- NRF-20, A1W Acid Spill Area
- NRF-45, Site Incinerator
- NRF-56, Degreasing Facility

Operable Unit 8-04

- NRF-28, A1W Transformer Yard
- NRF-29, S5G Oily Waste Spill
- NRF-31, A1W Oily Waste Spill
- NRF-44, S1W Industrial Wastewater Spill Area
- NRF-58, S1W Old Fuel Oil Tank Spill
- NRF-62, ECF Acid Spill Area
- NRF-65, Southeast Corner Oil Spill
- NRF-69, Plant Service Underground Storage Tank (UST) Diesel Spill
- NRF-70, Boiler House Fuel Oil Release
- NRF-71, Plant Service UST Gasoline Spill
- NRF-72, NRF Waste Oil Tank
- NRF-73, NRF Plant Services Varnish Tank
- NRF-74, Abandoned UST's Between the NRF Security Fences
- NRF-75, Fuel Oil Revetment Oil Releases
- NRF-76, Vehicle Barrier Removal
- NRF-77, A1W Fuel Oil Revetment Oil Releases

Operable Unit 8-08

- NRF-13, S1W Temporary Leaching Pit
- NRF-32, S5G Basin Sludge Disposal Bed
- NRF-79, ECF Water Pit Release

Operable Unit 8-09

- Interior Industrial Waste Ditch

NO FURTHER ACTION SITES:

Operable Unit 8-02

- NRF-42, Old Sewage Effluent Ponds
- NRF-61, Old Radioactive Materials Storage and Laydown Area

Operable Unit 8-03

- NRF-18A, S1W Spray Pond #1
- NRF-22, A1W Painting Locker French Drain

Operable Unit 8-08

- NRF-02, Old Ditch Surge Pond
- NRF-16, Radiography Building Collection Tanks
- NRF-23, Sewage Lagoons
- NRF-43, Seepage Basin Pumpout Area
- NRF-66, Hot Storage Pit
- NRF-81, A1W Processing Building Area Soil

No Operable Unit (new sites identified after RI/FS)

- NRF-82, Evaporator Bottoms Tank Release
- NRF-83, ECF Hot Cells Release Area

8.2 Selected Remedy for Sites of Concern

The following sites were determined by the NRF Comprehensive RI/FS to be sites of concern:

- NRF-11, S1W Tile Drainfield and L-shaped Sump
- NRF-12A, Underground Piping to Leaching Pit
- NRF-12B, S1W Leaching Pit
- NRF-14, S1W Leaching Beds
- NRF-17, S1W Retention Basins
- NRF-19, A1W Leaching Bed
- NRF-21A, Old Sewage Basin
- NRF-21B, Sludge Drying Bed
- NRF-80 A1W/S1W Radioactive Line Near BB19

The Limited Excavation, Disposal, and Containment alternative (Alternative 3) is selected for the nine sites of concern. Alternative 3 best satisfies the nine evaluation criteria. The Limited Action alternative (Alternative 2) may not be protective of ecological receptors and would have a potential impact on future site operations by eliminating access to various portions of NRF. Alternative 3 was evaluated to be equally protective of human health and the environment as the Complete Excavation and Off-site Disposal alternative (Alternative 4). Alternative 3 will comply with all ARARs. In addition, Alternative 3 has greater short-term effectiveness, is easier to implement, and costs less than Alternative 4. Alternative 3 was also supported by the State of Idaho and generally had community acceptance. The major components of the selected remedy for the nine sites of concern include:

- Excavating contaminated soil above remediation goals and debris from six of the nine sites;
- Consolidating the excavated soil at one site (S1W Leaching Beds);
- Disposing of radiological, non-hazardous debris to an INEEL disposal facility or an appropriate off-site (away from INEEL) disposal facility and, if necessary, disposing of radiological, hazardous debris as a mixed waste per the INEEL Site Treatment Plan;
- Constructing engineered covers primarily of native earthen materials in two areas that would cover the three sites not excavated, which includes the site where soil was consolidated. Cover materials will be determined in the Remedial Design/Remedial Action Work Plan;
- Radiation surveys and soil sampling during excavation;
- Soil and groundwater sampling to monitor any potential releases from the covered areas;

- Periodic inspection and maintenance of covers to ensure their integrity;
- Establishing fencing or other barriers and land use restrictions.

Soil above 16.7 pCi/g of cesium-137 and 45.6 pCi/g of strontium-90 will be removed from sites NRF-11, NRF-12A, NRF-17, NRF-21A, NRF-21B, and NRF-80, if present. Lead was detected above remediation goals in only one sample in a location where a cover will be placed. As explained in Section 5.1, remediating the soil to below remediation goals for cesium-137 and strontium-90 will also reduce the risks associated with other radiological contaminants of concern. NRF-11, NRF-12A, NRF-17, NRF-21A, NRF-21B, and NRF-80 contain underground piping or concrete structures that are planned for removal during decontamination and dispositioning activities at NRF. Disposal of pipe and concrete debris will be through current decontamination and dispositioning practices and will likely be sent to the RWMC located at the INEEL. Sampling concurrent with excavation activities will ensure all soil above remediation goals is removed. After the soil is excavated, it will be placed in NRF-14 (S1W Leaching Beds). The estimated contaminated soil volume from all the proposed excavation areas will fit into the present leaching beds. A single engineered earthen cover will cover NRF-14 and the adjacent NRF-12B (S1W Leaching Pit). Another cover will be placed over site NRF-19 (A1W Leaching Bed). The cover design will be determined during the remedial design phase, but will likely include soil, gravel cobble, and/or rip-rap to ensure proper containment of contaminants. Performance goals established for the proposed cover were given in Section 5.2.3.

This alternative includes operation and maintenance costs for long-term maintenance and monitoring of the covers. Institutional controls including fencing or other barriers and land use restrictions will be implemented to prevent access to the covered areas. A description of the areas where access will be restricted, the specific controls (e.g., fences, signs) that will be used to ensure that access will be restricted, the types of activities that will be prohibited in certain areas (e.g., excavation), and the anticipated duration of such controls will be determined during the remedial design phase and will be incorporated into the SDP. This information will be submitted to the EPA and IDHW once it has been placed in the SDP. As appropriate, NRF shall also provide the Bureau of Land Management or other Federal agencies the detailed description of the controls identified above. Long-term monitoring of NRF groundwater via the present groundwater well network and monitoring of soil around the covered areas will be performed. A review will be conducted at least every five years as required by CERCLA to verify the effectiveness of the selected remedy. Contingency actions would include off-site (away from NRF) disposal of soil that exceeds the capacity of NRF-14 or continued consolidation at NRF-14 above surface level, although these are unlikely to be necessary. The remedial actions will be performed in accordance with all ARARs. See Section 5.2.3 for a more detailed discussion of Alternative 3.

9.0 Statutory Determination

The selected remedies (including No Action and No Further Action decision sites) meet the statutory requirements of CERCLA Section 121, the regulations contained in the NCP, and the requirements of the FFA/CO for the INEEL. All remedies meet the threshold criteria established in the NCP (i.e., protection of human health and the environment and compliance with ARARs). CERCLA also requires that the remedy uses permanent solutions and alternative treatment technologies to the maximum extent practicable, and that the implemented action be cost effective. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy addresses these statutory requirements.

9.1 Protection of Human Health and the Environment

As described in Section 8, the selected remedy for the sites of concern satisfies the criterion of overall protection of human health and the environment.

9.1.1 No Action/No Further Action Sites

For the 55 No Action and No Further Action sites covered by this ROD, no remedial action is necessary to ensure continued protection of human health and the environment. The 55 sites are identified in Section 8. The 43 No Action sites have no risk or an acceptable risk to human health and the environment were they to be released for unrestricted use, and therefore No Action is justified. The 12 No Further Action sites contain sources or potential sources that may pose unacceptable risks to human health and the environment, but an exposure pathway is not available, thus providing overall protection of human health and the environment. Because a source may still be present at the 12 No Further Action sites, a review will be performed every five years to ensure the No Further Action decision remains protective of human health and the environment.

9.1.2 Limited Excavation, Disposal, and Containment

Limited Excavation, Disposal, and Containment is the selected remedy for the nine sites of concern. This remedy satisfies the criterion of overall protection of human health and the environment by preventing direct contact with the contaminated soils by all potential receptors, reducing radiation external exposure through shielding by the cover, and reducing the likelihood of biointrusion.

9.2 Compliance with ARARs

The Limited Excavation, Disposal, and Containment remedy for the nine sites of concern will meet all federal and state ARARs. The selected remedy will be designed to comply with all action-specific, location-specific, and chemical-specific federal and state ARARs, as presented in Table 10.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law which specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. Relevant and appropriate requirements are those same standards mentioned for applicable requirements, except while not applicable at the CERCLA site, address problems or situations sufficiently similar to those encountered at the site such that their use is well suited to the particular site.

Three types of ARARs exist: location-specific, action-specific, and chemical-specific. In general, location-specific ARARs place restrictions on the concentration of hazardous substances or the conduct of activities solely because they occur in special locations. Action-specific ARARs are usually technology or activity based requirements or limitations on actions or conditions involving specific substances. Chemical-specific ARARs are health or risk-based numerical values or methodologies that result in the establishment of numerical values. The values establish the acceptable concentrations of chemicals or substances that may be found in or discharged to the environment.

9.2.1 Location-specific ARARs

The Idaho State Historical Society has identified the INEEL as containing properties potentially eligible for the National Register of Historic Places (NRHP). Several structures at NRF are eligible for the NRHP including NRF-17 (S1W Retention Basins) and, therefore, the National Historic Preservation Act (NHPA) (16 USC 470) is considered applicable for the remedial action associated with NRF-17. A final designation under the NRHP would mean this site must be accorded the same protection under the NHPA as a site listed under the Act. All applicable requirements established under the NHPA will be followed for remedial actions associated with NRF-17. Administrative controls are in place at NRF to ensure the requirements are met.

9.2.2 Action-specific ARARs

The action-specific ARARs identified for the sites of concern are listed in Table 10. The Idaho Fugitive Dust Emission (IDAPA 16.01.01.651) requirements are applicable due to the disturbance of soil at these sites. Because of the potential of encountering hazardous wastes in the debris that leaves the area of contamination (AOC) during the remedial action activities (i.e., demolition and disposal), state regulations (with reference to the specific sections in the federal regulations) concerning hazardous waste identification (IDAPA 16.01.05.005) and determination (IDAPA 16.01.05.006.01) are considered applicable. These requirements for hazardous waste management become applicable for the debris generated during the remedial work activities because the debris must be transported off the NRF site; therefore, the debris must be characterized for the presence of hazardous constituents for proper disposal. The land disposal restrictions (IDAPA 16.01.05.011) will be applicable in the event that the debris leaving the AOC is found to contain hazardous wastes.

Portions of the state regulation (IDAPA 16.01.05.008) with reference to the specific federal regulations as listed in Table 10, pertaining to surveying, closure, and post closure care requirements for RCRA landfill sites are considered relevant and appropriate for the two CERCLA sites identified to be capped with an engineered cover under the selected remedy, Alternative 3. Since the two sites to be capped were not fully characterized, there remains an uncertainty concerning the types and quantity of wastes that may remain in place. Therefore, the specific regulatory sections pertaining to the closure and post closure care requirements as listed in Table 10 are considered relevant and appropriate. The specific regulatory section pertaining to surveying requirements for identifying the exact locations and dimensions of the boundaries for the capped areas with respect to permanently surveyed benchmarks is also considered relevant and appropriate. Although unlikely, in the case where contaminated debris generated during the remedial work activities could be transported off the INEEL to an EPA approved disposal facility, the procedures for planning and implementing off-site (away from INEEL) response actions (40 CFR 300.440) are considered applicable.

Table 10. ARAR and To-be-Considered List

Title	Citation	Relevancy
Location-Specific		
National Historic Preservation Act	16 USC 470	Applicable
Action-Specific		
Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities [Specific Appropriate Federal Regulation Sections: Surveying, Closure and Post Closure Care for Landfills]	IDAPA 16.01.05.008 [40 CFR 264.309(a), 40 CFR 264.310(a)(1)(2)(3)(4)(5) and 40 CFR 264.310(b)(1)(4)(5)(6)]	Relevant & Appropriate
Identification and Listing of Hazardous Waste (Specific Applicable Federal Regulation)	IDAPA 16.01.05.005 (40 CFR 261)	Applicable
Standards Applicable to Generators of Hazardous Waste (Specific Applicable Federal Regulation Section: Hazardous Waste Determination)	IDAPA 16.01.05.006.01 (40 CFR 262.11)	Applicable
Land Disposal Restrictions (Specific Applicable Federal Regulation Sections)	IDAPA 16.01.05.011 (40 CFR 268.7, .9, .40, .45, and .48)	Applicable
Procedures for Planning and Implementing Off-site Response Actions	40 CFR 300.440	Applicable
Idaho Fugitive Dust Emissions	IDAPA 16.01.01.651	Applicable
Chemical-Specific		
National Emission Standards for Hazardous Air Pollutants	40 CFR 61.92	Applicable
Increments for Toxic Air Pollutants	IDAPA 16.01.01.585 & .586	Applicable
Idaho Groundwater Quality Rule	IDAPA 16.01.11.200.01(a)	Relevant & Appropriate

To-Be-Considered List	
Environmental Protection, Safety and Health Protection Standards	DOE Order 5480.4
Low-level Radioactive Waste Management	DOE Order 5820.2A
Radiation Protection of the Public and Environment	DOE Order 5400.5
Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities	EPA Guidance Document

9.2.3 Chemical-specific ARARs

The chemical-specific ARARs identified for the sites of concern are also listed in Table 10. Because of the potential for the release of contaminants (radionuclides) into the air from the remedial work activities involving soil movement and consolidation under the selected remedy, the emission standard for radionuclide emissions to ambient air under the National Emissions Standards for Hazardous Air Pollutants (40 CFR 61.92) are applicable. The State of Idaho's increments for toxic air pollutants (IDAPA 16.01.01.585 and 586) are considered applicable because of the potential for the release of some of the listed contaminants into the air during excavation activities. In addition, the Idaho Groundwater Quality Rule (IDAPA 16.01.11.200.01 (a)) is considered to be relevant and appropriate due to the potential, although not likely, for the migration of contaminants into the aquifer. The selected remedy provides for long term monitoring of the aquifer beneath NRF. The Idaho Groundwater Quality Rule includes a wide variety of constituents, including radiological constituents, with limits based on the protection of human health.

9.2.4 To-be-Considered Guidance

Table 10 also lists other requirements, procedures, and guidance documents. The DOE Orders stem from DOE's policy for implementing legally applicable protection standards and to consider and adopt, as appropriate, recommendations by authoritative organizations. Since the identified DOE Orders cover areas (i.e., low-level radioactive waste management, radiation protection) that may be relevant for the selected remedy, these Orders will be considered and adopted as appropriate. Since lead has been detected at one of the sites of concern, the EPA guidance document will be useful in providing guidance for the selected remedy.

9.3 Cost Effectiveness

The selected remedial action (Limited Excavation, Disposal, and Containment) for the nine sites of concern is cost effective because it is protective of human health and the environment, achieves ARARs, and the costs are proportional to the effectiveness in meeting remedial action objectives. Although the selected remedy costs more than a limited action remedy, it protects ecological receptors, reduces the area footprint of soil requiring monitoring, and provides more efficient control measures (i.e., engineered cover) to prevent direct contact by receptors with contaminated soils. The selected remedy costs significantly less than the excavation and off-site (away from NRF) disposal option. Although the excavation and off-site disposal option completely removes the source from NRF, costs for packaging, transportation, disposal fees, and excavating over seven times more contaminated soil are considerably higher than the selected remedy. In addition, the short-term effectiveness for excavating and off-site disposal is considerably less since a much larger amount of contaminated soil would be handled for a longer period of time causing an increased risk for construction workers.

9.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy will result in the permanent removal of contaminated soil from six of the nine sites of concern. For the sites contaminated with radionuclides, effective treatment technologies are currently unavailable; therefore, the preference for permanent solutions cannot be met except through natural radioactive decay processes over time. Treatment technologies were determined not to be practicable because they were ineffective, difficult to implement, and/or very costly. Since contaminated soils will remain on site, the selected remedy will not result in a permanent solution for the three sites where contaminated soil will be covered with an engineered cover. The selected remedy is a permanent solution for the six sites where contaminants are permanently removed through soil excavation.

9.5 Preference for Treatment as a Principal Element

The statutory preference for remedies that employ treatment as a principal element will not be met. The treatment technologies considered during remedial action development were not considered to be a technically or cost effective means for reducing risks to human health and the environment. Natural radioactive decay will result in the reduction of contaminant concentrations.

10.0 Documentation of Significant Changes

CERCLA Section 117(b) requires that an explanation of any significant changes from the preferred alternative originally presented in the Proposed Plan be provided in the ROD. A few changes have been made in the ROD that are different than presented in the Proposed Plan. Although the changes may not be considered significant, they are included in this section of the ROD to accurately reflect modifications made to the Proposed Plan.

Two new sites have been identified in this ROD. One of the two sites, NRF-82, was identified as a CERCLA site immediately after issuing the Final Comprehensive RI/FS; a description and recommendation were included in the Proposed Plan. The other site, NRF-83, was identified as a CERCLA site after the Proposed Plan and is included in this ROD.

NRF-83, ECF Hot Cells Release Area, is an area where cobalt-60 and cesium-137 were discovered in the soil below a concrete trench at ECF during a construction project. All accessible contaminated soils adjacent to the trench were removed during the construction project and replaced with clean soil. Contaminated soils below the trench were not removed to preserve the integrity of the trench structure. The trench was not removed and, therefore, an exposure pathway to a potential receptor does not exist making the estimated risk low. A Track 1 investigation has been issued for the site and is available in the Administrative Record for NRF. The remaining risk at NRF-83 is estimated to be low because the presence of the trench prevents exposure to remaining constituents. Therefore, this site has been designated as a No Further Action site. Because an exposure route does not exist for NRF-83, this site would not impact the comprehensive assessment performed for NRF.

Site NRF-18, S1W Spray Ponds, was identified in the Proposed Plan as a single site. NRF-18 was proposed to be a No Further Action site because the concrete spray ponds would eliminate any exposure pathway to contaminants below the basin. In addition, sampling data from around the spray pond indicated an acceptable risk at the spray pond, but uncertainty existed in the assessment because sample data below the spray ponds was not available. Since the issuance of the Proposed Plan, additional samples have been collected, analyzed, and evaluated from the soil below and around Spray Pond #2 (north spray pond) in preparation for demolition of Spray Pond #2. The additional information for Spray Pond #2 allowed a more detailed assessment of Spray Pond #2. Therefore, NRF-18 was split into two sites: NRF-18A (S1W Spray Pond #1) and NRF-18B (S1W Spray Pond #2 and A1W Cooling Tower). NRF-18B includes the A1W Cooling Tower, which, unlike the spray ponds, did not have a groundwater concern because of leakage. The risk at the A1W Cooling Tower through surface pathways was estimated to be low based on a Track 1 risk evaluation. The A1W Cooling Tower was demolished in 1995. NRF-18A includes portions of the fire protection system that was connected to the spray ponds and cooling tower and was suspected to have leaked on occasion.

Samples were collected from several boreholes drilled through and around Spray Pond #2. Sample data showed only slightly elevated levels of chromium, which was the primary contaminant of concern at Spray Pond #2. No elevated amounts of radionuclides were detected. An updated assessment was issued for NRF-18B showing a low estimated risk associated with Spray Pond #2 and the A1W Cooling Tower, with much less uncertainty than the original assessment. The updated assessment indicates NRF-18B is a No Action site instead of a No Further Action site as stated for all the original NRF-18 in the Proposed Plan. NRF-18A will remain a No Further Action site until additional data are available to more accurately assess it. The new data collected for Spray Pond #2 shows the cumulative risk assessment to be more conservative than originally indicated since actual contaminant concentrations were less than concentration terms used in the cumulative risk assessment.

The Proposed Plan indicated that there were nine sites of concern and 62 other identified release or potential release sites at NRF, for a total of 71 sites. Fifty-two of the 62 sites were proposed as No Action or No Further Action sites and the other ten sites were associated with a previous ROD, thus requiring no recommendation in the Proposed Plan. The current ROD (this document) identifies all 87 sites at NRF, to more completely show the comprehensive nature of the NRF Comprehensive RI/FS. The 71 sites identified in the Proposed Plan did not include the 13 No Action COCA sites, the new site (NRF-83) discussed above, or the splitting of sites NRF-18 and NRF-52. NRF-52 was evaluated as NRF-52A and 52B during past Track 1 investigations, but the Proposed Plan failed to identify NRF-52 as two separate sites. Hence, 71 sites (Proposed Plan) plus 13 sites (COCA) plus a new site (NRF-83) plus two additional sites (splitting NRF-18 and NRF-52 into two sites each) equals 87 total sites.

The 13 COCA sites were included in the comprehensive assessment of NRF, but were initially screened out because they lacked a source. The Proposed Plan shows 41 No Action sites and 11 No Further Action sites (52 total). The ROD revises these to 43 No Action sites (includes NRF-18B and both NRF-52 sites) and 12 No Further Action sites (includes NRF-83), for a total of 55.

The Proposed Plan indicated that 316,470 cubic feet of contaminated soil would be excavated under Alternative 4. The actual estimate of soil to be excavated is now 1,170,890 cubic feet, of which 446,550 cubic feet would be contaminated soil. The volume given in the Proposed Plan failed to include additional contaminated soil (130,080 cubic feet) to be excavated near the S1W Leaching Beds (NRF-14) and S1W Leaching Pit (NRF-12B). Although the volume was not correct in the discussion of Alternative 4, the cost estimate provided in the Proposed Plan was based upon the correct volume of soil.

PART III
RESPONSIVENESS SUMMARY

A Summary of Comments Received During the Public Comment Period

OVERVIEW

The Naval Reactors Facility (NRF) constitutes Waste Area Group (WAG) 8 at the Idaho National Engineering and Environmental Laboratory (INEEL). There have been 87 release or potential release sites and nine operable units (OU) identified at NRF. OU 8-08 was the last OU to be investigated and represents the NRF Comprehensive Remedial Investigation/Feasibility Study (RI/FS) including 18 sites not previously assessed. Twenty-three of the 87 sites were included in previous decision documents. Selected remedies were chosen for the remaining 64 sites in this Record of Decision (ROD). Nine of the 64 sites have been identified as sites of concern that pose or potentially pose unacceptable risks to human health and the environment. The other 55 sites were determined to pose no risk or an acceptable risk to human health or the environment and were identified by the agencies to require no additional action. For the nine sites of concern, remedial action alternatives were evaluated, and a preferred alternative was selected. A Proposed Plan that summarized the results of the NRF Comprehensive RI/FS and presented the preferred remedial alternative was released by the agencies for public review on January 6, 1998. Public comment on this document started on January 12, 1998, and was extended until March 12, 1998 due to a request from the public. Public meetings were held in Boise, Moscow, and Idaho Falls, Idaho, on January 20, 21, and 22, 1998, respectively.

This Responsiveness Summary responds to both written and oral comments received during the public comment period and meetings. Generally, support for the preferred alternative was favorable with concerns from commentors over the mobility of contaminants and the construction design of the proposed covers.

BACKGROUND ON COMMUNITY INVOLVEMENT

In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §113(k)(2)(B)(i-v) and §117, a series of opportunities for public information and participation in the investigation and decision process for WAG 8 was provided to the public from September 1995 through March 1998. The opportunities to obtain information and provide input included *INEEL Reporter* newsletter articles (a publication on the INEEL's Environmental Restoration Program), *Citizens' Guide* supplemental updates, a proposed plan, focus group interactions, which included teleconference calls, briefings and presentations to interest groups, and public meetings.

Regular reports concerning the status of the project were included in bimonthly issues of the *INEEL Reporter* and were mailed to those on the mailing list. Reports also appeared in two issues of the *Citizen's Guide* to environmental restoration at the INEEL in early 1996 and 1997 and one issue of *Progress a Status Report of Environmental Cleanup at INEEL* in February 1998. Both of these reports are supplements to the *INEEL Reporter*.

On January 12, 1998, U.S. Department of Energy (DOE) issued a news release to more than 100 contacts concerning the beginning of a 30-day public comment period pertaining to the NRF Proposed Plan. This comment period began on January 12, 1998. In response to a request from the public, the comment period was extended 30 days and ended on March 12, 1998. The news release gave notice to the public that NRF investigative documents would be available from the beginning of the comment period. These documents were available in the Administrative Record section of the INEEL Information Repositories located in the INEEL Technical Library in Idaho Falls and public libraries in Fort Hall and Moscow.

Copies of the proposed plan were mailed on January 6, 1998 to 700 members of the public on the INEEL Community Relations mailing list, urging citizens to comment on the proposed plan and to attend public meetings. Public meetings were held at Boise, Moscow, and Idaho Falls, on January 20, 21, and 22, 1998, respectively. Written comment forms were available at the meetings, and a court reporter was present at each meeting to record transcripts of discussions and public comments. A total of about 80 people not associated with the project attended the public meetings. Overall, 12 citizens provided formal comments; of these, three citizens provided oral comments and 11 provided written comments (two citizens provided oral and written comments). Comments were also received from the INEEL Citizens Advisory Board and are included in this Responsiveness Summary.

This Responsiveness Summary has been prepared as a part of the ROD. The ROD presents the preferred alternative for the nine sites of concern and the recommendation of No Action or No Further Action for 55 other sites. The preferred alternative was selected in accordance with CERCLA, as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (the National Contingency Plan). The decisions presented in the ROD are based on information contained in the Administrative Record. All formal oral comments, as given at the public meetings, and all written comments, as submitted, are included in the Administrative Record for the ROD.

LISTING OF COMMENTORS, COMMENT NUMBERS, AND PAGE NUMBERS

All of the formal comments submitted by the public in either written or oral form were tabulated and assigned a comment number. Where applicable, the commentors are listed alphabetically in the first column; the affiliation of the commentor is given in the second column (if no known affiliation, identified as "concerned citizen"); the comment number appears in the third column; and the page the comment and response begins can be found in the last column.

NAME	AFFILIATION	COMMENT #	PAGE #
Beatrice Brailsford	Snake River Alliance	27	103
Beatrice Brailsford	Snake River Alliance	28	104
Beatrice Brailsford	Snake River Alliance	29	104
Chuck Broscious	Environmental Defense Institute	6	90
Chuck Broscious	Environmental Defense Institute	7	91
Chuck Broscious	Environmental Defense Institute	8	91
Chuck Broscious	Environmental Defense Institute	9	92
Chuck Broscious	Environmental Defense Institute	10	92
Chuck Broscious	Environmental Defense Institute	11	93
Chuck Broscious	Environmental Defense Institute	12	93
Chuck Broscious	Environmental Defense Institute	13	94
Chuck Broscious	Environmental Defense Institute	14	95
Chuck Broscious	Environmental Defense Institute	15	95
Chuck Broscious	Environmental Defense Institute	16	96
Chuck Broscious	Environmental Defense Institute	17	97
Chuck Broscious	Environmental Defense Institute	18	98
Chuck Broscious	Environmental Defense Institute	19	98
Chuck Broscious	Environmental Defense Institute	20	99
Chuck Broscious	Environmental Defense Institute	21	99
Chuck Broscious	Environmental Defense Institute	22	100
Charles B. Greer	concerned citizen	1	88
Walt Hampton	concerned citizen	25	102
Martin Huebner	Coalition 21	36	106
KayLin Loveland	Envirocare of Utah, INC.	31	105
KayLin Loveland	Envirocare of Utah, INC.	32	105
KayLin Loveland	Envirocare of Utah, INC.	33	105
KayLin Loveland	Envirocare of Utah, INC.	34	106
KayLin Loveland	Envirocare of Utah, INC.	35	106
Swen Magnuson	concerned citizen	23	101
Swen Magnuson	concerned citizen	24	102
Joe Merted	concerned citizen	42	109
Charles M. Rice	Citizens Advisory Board	39	107
Charles M. Rice	Citizens Advisory Board	40	108
Buck Sisson	concerned citizen	2	88
Buck Sisson	concerned citizen	3	89
Buck Sisson	concerned citizen	4	90
Buck Sisson	concerned citizen	5	90
Buck Sisson	concerned citizen	41	108
Dianne Thompson	concerned citizen	30	104
Thomas D. Van Liew	concerned citizen	37	107
Thomas D. Van Liew	concerned citizen	38	107
Unknown	concerned citizen	26	102

SUMMARY OF COMMENTS WITH RESPONSES

Comments presented during the public comment period on the Proposed Plan for the NRF Comprehensive RI/FS are given below. The public meetings were divided into a brief presentation, an informal question-and-answer session, and a formal public comment session. The meeting format was described in published announcements, and meeting attendees were reminded of the format at the beginning of the meeting. The informal question-and-answer session was designed to provide immediate responses to the public's questions and concerns. Several questions were answered during the informal period of the public meetings on the Proposed Plan. This Responsiveness Summary does not attempt to summarize or respond to issues and concerns raised during the informal part of the public meetings. However, the Administrative Record contains complete transcripts of these meetings, which include the agencies' responses to these informal questions.

Comments received during the formal comment session of the meetings and written comments received during the public comment period are addressed by the agencies in this Responsiveness Summary. The public was requested to provide their comments in writing, orally during the public meetings, or by recording a message using INEEL's toll-free number. The comments below are printed in their entirety and were not summarized. The only edits made were to correct minor spelling and editorial errors. In those cases where written comments were received that were difficult to read, a best attempt to interpret the comment is provided. Copies of the originally written comments are provided in the Administrative Record file for NRF.

Comment 1

Agree that Alternative 3 is the best option.

Response: The agencies appreciate the time and effort made to read and comment on the Proposed Plan.

Comment 2

The proposed "Alternative 3: Limited Excavation, Disposal, and Containment" for Waste Area Group 8 - Naval Reactors Facility needs to be modified to better protect the groundwater, reduce costs, and reduce health risks to construction workers. The contaminated soils should be left in place and capped with capillary barriers. The capillary barrier will result in reduced health risk, reduced costs, and improved groundwater protection. There is an ongoing effort at the INEEL as well as the Hanford Area and Sandia National Laboratories to design capillary barriers that greatly reduce the movement of water through buried waste and thereby minimize contaminant transport. As a steward of the environment, the INEEL needs to minimize the leaching and contaminant transport at all sites, within reasonable economic constraints.

Response: The riprap cover shown in the Proposed Plan for Alternative 3 was only a preliminary design consideration and will be more fully evaluated during the remedial design phase. To eliminate any additional confusion about the cover design, the figure shown in the Proposed Plan was eliminated from the ROD text. The design of the covers for Alternative 3 at the consolidated areas will include an evaluation of contaminant migration and the value of capillary barriers, although sampling performed during the NRF Comprehensive Remedial Investigation (RI) showed very little migration of contaminants of concern from the discharge point (i.e., pipe, concrete basin).

Leaving the soil in place at all sites and constructing caps over each site was not considered a feasible option. Some sites are below a concrete basin (NRF-17) or asphalt roadway (NRF-12A and NRF-80). Portions of three sites (NRF-11, NRF-12A, and NRF-21A) exist in the subsurface between the NRF security fences, which makes covering in place not possible. In addition, some of the sites involve underground piping. Covering the entire length of the pipe was not considered feasible and could permanently disrupt the use of site areas.

Comment 3

The excavation and capping with riprap proposed under Alternative 3 is not a good alternative. The excavation process is not a simple process in itself and the details are important. Several details that come to mind include: (1) The cleanup level is specified as a concentration for each species in pCi/g, is the number a mean over the whole area? Or is it the maximum concentration on the remaining solids? (2) During excavation and transport of the contaminated soils how will spills and over filling of trucks be handled? (3) What dust suppression method will be used? (4) Moving soil is a very dirty operation and even though dust is controllable there is always dirt. The risk analysis presented in the Public Meetings/Briefings brochure dated January 1998 is not complete. I could not find any mention of the risk to construction workers arising from physical activities. This risk estimate needs to include the physical risk as well as the inhalation, ingestion, and physical contact exposure effects. Thus, the total risk of the alternatives appears to not have been assessed. I realize this meeting was not put together to deal with this level of detail, but the moving of contaminated soil at the INEEL will cost time and cost money. Any idea that does not require moving contaminated soils should be moved up the list of preferred alternatives.

Response:

(1) The cleanup levels established in the Proposed Plan correspond to maximum allowable values for each confirmatory sample. Any material above these values will be removed.

(2) The work will be engineered with detailed work, safety, and training procedures to minimize the potential for spills and to prevent overfilling trucks during excavation work. Many of these procedures are currently in place and workers are continuously trained on proper radiological controls, including spill response situations.

(3) The excavation of contaminated soil has been successfully performed during past remedial work. Also, NRF gained experience in dust suppression during the prior construction of three landfill covers at NRF. Possible dust suppression techniques include keeping the soil wetted during excavation activities, performing excavation in tented enclosures, halting excavation work during windy conditions, and keeping man-made covers over contaminated soils. All these techniques will be evaluated when planning the work addressed by this ROD.

(4) The comparison of alternatives required a qualitative evaluation of risk to workers and the public during remedial activities. A quantitative, or numeric, risk assessment for the workers performing the remedial actions is outside the scope of the NRF Comprehensive RI/FS. Exposure limits are established that workers cannot exceed and exposure is monitored. Long standing, proven Naval Nuclear Propulsion Program radiation and contamination controls will be applied to this work.

Regarding physical (e.g., construction safety-related) work risk, NRF requires many safety provisions in work procedures and requires following applicable Occupational Safety and Health Act requirements. However, as stated above, a quantitative risk assessment in this regard is outside the scope of the RI/FS. The quantitative risk assessments performed during the RI/FS are intended to show the risks associated with a site in the absence of any remedial action, which in turn will provide the basis for determining whether or not a remedial action is necessary and the justification for performing specific remedial actions. The chosen Alternative 3 appears to minimize the movement of contaminated soils, which in turn will minimize physical work-related risks.

Comment 4

Actual performance of the riprap for controlling biologic processes over time has not been demonstrated. The riprap covers in place on the INEEL do not appear to me to be effective in control of small mammals. In fact riprap appears to be excellent habitat for pack rats, mice, and rock chucks. They provide high elevations for the rock chucks to sun themselves, the network of large voids serve as ready made burrows, and as a whole appear to be excellent protection from predators. The riprap will trap snow and further increase infiltration of water. Also, the riprap will reduce water losses from evaporation and evapotranspiration processes and thereby increase the total volume of water available for the leaching of contaminants. The overall effect of Alternative 3 will be to increase leaching rates and long term contaminant transport to the Snake River Plain Aquifer. The fact that Alternative 3 may meet regulations of today is no indication that the design will meet future regulations. Future regulations will include monitoring above the aquifer, at which time the rapid infiltration and possibility of contaminant transport will become front-page news.

Response: The cover design shown in the Proposed Plan was only a preliminary design consideration, and all comments received on the cover design will be considered during the design evaluation. It should be noted that migration of contaminants of concern to the aquifer is not considered likely because the contaminants of concern tend to adsorb to site soils, and because the low precipitation in this area provides only minimal driving head to move contaminants deeper into soils. The sites of concern were typically pond or leaching areas that received large quantities effluent, yet sampling has shown that the contaminants of concern are still primarily retained in the soil within a few feet from the discharge point. The entrapment of future precipitation would not likely alter this condition.

Comment 5

One way to further reduce risk is to minimize the construction effort. Since the capillary barriers can be constructed using gravels and soils that are close to the actual site the efforts of construction and overall cost will be reduced. I recommend that the contaminated soils be left undisturbed and that capillary barriers be added to the land surface, to control health risks associated with removal, transport, and repositioning of contaminated soils.

I want the capillary barriers to be considered as an Alternative Action and see the comparison to the alternatives presented in the Proposed Plan for Waste Area Group 8 - Naval Reactors Facility. I also want to see the risk to construction workers accounted for in the risk assessments of the alternatives.

Response: The agencies agree that minimizing construction efforts in general reduces short-term risks. That is one reason the limited excavation alternative (Alternative 3) was selected over the complete excavation alternative (Alternative 4). However, as stated in the response to Comment 2, several sites are located in areas where a cover is not practical. Capillary barriers will be considered as part of the covers during the design phase. Health risks during construction activities were discussed in Comment 3 above.

Comment 6

The Environmental Defense Institute (EDI) received the Department of Energy (DOE) proposed plan (Plan) on Friday January 16th. Since Monday was a national holiday, it meant that EDI received the Plan one working day prior to the public meeting in Moscow Wednesday

January 21. The public meetings are the only opportunity an individual has to get oral testimony into the public record. Inadequate preparation time literally translates into inadequate opportunity to be engaged in the decision making process. Additionally, there are two comprehensive waste area group plans presented, one for the Naval Reactors Facility and one for Argonne National Laboratory - West, covering a total of over 28 individual waste release sites. The volume of information needed to review two comprehensive plans is orders of magnitude over one or two subgroup (operable unit) waste release sites. Therefore, the public participation process is fatally flawed and unacceptable. EDI appreciates that the agencies responded to our preliminary comments by extending the comment period.

Response: As stated in the comment, the public comment period was extended for 30 days to allow additional time for public review and comment on the Proposed Plan.

Comment 7

The apparent absence of lessons learned between the Hanford Environmental Restoration (ER) process and the INEEL ER process is regrettable and a serious threat to Idaho. DOE is taking advantage of its position as the single largest employer in Idaho to float ER actions at INEEL that it was not allowed to do at Hanford because public and regulatory pressure blocked shortcuts. Specifically, at Hanford DOE was required to build the Environmental Restoration Disposal Facility (ERDF) which is a fully compliant Resource Conservation Recovery Act (RCRA)/Nuclear Regulatory Commission (NRC) mixed hazardous/radioactive dump with double liner, leachate collection and monitoring wells and an impermeable cap. ERDF was completed in the Spring of 1996 at the farthest location on Hanford away from the Columbia River and will receive contaminated soil and decontamination/decommissioning (D&D) waste. At INEEL, DOE refuses to build such a repository because the Department is not being pressured by the state and EPA regulators to comply with the law.

Response: Sampling performed at NRF has not shown any RCRA characteristic waste in the soil. If any RCRA characteristic waste is encountered while excavating, the applicable RCRA regulations will be met. Disposal will be accomplished per the applicable or relevant and appropriate requirements (ARARs) given in the Record of Decision. NRF has always complied with applicable regulations and will continue to do so in the future.

Comment 8

The Plan (January 1998 publication) assumes that the DOE and the Naval Reactors Facility (NRF) enjoy credibility in the public's eye. This is an invalid assumption. These agencies have broken the law and are being forced via a Federal Facility Agreement and Consent Order to correct their illegal activities. As illegal polluters, no credibility can be assumed and therefore full and complete disclosure is demanded in all Plan publications. The Plan does not provide the reader with full disclosure or provide the essential information the reader needs in order to evaluate the appropriateness of the preferred remedial alternative. For instance, maximum contaminate levels for all contaminates of concern must be stated for each Operational Unit as well as the effective standard for that contaminate so that the reader can make up their own mind whether the cleanup actions or no actions are appropriate. Stating conclusions without providing definitive data to support the finding assumes credibility that the agencies do not have.

Response: Maximum soil concentrations detected at OU 8-08 during RI/FS or pre-RI/FS sampling were provided in Table 2 of the Proposed Plan. The Proposed Plan is a summary of the Comprehensive RI/FS performed at NRF. As stated in the plan, supporting documents are available at Information Repositories at various locations identified in the Plan. The supporting documents contain much more detailed information on the investigations performed at NRF.

including sample results. As previously stated in the response to Comment 7, NRF has always complied with applicable regulations and will continue to do so in the future.

Comment 9

Another major assumption that is extensively evoked in the Plan is 100 years of DOE monitoring and institutional control of the contaminated sites. In real life, when entities break the law, and are required to do major corrective actions in the future, they are generally required to establish a trust fund so that if they again decide to disregard their legal requirements, or are no longer in existence, the funding will be there for the state or local government to do the job. The state of Idaho should therefore, require DOE to establish a monitoring/institutional control trust fund to cover those costs at INEEL. An example of where this issue is important is the current designation that NRF is not in the Big Lost River (one mile away) 100 year flood plain. This current designation is due to Big Lost River dams that divert flood waters south into spreading areas. These dams and their related water channels require regular maintenance in order to provide that flood protection to NRF and other INEEL facilities. Spring 1997 runoff nearly topped the dams. Prior to construction of the diversion dam, NRF was in the Big Lost River 100 year flood plain[RI/FS@5]. Nuclear Regulatory Commission (NRC) radioactive waste disposal requirements state, "waste disposal shall not take place in a 100 year flood plain."[10CFR § 61.50] Stipulated institutional control in the Record of Decision must include diversion dam and water channel maintenance as well as an explicit monitoring regime and maintained fencing of waste sites. The NRF Plan proposes consolidation of contaminated soil into one of the leach pits. The cesium alone will take over 420 years to decay to acceptable risk levels, or considerably longer than the planned 100 year institutional control. Indeed, institutional control must extend as long as the contaminates are hazardous.

Response: (1) Trust funds are not applicable to the Federal Government. (2) NRF is not located on the 100-year flood plain (even in the absence of the dam), although parts of the INEEL are on the flood plain. Nevertheless, the scenarios evaluated for the human health risk assessment conservatively included flood-type conditions even though flood-type conditions are very unlikely at NRF. (3) The monitoring and institutional controls are an integral part of the selected remedial action. CERCLA requires that a review be conducted every five years when contaminants are left onsite above risk-based levels to ensure the selected remedy remains protective of human health and the environment. This continues after the 100-year period, which refers to the earliest reasonable time that residential use could be envisioned for any portion of the NRF site. The remedial action does not allow an entity to "walk away" from the sites of concern. Institutional controls are established such that fencing, border markers, and legal land use restrictions will control access to the sites even if a DOE presence is no longer established at the site. The design of the engineered cover will include a design criterion that the integrity of the cover remains protective for as long as the radionuclides are present above risk-based concentrations, which, based on the highest cesium-137 detected during remedial investigation sampling (7,323 pCi/g), would be approximately 365 years.

Comment 10

The Environmental Protection Agency (EPA) and the Idaho Division of Environmental Quality (DEQ) also incorrectly assume credibility with the public. The presence of their logos on the Plan, their review of the document, and their endorsement of the preferred alternative make these agencies complicitous in the Plan's inadequacies and flaws as well as a history of INEEL "cleanup" Plans that were more coverup than cleanup.

Response: EPA and DEQ have reviewed the Proposed Plan and have determined that it adequately describes all essential elements of a Proposed Plan including site characteristics, the nature and extent of contamination, site risks, remedial action objectives, description of remedial alternatives, and comparative analysis of alternatives. The presence of the agencies' logos on the Proposed Plan does not mean that the agencies have selected a remedy for NRF. The agencies will consider public comments received on the Proposed Plan prior to selecting a final remedy in the Record of Decision.

Comment 11

The Plan states: "The Comprehensive RI/FS Waste Area Group 8 represents the last extensive Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) investigation for the Naval Reactors Facility." This Plan is not "comprehensive" because it excludes the Retention Basin (one of the most contaminated waste sites at NRF) from the CERCLA cleanup process. The Retention Basin (OU-8-08-17) is a large concrete tank that temporarily holds liquid radioactive and chemical wastes (presumably to allow short-lived isotopes to burn off) prior to discharge to the various leach pits. The Plan fails to state that the sludge in the basin contains cesium-137 at 192,700 pico curies per gram (pCi/g)(risk-based action level is 16.7 pCi/g) and Cobalt-60 at 20,410 pCi/g.[RI/FS@H8-8] A long history of Basin leaks assures significant soil contamination under the basin and therefore must be included in the Comprehensive Plan.

Response: The retention basins were included in the Proposed Plan (e.g., see pages 9 and 10) with a remedial action that includes removing the concrete basins and cleaning up that soil below the basins which contains radioactivity above remediation goals. The sludge in the basin will be removed under decontamination and dispositioning activities at NRF. The basins and underlying soil will be remediated under CERCLA actions. The cesium-137 and cobalt-60 radioactivity results stated in the comment are from the sludge contained in the basins and do not accurately represent the potential radioactivity in the soil. The basins are known to have leaked on only one occasion (33,000 gallons in 1971). Although other leaks may have occurred and gone undetected, they would have been small compared to the 1971 leak. The sludge in the basins is an accumulation of several years of particulate matter, there is no reason to believe that the radioactivity concentrations in the soil would be equal to the radioactivity in the sludge. Although the sludge sample data are not used in risk calculations, they do help to identify potential contaminants of concern that may be present in the soil.

Comment 12

The Plan's exclusion of the NRF Expended Core Facility (ECF) contaminated soil resulting from leaks additionally demonstrates the incompleteness of the so called "comprehensive" Plan. The ECF, built in 1958, does not meet current spent reactor fuel storage standards that require stainless steel liner, leak containment, and leak detection systems. The ECF should be shutdown for exactly the same reasons the Idaho Chemical Processing Plant (CPP-603) Underwater Fuel Storage Facility and the Test Area North Pool were shut down - they are an unacceptable hazard and do not meet current standards. ECF has been leaking significantly over the past decade and the soil contamination around and underneath the basins must be included in the CERCLA cleanup process.[RI/FS@5-1] The Plan offers no soil sampling data to substantiate exclusion of the ECF from CERCLA action. A theoretical risk analysis assumed only one leak (>62,500 gallons) which does not reflect the actual ECF history and that is why the sampling data is essential.

Response: There has been only one known leak from the ECF water pits, which was evaluated in the NRF Comprehensive RI/FS. The most significant pathway due to an ECF leak would be via groundwater. The risk assessment in the RI/FS used a very conservative assumption that the entire volume of water immediately migrated to the aquifer without dilution and was available for consumption. Even with this very conservative assumption, risks were not above the National Contingency Plan (NCP) target risk range. The operational aspects of ECF with respect to accident analysis, earthquake scenarios, structural integrity, etc., have been evaluated and documented in the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement.* The Environmental Impact Statement concluded that present and future ECF operations have very small adverse environmental impact. In addition, this facility will continue to be operated in accordance with all applicable regulations and standards.

Comment 13

The Plan's exclusion of the Sewage Lagoon (NRF-23) from its so called "comprehensive" CERCLA cleanup, again, demonstrates the incompleteness of the Plan. Contaminate levels of arsenic, mercury, and cesium-137 would normally require remedial action. In fact, the Track 1 investigations recommended inclusion of the lagoons into the comprehensive RI/FS primarily due to radionuclides and the risk assessment results showed increased cancer rate of 1 in 10,000 from exposure to the site.[Plan@25] The Plan offers no data to substantiate the "risk management decision" to exclude the lagoons. NRF intends to continue to use these unlined leach pits despite the fact that every gallon of waste water that flows into the pit, leaches more of the contaminates toward the aquifer below. NRF should be required to close the Sewage Lagoons, clean them up, and build new lined ponds that meet current regulations. U.S. Geological Survey NRF well sample data confirm ground water inorganic contamination three orders of magnitude over the Maximum Contaminate Levels (MCL).[DOE/ID-22125@45] Clearly, the failed waste management practices of the past must end immediately.

Response: The sewage lagoons were evaluated as part of the NRF Comprehensive RI/FS. Arsenic and mercury were eliminated as contaminants of concern based upon risk management decisions that are detailed in Section 20 of the NRF Comprehensive RI/FS. In fact, the concentrations of arsenic and mercury at the sewage lagoons are below the allowable concentrations of these contaminants for direct land application of the sewage sludge to agricultural, forest, and home lawn lands (EPA 822/R-93-001a – Technical Support Document for Land Application of Sewage Sludge, November 1992). Discharges to the lagoons remain in compliance with existing regulations.

The data used to assess the presence of radionuclides in the lagoons were from the 1994-95 Environmental Monitoring Program. This data is the most reliable data available.

The sewage lagoons are clay lined. The clay liner acts to trap constituents present in the sewage effluent. A hydrogeologic study was performed for the NRF Comprehensive RI/FS and conservative assumptions were made during the study. The clay liner was assumed to leak, making all contaminants present in the sludge available for migration. Even with this conservative assumption, risks from the groundwater pathway were acceptable.

The 1 in 10,000 (1E-04) chance of increased cancer represents a very conservative estimate of the cancer risk associated with chemical and radiological constituents present in the sewage lagoon. There are uncertainties associated with the calculated risk. For instance, adding the increased cancer risk from a chemical constituent, such as arsenic, to an increased risk from a radiological constituent, such as cesium-137, likely overestimates the risk since each constituent affects humans differently. For this and other reasons, regulatory agencies have not historically attempted to sum chemical and radiological risks. In any event, the 1E-04 increased risk falls within the allowable risk range established by the NCP and, considering the conservative assumptions used in the risk assessment, a decision was made by the agencies that the risk present at the sewage lagoons is acceptable. The sewage lagoons have been delineated as a No Further Action site, which requires the decision to be reviewed every five years to ensure this decision remains effective. This review will include newly acquired data from sampling performed at the lagoons and groundwater sampling.

Wells at NRF have exceeded secondary MCLs for iron. Secondary MCLs are non-mandatory guidelines that are intended to control the aesthetic quality of drinking water. As discussed in the hydrogeologic study in the RI/FS, the iron concentrations are highly variable. For example, the concentration of iron in a USGS well upgradient of NRF varies from 10 parts per billion (ppb) to 3,000 ppb, which is ten times the secondary MCLs. This phenomenon is observed often across the INEEL. A review of INEEL groundwater data for iron in conjunction with research associated with the NRF Land Application Permit indicates that the presence of iron is related to the unfiltered nature of the samples, the iron being contained in the naturally occurring sediment extracted during the pumping of well water. The amount of sediment observed from well samples is a property of well construction and geology, and does not appear to be related to their proximity to NRF facilities.

Comment 14

The preferred alternative 3 that DOE, the State, and EPA want the public to accept cannot be justifiably called a cleanup plan. A shell coverup game, yes, but not a cleanup plan. Alternative 3 is a rerun of the misguided actions at the INEEL Test Reactor Area Warm Waste Pond. The NRF Plan calls for the consolidation of the contaminated soil from numerous sites into the bottom of one of the old leach pits (S1W Leach Pit), then cap it with rocks and gravel. It's quick, dirty and comparatively cheap; and that's why DOE likes it. With a slight of hand DOE wants to create a dump without calling it a dump because if they called it a dump then they would have to comply with hazardous and radioactive disposal regulations. If it looks like a duck, walks like a duck, and quacks like a duck then it is a duck. The very moment contaminated soil is moved from one site to another, a dump is created, and therefore, the regulations apply regardless what DOE wants to call it.

Response: Consolidation of contaminated soil at NRF (Alternative 3) was compared to various alternatives for soil disposal including complete excavation and disposal at facilities away from NRF (Alternative 4). Consolidation of soil at NRF rated favorably when compared to the complete excavation option (Alternative 4) for short-term effectiveness (more protective of workers during remedial actions), implementability (much less soil to excavate, package, and transport), and cost (estimated at $10 million dollars less). Alternatives 3 and 4 rated equivalent in overall protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). It is important to note that consolidation of soil at NRF will meet all ARARs. None of the excavated soil is expected to be hazardous. Also, strictly speaking, consolidation of existing contamination as part of a CERCLA remedial action does not constitute formation of a "dump."

Comment 15

The Plan offers inaccurate data to support the preferred alternative. The Plan states that the maximum soil concentration at all of the 8-08 Operable Units for cesium-137 is 7,323 pCi/g$_{\{Plan@14\}}$. Appendix H of the RI/FS however credits the S1W Leach Pit with a maximum detected cesium-137 concentration of 149,759 pCi/g "decay corrected to obtain equivalent 1995 results." $_{\{RI/FS@H4\text{-}22\}}$ This contaminate concentration discrepancy is significant because the undisclosed higher amount qualifies under NRC radioactive waste Class B criteria in 10CFR § 61.55 and the "technical requirements for land disposal facilities," in § 61.50. The preferred alternative does not meet NRC requirements. Actually, DOE's preferred alternative does not even meet municipal garbage landfill requirements under RCRA Subtitle D which require liner, leachate monitoring wells, impermeable cap, and location restrictions over sole source aquifers. The NRF Plan contains none of these essential features. This Plan effectively shifts the risks, hazards, and ultimate cleanup costs to future generations. The high levels of hazardous materials in the NRF waste qualify it as a mixed hazardous and radioactive waste under the 1992 Federal Facility Compliance and RCRA Land Disposal Restrictions. Hazardous contaminates in the soil include chromium at 2,090 mg/kg, lead at 1,140 mg/kg and mercury at 56.1 mg/kg. EPA's interim lead soil cleanup level is 400 mg/kg. The Plan offers no Toxic Concentration Leach Procedure (TCLP) data to support exclusion of this hazardous waste from regulatory disposal compliance. The transuranic contaminates (americium-241 and plutonium-238) at 20 pCi/g have half-lives of 432 and 87 years respectively guarantee the waste will be hazardous for a long time. Under the circumstances, it is difficult to see how the Plan's preferred alternative can claim to meet all the "Applicable or Relevant and Appropriate Requirements" (ARAR).

Response: The cesium-137 concentration of 149,759 pCi/g identified in the comment was detected at NRF-12B (S1W Leaching Pit) in 1972. As stated in the RI/FS Work Plan, this concentration was suspected to be a particle and not representative of actual soil concentrations; 69 other samples collected from the area between 1972 and 1978 showed a maximum cesium-137 activity of 2,600 pCi/g (decay corrected to 1,759 pCi/g in 1995) and a second highest value of 620 pCi/g (decay corrected to 410 pCi/g in 1995). The sampling performed in the 1970's was used to determine contaminants of potential concern, but was not used for risk assessment calculations. Data collected between 1990 and 1996 were used for the risk assessment.

Further, the comment states that the 149,759 pCi/g would qualify the soil as NRC radioactive waste Class B as defined in 10CFR § 61.55. This is incorrect. Even if the 149,759 pCi/g were representative of the soil contamination, and even if no credit were taken for radioactive decay since 1972, the contaminated soil would still fall below Class A criteria, which the proposed cover will meet. (It is also appropriate to note that meeting Class A criteria is not a requirement for CERCLA actions.)

None of the contaminated soil at the nine sites of concern is expected to be RCRA hazardous. The Proposed Plan, which is a summary document of proposed remedial action alternatives, did not include all past sample results; however, none of the soil at NRF has been shown to be RCRA hazardous. The concentrations of metals cited in the comment are total metal results and do not represent TCLP results. Past TCLP sample results from areas with the highest metal concentrations did not show levels above RCRA limits. (TCLP sample results were presented in the NRF Comprehensive RI/FS Work Plan.) Therefore, no hazardous or mixed waste is expected to be generated during remedial actions.

The sample result showing 20 pCi/g of americium-241 and plutonium-238 did not distinguish between the two radionuclides. A conservative approach was taken that considered both americium-241 and plutonium-238 to be present at a maximum concentration of 20 pCi/g. As shown in the Proposed Plan, the 20 pCi/g for either americum-241 or plutonium-238 is still well below the risk-based concentration representing an increased cancer risk of 1E-04. The lowest risk-based concentration was 283 pCi/g for americium-241 and 590 pCi/g for plutonium-238 through the soil ingestion pathway. Americium-241 at 20 pCi/g represents an increased risk to a future resident through all exposure pathways of 2E-05. Plutonium-238 at 20 pCi/g represents an increased risk to a future resident through all exposure pathways of 5E-06. These risks fall within the target risk range as defined in the NCP.

Comment 16

The INEEL Oversight Program's Kathleen Trever claims that the S1W data set containing the 149,759 pCi/g cesium-137 was not considered reliable by DOE and therefore it was not used in the Risk Assessment. When asked about this data-set discrepancy, EPA's Wayne Pierre said that DOE could not arbitrarily ignore a data-set unless they had more than 10 data-sets, and then they could choose the most reliable 10 sets. Since DOE only had three data-sets, Pierre thought it unacceptable to rely completely on the 1991 and 1992 samples. It is possible that the earlier sampling grid identified hot spots that the later sampling grids could be planned to avoid.

Response: The cesium-137 activity of 149,759 pCi/g that was detected in one of 70 samples collected between 1972 and 1978 from the S1W Leaching Pit area was not ignored. Each site's maximum concentration was used throughout the initial evaluation to identify potential contaminants of concern in the RI/FS work plan for that site, even though average concentrations would have shown a more likely contaminant concentration at each site. The average concentration for data collected at the S1W Leaching Pit between 1972 and 1978 was less than 3,000 pCi/g when including the single 149,759 pCi/g sample, or near 100 pCi/g when not including the 149,759 pCi/g sample. Sample data collected in the 1970's did not have the appropriate data quality (e.g., no quality control samples were run, or exact sample location is unknown) to allow its use in risk assessment calculations, and therefore data collected from recent sampling events as described in the RI/FS Work Plan were used for risk assessments. For the S1W Leaching Pit, a concentration term of 2,040 pCi/g for cesium-137 was used, which was the highest detected cesium-137 activity from either the S1W Leaching Pit or the adjacent S1W Leaching Beds during recent sampling. This was very conservative, relative to using the 95% upper confidence limit of the mean concentration, which would have been more realistic.

EPA does not provide guidance concerning the number of data sets necessary for risk assessment. EPA does provide information recommending the use of at least ten data points when calculating a mean and 95% upper confidence limit used for establishing a reasonable maximum exposure (RME) level for risk assessment (EPA/540/1-89/002, Risk Assessment Guidance for Superfund Volume 1 Human Health Evaluation Manual (Part A)). When there are fewer than ten data points in a data set, EPA recommends to use the maximum value of the data set. Although most data sets consisted of more than ten samples, NRF conservatively elected, in most cases, to use the maximum value found at each site when performing the individual site risk assessments.

Finally, later sampling did not avoid the location of the 1972 highest level sample. Rather, sampling has been performed all around this area, but the levels found were much less than the highest 1972 level found.

Comment 17

1971 sampling data buried in the RI/FS show long-term waste mismanagement at the S1W Leach Pit with cesium-137 at 310,000 pCi/g, cesium-134 at 4,200 pCi/g, hafnium-181 at 20,000 pCi/g, and cobalt-60 at 1,300,000 pCi/g.[RI/FS@I-59] Algae (accessible to ducks using the pond) sampling shows 667,447 pCi/g.[RI/FS@pg H6-13] By comparison, the risk based soil concentration for cesium-137 applied to this Plan is 16.7 pCi/g. These high contamination levels were due primarily to once through reactor cooling water dumped in the leach pits which was discontinued by 1980. No explanation is offered why the remediation goal applied to Waste Area Group 3 of 0.02 pCi/g for cesium-137 was changed.

Response: As stated in the RI/FS Work Plan, the 1971 samples were collected from the mud of the active S1W Leaching Beds. The location and circumstances of the sample collection were not recorded. The contaminants detected during historic sampling were only used to determine potential contaminants of concern, not risk; historic sampling does not represent current conditions of the leaching bed soil. Recent sampling evolutions better represent site conditions.

The comment also states that a remediation goal of 0.02 pCi/g for cesium-137 was used at Waste Area Group (WAG) 3. WAG 3 does not have a remediation goal of 0.02 pCi/g for cesium-137, but did use that as a screening level for considering cesium-137 as a potential contaminant of concern. WAG 3 cleanup goals are similar to WAG 8 (NRF) cleanup goals.

Comment 18

Alternative 4, Complete Excavation and "Off-site Disposal" is equally unacceptable because "Off-site" is defined as hauling the contaminated soil from NRF to another INEEL leach pit consolidation site at the Idaho Chemical Processing Plant, Test Reactor Area, or the Radioactive Waste Management Complex, none of which would qualify even as a garbage dump. Interestingly, DOE calls these "INEEL soil repositories." Therefore, alternative 4 does not meet legal requirements in the ARAR's.

Response: Alternative 4 would meet the legal requirements in the ARARs. Off-site, as defined in Alternative 4, means: (1) disposal to a potential soil repository at the Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant (ICPP)) that would be established through a public input process; (2) disposal to the warm waste pond at the Test Reactor Area that is currently being used for soil consolidation of other CERCLA sites; (3) disposal to the Radioactive Waste Management Complex that currently accepts low-level radioactive waste; or (4) disposal away from the INEEL to a location licensed to receive the soil and debris from NRF.

Comment 19

The cumulative risk assumptions that determine the exposures to future 100 year residential and occupational scenarios are not conservative (most protective of human health) and not supportable. The Plan states: "The ingestion of soil, the ingestion of food crop, and direct contact with soil through the dermal pathway are not included in the cumulative assessment because these involve exposures routes that are not likely to occur at more than one release site at a time." [Plan@11] A possible future scenario of a pasture over the leach pit, a well over the Retention Basin, and dermal exposure from digging around the ECF is reasonable. Therefore, all these pathways must be considered to be cumulative. The risk assessment must also be recalculated using the above cited maximum cesium-137 contaminate level of 149,759 pCi/g which will produce radically different results from the 7,323 pCi/g used by DOE as the maximum contaminate level at NRF.

Response: The purpose of the cumulative risk assessment was not to add worst case risks from various pathways across many sites (i.e., soil ingestion risk from one site added to groundwater ingestion risk at another site). The cumulative risk assessment evaluated the additive effects of several sites for each cumulative pathway of concern (i.e., dust from one site intermingles with dust from another site causing an accumulation or higher contaminant concentration in the dust). The ingestion of soil, the ingestion of food crop, and direct contact with soil through the dermal pathway are not considered cumulative because the worst case scenario for these exposure pathways would be a person residing directly at the site in question. The individual site risk assessments calculated the worst case scenario risks for these pathways. Risks via these pathways cannot be any higher through accumulation than the risk calculated for the individual site with the highest contamination. As an example, a person eating the maximum expected quantity of site-grown food, all from within the most contaminated area, cannot also be expected to eat food grown in a less contaminated area. If an individual were to ingest a mixture of plant material grown at two sites (one with the highest contamination and one with less), the cumulative effect (risk) to that individual would be less than ingesting all plant food from the site with the highest contamination. This illustrates why ingestion of soil, ingestion of food crop, and direct dermal contact are not considered cumulative across different sites.

However, the inhalation of dust, groundwater ingestion, and direct exposure to radionuclide pathways are spatially cumulative. A receptor located at one site breathes air containing particulates which may have come from multiple sites. In the case of groundwater ingestion, it is not possible to determine the location of a hypothetical future well. It must be assumed that a well could be in a location in which it would receive contamination from multiple sites. The direct exposure to radionuclides may also be additive if a receptor is located between two sites and receives exposure from both sites.

The cesium-137 activity used for risk assessments was explained in the response to comment #15. Regardless of the cesium-137 activity used for the risk assessment, the results would be the same: based upon either 7,323 pCi/g or 149,759 pCi/g, an unacceptable risk would be present that requires some type of remedial action. The 16.7 pCi/g remediation goal for cesium-137 was established to prevent effects from any amount of cesium-137 above this level. Its selection is independent of the cesium-137 levels at each site.

Comment 20

NRF and DOE representatives stated at a public meeting in Moscow that the groundwater and aquifer are not at risk because contaminates are absorbed by the soil column. Review of the historical deep well sampling data at NRF does not support the Navy's conclusion. The NRF October 1995 Remedial Investigation/Feasibility Study (RI/FS) Appendix K shows Table III Deep Well Sample Results for Wells #1, #2, and #3 at 60, 69, and 44 pico Curies per liter respectively for gross beta. The federal drinking water standard (MCL) for gross beta is 8 pico curies per liter. This deep well sample data confirm that the contaminates do migrate, contrary to the Navy's claims. The USGS well sample data previously cited additionally confirm contaminate migration.

Response: The data from groundwater wells in October 1976 were described in the 1976 Environmental Monitoring Report as being an abnormality. The laboratory performing the analysis confirmed that all INEEL wells showed elevated beta activity levels above minimum detectable levels. The laboratory concluded that the likely cause was cross-contamination at the laboratory and not contamination of well water. This is supported by the data collected during the months prior to and after the October data.

In any event, for risk calculation purposes, some absorption by the soil column is considered. The absorption is a property of the soil matrix and chemical being absorbed. No chemical was assumed to be completely absorbed.

Comment 21

The Plan's "remediation goals" that set risk-based soil concentrations for contaminates of concern (cleanup goals) fail to include inhalation as an exposure pathway. This exclusion represents a major flaw in the Plan. Inhalation is the most biologically hazardous for alpha emitting contaminates of concern listed as americium-241, neptunium-237, plutonium-238, plutonium-244, and uranium-235, yet inhalation is not considered for these isotopes, nor for lead. The wide difference between ingestion of beta/gamma contaminated soil also appears out of balance. For instance cleanup goals for cesium-137 external exposure is set at 16.7 pico curies per gram (pCi/g) while ingestion of soil is set at 24,860 pCi/g. Additionally, the beta emitter strontium-90 is not considered for external or inhalation exposure but is considered for soil ingestion at 15,416 pCi/g and food crop ingestion at 45 pCi/g.

Response: The inhalation exposure pathway was evaluated in the risk assessment presented in the NRF Comprehensive RI/FS, which was the primary referenced document of the Proposed

Plan. The inhalation pathway did not show an increased cancer risk greater than 1E-06 for any of the contaminants of concern. It was therefore not necessary to calculate a risk-based cleanup target concentration for any contaminants through this pathway. Although inhalation of alpha-emitting radionuclides was a concern and was evaluated during the risk assessment, the soil concentration would have to be relatively high in order for enough alpha-emitting radionuclides to become airborne and become a risk driver. The same logic applies to the inhalation pathway for other contaminants.

The wide variability in acceptable concentrations of radionuclides, depending on both radionuclide and pathway, is based on how they can affect people. Radionuclides that emit gamma radioactivity can cause a larger direct exposure dose than those that only emit beta or alpha types of radioactivity (which do not penetrate more than a few inches of air); hence a relatively low cleanup concentration for gamma emitters may be required to keep direct exposure doses low, whereas much higher concentrations of non-gamma emitters (e.g., beta or alpha only) may be acceptable since the doses they can give people are much less. For cesium-137, the relatively high risk-based concentration through the soil ingestion pathway compared to the external exposure pathway is a result of the limited bioaccumulation of cesium-137 in human tissue during the ingestion process. In other words, a large percentage of cesium-137 passes through the body, limiting exposure to the radionuclide. The external exposure pathway assessment assumes a constant source of gamma emitting radioactivity being present in the soil and assumes the receptor is exposed to the source continually throughout the exposure duration period, which is more conservative than the assumptions in some standard computer programs modeling exposures.

Similarly, some radionuclides such as strontium-90, due to their chemical nature, may be readily taken up into the food chain, which would result in the need for lower concentrations as cleanup goals for this pathway (to keep the doses low). Other chemicals such as cobalt (and hence any cobalt radionuclides like cobalt-60) may not be readily taken up by plants, and hence even high concentrations would still be of low risk for this pathway.

The RI/FS essentially picks the lowest acceptable concentration for each radionuclide, from among the various pathways, and uses that for the risk-based cleanup goal for that radionuclide.

<u>**Comment 22**</u>

An integral factor in the Plan's establishing a "remediation goal" is the maximum concentration of contaminates of concern. The Plan acknowledges (pg 14) that the maximum cesium-137 soil contamination detected at the NRF is 7,323 pCi/g which generated a risk based cleanup goal of 16.7 pCi/g. Again, as previously discussed, this must be recalculated using the above cited maximum detected cesium-137 at 149,759 pCi/g "decay corrected to obtain equivalent 1995 results." This significant discrepancy begs the question as to the quality of regulatory review the State and EPA are bringing to the process and whether the "remediation goals" are supportable.

Response: The remediation goals are based on risk levels associated with specific post-remediation concentration limits. The goals are not related to any specific sample results. Regardless of the activity of cesium-137 used for the existing site-specific risk assessments, the remediation goal of 16.7 pCi/g would not change. The 16.7 pCi/g represents a current present-day activity level which corresponds to an increased risk of cancer of 1 in 10,000 for a future 100-year resident via the external exposure pathway, which is the exposure route of concern. Hence, areas below 16.7 pCi/g cesium-137 at the present time would be acceptable for unrestricted release in 100 years.

Comment 23

These comments actually apply to both the proposed plans for WAGs 8 and 9, but *especially* WAG 8 since containment is part of the preferred alternative for WAG 8.

I am concerned that DOE-ID appears to be using the engineered barrier or rock cover that was emplaced at the SL1 burial grounds and at the BORAX facility as the prototype barrier for any subsequent proposed disposal facilities on the INEEL. This SL1-style rock cover or "barrier" is part of the containment alternative presented in the proposed plans for both WAG 8 and WAG 9. It is well documented that the effect of this rock cover would be to increase infiltration and minimize evaporation thereby increasing the amount of water available to leach contaminants from the disposed soil the cover is supposed to protect. I have read the proposed plan for WAG 8 and pertinent portions of the WAG 8 Comprehensive RI/FS and see no acknowledgment that this rock cover will increase infiltration. The fact that this rock cover will increase infiltration and leaching should be plainly stated in the proposed plan for the information of members of the public. If anything, the wrong impression is given in the Overall Protection of Human Health and Environment section of the proposed plan for WAG 8 (page 16) where it is stated that Alternative 3 will "minimize infiltration." This last statement is miserably incorrect and needs to be changed.

While the groundwater pathway may not have been a risk in the baseline risk assessment for either WAGs 8 or 9, even with infiltration rates as high as 1 m/yr, it still seems wrong from an environmental stewardship viewpoint to needlessly install a rock cover that will undoubtedly increase leaching from the contaminated soil and increase concentrations of leached contaminants in the Snake River Plain aquifer. I feel this statement is true even if the increased infiltration caused by the rock cover only incrementally increases contaminant concentration in the aquifer because there are better cover alternatives. True engineered barriers that provide the necessary shielding and biotic protection have been designed and are being tested on the INEEL. These barriers are resistant to erosion and minimize infiltration. These barrier designs should be given a thorough comparative evaluation to an SL1-style barrier for use in the preferred alternative. This comparison should include analysis of even incremental risk increases in the groundwater pathway from increased infiltration due to the rock cover. Hopefully, this comparison will occur since there are words in the Comprehensive RI/FS for WAG 8 that the proposed rock cover in Alternative 3b is a "conceptual design" and that the final design will be developed during the remedial design process.

The WAG 8 Comprehensive RI/FS cites Reith and Caldwell (1990) as stating the proposed barrier is appropriate for containment in an arid area. I have read the article by Reith and Caldwell and, although the article admits that several of these rock covers have been built at UMTRA sites, the main point presented in the article is that since vegetated soil covers are more effective for reducing infiltration and subsequent leaching from contaminated soil, vegetative covers should be used in semiarid climates to protect the environment from contaminated soils rather than simple rock covers. This gives the appearance that the Reith and Caldwell article is incorrectly cited out of context for purposes of justifying the choice of engineered barriers.

Response: As stated in the WAG 8 Proposed Plan and the NRF Comprehensive RI/FS, the cover shown in the Proposed Plan and RI/FS is only one possible design. All comments received on the cover design will be considered during the remedial action design phase. One of the purposes of Alternative 3 will be to minimize infiltration to prevent contaminant migration. Presently, the leaching beds are a depressed pond area with large cobblestone along the bottom, making an ideal infiltration situation, yet sampling has shown very little migration to date of contaminants of concern. The consolidation of soil in the pond area and the construction of any type of cover would actually decrease infiltration compared to what currently exists. The cover layers may include a low permeability layer or layers of soil with sufficient thickness to enhance evapotranspiration. A top layer for a vegetation cover will certainly be considered. The experience gained at NRF during the construction of three landfill caps with vegetation covers was also valuable. NRF was successful at designing covers which resist erosion and minimize surface infiltration. This experience will be put to use during the design of the covers proposed by Alternative 3.

The purpose for citing the Reith and Caldwell reference was to show that a rock-type cover is a potential cover in an arid climate, but possibly not an appropriate cover in a humid climate. It was not intended to justify any cover design.

Comment 24

If the preferred alternative is actually selected and implemented through a ROD, I would hope that shallow monitoring within the vadose zone beneath the consolidated soil disposal would occur to verify the assumptions and results that were used in the subsurface pathway flow and transport modeling that was performed to demonstrate the acceptability of the chosen remedy.

Response: Vadose zone monitoring will be considered during the remedial design phase as well as various other monitoring methodologies (i.e., radiation surveys, soil sampling, and groundwater monitoring).

Comment 25

Analyses seem conservative and thorough. I favor Alternative #3. If more excavation than that is considered, extreme care/caution would be needed to insure that close to zero plutonium compounds are airborne and subject to human ingestion. No amount of plutonium ingestion is considered safe. Various isotopes are probably present in minute quantities.

Response: The highest amounts of plutonium detected were in the leaching bed areas that are not planned for excavation. Even the maximum amount of plutonium detected in the soil at NRF, including in the leaching beds, showed risks to a 100-year future resident at 6E-06 for soil ingestion and 2E-06 for food crop ingestion (the only significant pathways for plutonium). Current risks to occupational workers showed a maximum risk of 2E-06 through the soil ingestion pathway. Each of these risk values are within the NCP target risk range.

Comment 26

Why do we (you) keep moving and shuffling this radioactive so called hazardous waste around to contaminate more and more area? We might as well just eat the stuff and be done with it or sell it to the fertilizer and petroleum industry and let them spread it around. It would be less money than INEEL spent fooling around. Or are you waiting for your retirement plan to kick in then you can move far away from ground zero. No more of your worry!

I think maybe you people are missing something which is filtering into water aquifers and killing and sterilizing fishes and other living, now dead things. Why keep stirring the pot to make dust and fumes fly around to contaminate more! Is this just a job, or do you really care?

Either INEEL or U.S. Postal Service - Thank You - Your mailings didn't get to North Idaho until the day of the Public Meetings or after not much time to schedule. After the fact. Guess our highways are slow traffic only. Thank You. The goat trail to North Idaho.

Response: The contaminated soil to be excavated will not be RCRA hazardous waste (see response to Comment #7). The option chosen will decrease the total area of contamination.

Controls would be used during soil consolidation to minimize the spread of dust. The sampling of groundwater monitoring wells around the perimeter of NRF currently measures the quality of groundwater and helps ensure past operations have not adversely impacted the aquifer.

We apologize for the late notification and, as a result, the comment period was extended for 30 days.

Comment 27

The scope of the proposed cleanup at the Naval Reactors Facility and the discussion at the Idaho Falls public meeting point once again to a fundamental dilemma facing Department of Energy cleanup. That dilemma is ongoing uncertainty, confusion, and disagreement about the magnitude of the DOE's long-term stewardship responsibilities. On the one hand, nuclear material should not be dinked with more than necessary, and handling, treating, and transporting it should occur only when environmental and health protection demands any of those steps. On the other hand, any residual material presents a risk. The level of residual risk will obviously affect the level of stewardship required. Then there is the question of the future uses for any site--from nature preserve to industrial park to residential neighborhood--which will also affect stewardship requirements. Commentors in Idaho Falls raised both these questions.

There is a land use plan for INEEL, and it is our understanding that it is being used by the DOE and its regulators to guide cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act. But that plan was developed through a less than perfect process with very little public involvement.

Acceptable risk and future use are both topics that deserve and are amendable to wide, ongoing public discussion, and it is clear that discussion has not yet really begun. This is particularly unfortunate since, as the decades pass, it's quite likely that stewardship will become more and more the responsibility of local communities. Some decisions about long-term stewardship cannot be made for many years, and some we're working from now will no doubt be revisited. The Alliance encourages efforts to engage the public in broad, ongoing consideration of the long-term stewardship required at INEEL.

Specific to the cleanup of NRF, it is quite frankly a relief that, unlike its spent fuel, the nuclear navy does not propose to treat and transport to a fare-thee-well the soil it has contaminated at INEEL. On the other hand, the environmental benefits of consolidating contamination are not entirely clear. The nuclear footprint in Idaho will never fit in the glass slipper.

Response: If contaminants are left on site above risk-based concentrations, CERCLA requires a review of the selected remedy every five years to evaluate the effectiveness of assumptions, remedies chosen, and decisions made during the CERCLA process. One assumption agreed with by the DOE, EPA, and IDHW was that a Government or institutional presence will be in place for 100 years. Although predicting the future land use scenarios has many uncertainties, the five year CERCLA review process helps accommodate these uncertainties, particularly in later years. Part of the consideration for the selected alternative was to include institutional controls that would prevent access to the sites of concern even if there is no longer a Government presence at NRF. These institutional controls include fencing or other barriers, permanent markers, and legal land use restrictions. Regarding land use, standard INEEL scenarios were used: on-site workers for near term exposure and residents for 100 years in the future. Actual future land use decisions were beyond the scope of this study.

The primary benefit to consolidating the soil in a few locations rather than covering each area is that it is not practical to individually cover or cap several of the sites of concern. Most of the sites to be excavated are under concrete basins, below asphalt roadways, or between security fences. Therefore, the only feasible alternatives available for these sites were no action, additional monitoring, or excavation. Consolidating soil and placing an engineered cover over the consolidation area will prevent animal/erosion intrusion while also being designed to limit maintenance requirements, and reduces overall risk.

Comment 28

The 1995 nuclear waste deal included a commitment from the nuclear navy to spend $45 million on "discretionary" environmental remediation within five years. Activities carried forward under CERCLA are required by law and are not at the polluter's discretion. Without question, the funds promised in the nuclear waste deal cannot be used for any part of the proposed cleanup plan under review here. The $45 million raises other questions, though. What, if any, róle will DOE-Idaho, the Environmental Protection Agency, and the State of Idaho have in determining expenditure of the promised $45 million? What criteria (e.g., downstream health protection) will be used? More to the point, *as required* environmental activities at INEEL grow increasingly problematic both through budget constraints and through the DOE's inability to meet technical and management challenges, is it appropriate to spend $45 million on *discretionary* remediation at all?

Response: The Navy does not intend to spend any of the committed $45 million in discretionary remediation funding to accomplish CERCLA-required actions discussed in this ROD. The $45 million in the "Idaho Agreement" documents the Navy's ongoing commitment to pro-actively remediate site facilities to minimize future environmental liabilities. Other decontamination and dispositioning tasks will be accomplished with this funding, with the objective of obtaining the greatest benefit in the most cost-effective manner. To a large extent, the Naval Nuclear Propulsion Program uses its discretionary authority to focus funding on remediation projects addressing the more significant near term risks. See also the discussion of costs and planned decontamination and dispositioning actions in the response to Comment 39 below.

Comment 29

How did you folks get silver in the parking lot runoff trenches? What are your tire studs made of?

Response: Silver was only detected above background levels in one sample at 1.25 parts per million (ppm). The risk-based concentration for silver as calculated in the NRF Comprehensive RI/FS is 39 ppm. Because there was such a low concentration of silver detected in only one sample, it is questionable that a source exists. If a source is present, the small fluid leaks and wear products from automobiles in the parking lot are the most likely source. Alternatively, a small spill of automotive battery acid contacting an old silver dime could account for such trace levels.

Comment 30

I have read Snake River Alliance's comment letter dated February 10, 1998, from Beatrice Brailsford and concur with the contents. I lived in Idaho from 1977 to 1991 and I have always been concerned about INEEL, nuclear pollution and contamination, the aquifer and the Snake River.

Response: Please see responses to Comments 27, 28, and 29.

Comment 31

Alternative 3 is not less costly than Alternative 4, Complete Excavation and Off-site Disposal. The Alternative 4 cost analysis was exaggerated by more than 400% of what is commercially available at a low-level radioactive facility off-site from INEEL through contracts to which the DOE and INEEL currently have access. As a result, Alternative 4 has less construction/capital costs associated with it, and as indicated in the cost analysis, operation and maintenance costs for this option are minimal, since all material would be moved to an off-site commercial disposal facility.

Response: Alternative 4 is significantly more expensive than Alternative 3. The costs shown in the NRF Comprehensive Feasibility Study show a landfill disposal cost for each site that is excavated. This cost is estimated to be near $400 per cubic yard. This not only represents the disposal fee, but also the significant additional costs associated with handling, packaging, and transporting radioactively contaminated soil. Once packaged and ready for shipment the actual disposal fees may only be $100 per cubic yard. This difference takes into account the additional requirements needed during handling, packaging, and transporting activities for radioactive soil.

For Alternative 3, once the soil is placed in the leaching beds and a base layer of clean soil is placed over the area, cover construction would not require stringent radiological controls. Alternative 4 would require much more construction activity, to excavate over seven times the amount of contaminated soil to a depth of over 30 feet (vice 14 feet).

Comment 32

It is arguable that complete excavation and disposal (Alternative 4) requires more construction activity than limited excavation and disposal (Alternative 3). Although less material may be moved, the construction of a cap and cover system requires significant construction activity and is potentially equivalent to the limited excavation option.

Response: See response to Comment 31 above.

Comment 33

Alternative 3 is not more implementable than Alternative 4. It is stated that Alternative 4 ranks lowest in implementability because of additional excavation, transportation concerns and the uncertainty of the availability of off-site disposal facilities. First, commercial implementation of projects of this scope are quite routine and have been proven successful. Commercial contractors have trained workforces, thus eliminating the training that Alternative 3 requires, Second, INEEL have successfully transported large quantities of waste from INEEL to Envirocare of Utah without mishap, thus reducing any transportation concerns. Third, off-site disposal capacity is prevalent. Envirocare of Utah maintains a future capacity for low-level waste in excess of 12 million cubic yards and is accessible through current government contracts.

Response: The first option for Alternative 4 is an on-INEEL soil repository that is being proposed by the Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant (ICPP)), which would likely be the least expensive of the off-site (away from NRF) options. Uncertainty exists, since the repository has not been established, which makes the implementability of Alternative 4 using an INEEL soil repository questionable. Although projects of Alternative 4's scope have been performed in the past, there are aspects of Alternative 4 that make it more difficult to implement than Alternative 3. Alternative 4 would require excavating to a depth of 30 feet compared to an estimated maximum depth of 14 feet for Alternative 3. As previously stated, any work involving radiological controls is less efficient and more difficult to implement. Regardless of the successful transportation of past INEEL shipments to Envirocare, the additional concerns, regulations, and public sentiment make transportation of radioactive material along public highways or railways a concern that is included in the assessment of alternatives. Hence, the agencies believe that Alternative 3 is easier to implement than Alternative 4.

Comment 34

Alternative 3 required unlimited future surveillance and maintenance, creating an unending mortgage cost for the government and citizens. Not only is the cost estimate for these costs probably underestimated, but Alternative 4 eliminates these future costs.

Response: The agencies agree that Alternative 3 will require future monitoring and possibly maintenance; however, the 30 year costs show that Alternative 3 is less expensive than Alternative 4. The cover design will limit most maintenance needs. Institutional controls will be established to limit access and the need for continuous surveillance. Periodic reviews will evaluate future monitoring and maintenance requirements. Although future operations and maintenance (O&M) costs beyond 30 years can be assumed they are expected to be minimal based on proper cover design and established institutional controls. The future surveillance and maintenance costs would be similar for the Federal Government or an NRC regulated commercial disposal facility; the difference being Alternative 4 applies the cost upfront in the form of disposal fees. A commercial disposal facility also introduces potential future liabilities, if the company ceases to exist or fails to comply with all regulatory requirements.

Comment 35

Overall protection of human health and the environment is not equally served by alternatives 3 and 4. Placement of radioactive waste in an off-site facility licensed and selected for its suitability for radioactive material and maintained by a specialized staff trained specifically for this service is more protective than on-site capping.

Response: The overall protection of human health and the environment includes the evaluation of several criteria, particularly long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. Both alternatives comply with ARARs. Alternative 4 was judged better for long-term effectiveness and permanence based on the complete removal of the contaminant source and the reasons cited in the comment. However, Alternative 3 was judged to have a better short-term effectiveness because less contaminated soil is excavated and handled. Both alternatives satisfy the criteria of overall protection of human health and the environment, and were therefore given an equal rating. For Alternative 3, an appropriately trained staff will be employed at NRF for the remedial actions taken.

Comment 36

The presenters provided comprehensive discussions on the numerous sites assessed at the NRF during the Comprehensive Remedial Investigations. These investigations evaluated the potential for risk to human health from chemical and radiological sources at the NRF as well as looking into related ecological and hydrogeological issues.

The Coalition 21 has no criticisms or comments on the proposed Plan but reserves the right to comment at a further date should that be considered necessary by the Coalition's Board of Directors.

Response: The agencies appreciate the time and effort made to read and comment on the Proposed Plan.

Comment 37

I am interested in learning, can a "waterproof material" or "liquid rubber" be sprayed over the 4" gravel and under the contaminated soils to prevent water from permeating through the engineered covers? This water resistant material could be sprayed from a large vehicle or crane over the site and would "dry or shrink" after being exposed to the environment.

Response: Technologies that required a barrier to be placed beneath the contaminated soils were evaluated in the NRF Comprehensive Feasibility Study and were determined to be too difficult to implement, too costly, and therefore not practical. The inclusion of a rubber type material, or impermeable layer, above the contaminated soil will be considered during the cover design phase of the project.

Comment 38

Can a "sponge like material" or "absorbent" be added to the contaminated soils and liquids that might help prevent migration of the contaminated water to a lower aquifer?

Response: There is no contaminated liquid present at the sites of concern. Infiltration of water from precipitation events will be minimized by the installation of the cover. See the response to Comment 4 that discusses the limited migration potential at the sites of concern.

Comment 39

The INEEL CAB recommends selection of Alternative 3 as the preferred alternative for cleanup at NRF. It is less costly than the other alternative which also achieve appropriate risk reduction objectives. It also reduces risks to a more acceptable level than the less costly alternatives. By consolidating materials at an existing site at the NRF, the preferred alternative also minimizes transportation, risks to site workers, and potential for airborne contamination.

Alternative 3 would involve limited excavation of an estimated 58,080 cubic feet of contaminated soil and placement of the soil in the S1W leaching beds; containment of on-site disposal areas with earthen covers; removal to an approved low level radioactive disposal area of contaminated underground piping and concrete structures; and implementation of monitoring, fencing, other barriers, and/or land use restrictions.

While the INEEL CAB supports the risk reduction measures that would be achieved through implementation of Alternative 3, we are concerned about the much higher costs compared to Alternative 2 and about the accuracy of cost estimates as presented. The Board recommends that the Record of Decision (ROD) provide documentation that no other, less-costly alternatives exist which could achieve the desired risk reduction objectives. In addition, the ROD should provide documentation of total lifecycle cost estimates for all alternatives to allow comparisons among them and to document the justification for selecting an alternative which will require long-term institutional controls and monitoring.

Alternative 2 would involve various institutional controls and additional monitoring. Long-term monitoring of the soils and groundwater would continue through the control period. Fencing or other barriers would be constructed around the sites of concern to inhibit access to the area. Land use restrictions would be obtained near the end of the control period to prevent excavation in areas where wastes are contained and would include the placement of permanent property markers with posted signs.

Response: Section 6.7 of the ROD includes a more detailed cost breakdown than was presented in the Proposed Plan. This includes the specific costs associated with each action associated with Alternatives 2, 3, and 4. Although Alternative 3 is more expensive than the limited action associated with Alternative 2, the agencies feel the costs are justified. One consideration which is not evident from the cost estimate or the comparison of alternatives is that all sites being excavated as part of Alternative 3 were previously identified as areas of planned decontamination and dispositioning removals. The piping and concrete structures at these sites were not originally part of the CERCLA investigations; only contaminated soils outside contained systems were the focus of CERCLA investigations. Therefore, some of the excavation costs associated with these areas were expenses that were part of NRF's planned future decontamination and dispositioning activities.

The only feasible alternative (as determined in the NRF Comprehensive Feasibility Study) other than Alternative 3 that could achieve the desired overall protection of human health and the environment was Alternative 4. Other technologies were screened out during the development of alternatives. The least costly option available in Alternative 4 is likely the disposal of excavated soil to a soil repository established at the Idaho Nuclear Technology and Engineering Center (INTEC) (formerly the Idaho Chemical Processing Plant (ICPP)). However, the costs associated with placing covers over the consolidated areas, which are part of Alternative 3, are small compared to the costs of excavating over seven times more radiologically contaminated soil, which is necessary as part of Alternative 4. The actual disposal fees are small compared to the costs associated with excavating the contaminated soil and preparing the soil for shipment to a disposal facility away from NRF. For additional cost information see the response to Comment 31.

Comment 40

The INEEL CAB members understand that the assumptions used in the risk assessment process are conservative. The Proposed Plan does not describe the assumptions with enough detail to allow members of the general public to understand. The ROD should provide a better explanation of the risk assessment process and make it understandable to the general public (e.g., use quantities people can relate to).

The INEEL CAB also understands that the primary risk imposed by contamination at NRF is direct exposure. That fact is not well communicated in the Proposed Plan. It should be better communicated in the ROD so as to limit concerns among people living at a distance from the facility.

Response: Section 4.1.2.2.2 of the ROD specifically discusses the assumptions made in the risk assessment. Section 5.1 of the ROD also more clearly defines that direct exposure to cesium-137 is the primary risk associated with the sites of concern.

Comment 41

I'm concerned about the proposed engineering design. My name is Buck Sisson. I live in Idaho Falls. I'm concerned about the proposed engineered barrier over the top. It has a tendency - - it will maximize infiltration, probably collect snow and a lot of infiltration that is going on, really accelerating migration that should take place. I think that would be - - I'm worried about the engineered burial that is going to maximize infiltration and it will trap snow, and there won't be any plants growing, so it will maximize the infiltration and the leaching of the soluble waste.

There are much better alternatives than that. DOE spent quite a bit of money on developing cap or barrier designs that minimize that leaching effect, and it should be seriously considered.

Also the monitoring system should be in place in the vadose zone so you get an early warning if anything goes haywire. You'd have plenty of time to make remedies and fix it.

Response: See responses to Comments #2 through #5. Vadose monitoring as well as other monitoring methodologies will be considered during the cover design phase.

__Comment 42__

My name is Joe Merted. I would like to see a sharing of the technologies and the study data and the other ways that they have used to make decisions, and I'd like to see the modeling made available so that we can understand weather and understand groundwater phenomena and also deep water phenomena at the site and also in our areas. I've noticed in the previous studies that they've used models for weather forecasting that weren't based on our particular area. I would like to see a dynamic model of the Snake River Valley developed. I think it would help not only the site but agriculture and all this. These are probably some of the spinoffs that could happen from this wonderful science that we're seeing, and I would like to see more of that happen.

Response: The development of weather models was beyond the scope of the NRF Comprehensive RI/FS. No weather models were used; however, weather patterns, including average precipitation, temperature, and wind conditions, were assumed to remain the same during the scenarios evaluated. As identified in Appendix H of the RI/FS, the models used for evaluating groundwater at NRF included GWSCREEN, MODFLOW, and MEMO. GWSCREEN is a groundwater contaminant fate and transport model available to all Federal Governmental institutions and contractors. MODFLOW is a groundwater flow model that is a public domain program available to the public; a copy will be provided upon request. MEMO is a groundwater fate and transport dispersive flow model used to optimize placement of groundwater wells, and is available to Federal Governmental institutions and contractors.

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Appendix A

Adminstrative Record File Index

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IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
NO ACTION SITES FOR WASTE AREA GROUP (WAG) 8
01/25/95

FILE NUMBER

AR1.6 NO ACTION SITES

- Document #: 5837
  Title: NRF-4, SWMU Unit #4 - Top Soil Pit Area
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5838
  Title: NRF-5, SWMU Unit #5 - West Landfill
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5839
  Title: NRF-7, SWMU Unit #7 - East Landfill
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5840
  Title: NRF-24, SWMU Unit #24 - Demineralizer and Neutralization Facility
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5841
  Title: NRF-25, SWMU Unit #25 - Chemical Waste Storage Pad
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5842
  Title: NRF-27, SWMU Unit #27 - Main Transformer Yard
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

FILE NUMBER

AR1.6 NO ACTION SITES (continued)

- Document #: 5843
  Title: NRF-30, SWMU Unit #30 - Gatehouse Transformer
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5844
  Title: NRF-34, SWMU Unit #34 - Old Parking Lot Landfill
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5845
  Title: NRF-39, SWMU Unit #39 - Old Radiography Area
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5846
  Title: NRF-46, SWMU Unit #46 - Kerosene Spill
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5847
  Title: NRF-57, SWMU Unit #57 - S1W Gravel Pit
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5848
  Title: NRF-60, SWMU Unit #60 - Old Incinerator
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

- Document #: 5849
  Title: NRF-67, SWMU Unit #67 - Old Transformer Yard
  Author: NRF
  Recipient: N/A
  Date: 01/20/95

NO ACTION SITES FOR WASTE AREA GROUP (WAG) 8 01/25/95

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5446
  Title: NRF-4, SWMU Unit #4 - Top Soil Pit Area
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5447
  Title: NRF-5, SWMU Unit #5 - West Landfill
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5449
  Title: NRF-7, SWMU Unit #7 - East Landfill
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5466
  Title: NRF-24, SWMU Unit #24 - Demineralizer and Neutralization Facility
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5467
  Title: NRF-25, SWMU Unit #25 - Chemical Waste Storage Pad
  Author: N/A
  Recipient: N/A
  Date: 09/26/86

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: **This document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I**

NOTE: Sampling data are available upon request at NRF.

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 1 INVESTIGATION OPERABLE UNIT 8-01
11/04/94

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5445
  Title: NRF-3, SWMU Unit #3 - ECF Gravel Pit# OU 8-01
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5448
  Title: NRF-6, SWMU Unit #6 - South East Landfill, OU 8-01
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5450
  Title: NRF-8, SWMU Unit #8 - North Landfill, OU 8-01
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

AR3.5 TRACK 1 INVESTIGATIONS

- Document #: 5345
  Title: Track 1 Investigation for the ECF Gravel Pit Unit 8-01-3
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5346
  Title: Track 1 Investigation for the Southeast Landfill Unit 8-01-6
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 03/17/93

- Document #: 5347
  Title: Track 1 Investigation for the South Landfill Unit 8-01-33
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5348
  Title: Track 1 Investigation for the Lagoon Construction Rubble Unit 8-01-40
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5349
  Title: Track 1 Investigation for the East Rubble Area Unit 8-01-41
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5350
  Title: Track 1 Investigation for the A1W Construction Debris Area Unit 8-01-63
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5645
  Title: Track 1 Investigation for the North Landfill Area Unit 8-01-8
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: **Sampling data can be examined at the Woodruff Avenue Complex, 200 South Woodruff Avenue.**

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NAVAL REACTORS FACILITY
TRACK 1 INVESTIGATION OPERABLE UNIT 8-02
11/04/94

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5451
  Title: NRF-9, SWMU Unit #9 - Parking Log Run-Off Trenches, OU 8-02
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

AR3.5 TRACK 1 INVESTIGATIONS

- Document #: 5351
  Title: Track 1 Investigation for the Expended Core Facility French Drain Unit 8-02-38
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/24/93

- Document #: 5643
  Title: Track 1 Investigation for the South Gravel Pit Unit 8-02-64
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5646
  Title: Track 1 Investigation for the Old Sewage Effluent Ponds Unit 8-02-42
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/01/93

- Document #: 5649
  Title: Track 1 Investigation for the Old Lead Shack Unit 8-02-52B
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/01/93

- Document #: 5650
  Title: Track 1 Investigation for the Old Boilerhouse Blowdown Pit Unit 8-02-54
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 09/24/93

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5651
  Title: Track 1 Investigation for the Parking Lot Run-Off Trenches Unit 8-02-9
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5653
  Title: Track 1 Investigation for the Old Painting Booth Unit 8-02-37
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5656
  Title: Track 1 Investigation for the Site Lead Shack Unit 8-02-47
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5719
  Title: Track 1 Investigation of the Old Lead Shack Unit 8-02-52A
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5720
  Title: Track 1 Investigation of Miscellaneous NRF Sumps and French Drains Unit 8-02-55
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5721
  Title: Track 1 Investigation for the Old Radioactive Materials Storage and Laydown Area Unit 8-02-61
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5722
  Title: Track 1 Investigation of the Site Corrosive Area Behind Butler Building 11 Unit 8-02-68
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity Controls in Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: This document can be found in INEL OU 8-01 Administrative Record Binder.

Sampling data can be examined at the Woodruff Avenue Complex, 200 South Woodruff Avenue.

IDAHO NATIONAL ENGINEERING LABORATORY
ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 1 INVESTIGATION OPERABLE UNIT 8-03
10/21/96

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5452
  Title: NRF-10, SWMU Unit #10 - Sand Blasting Slag Trench, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/23/86

- Document #: 5457
  Title: NRF-15, SWMU Unit #15 - S1W Acid Spill Area, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5460
  Title: NRF-18, SWMU Unit #18 - S1W Spray Ponds, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5462
  Title: NRF-20, SWMU Unit #20 - A1W Acid Spill Area, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5464
  Title: NRF-22, SWMU Unit #22 - A1W Paint Locker French Drain, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 06/23/95

- Document #: 5465
  Title: NRF-23, SWMU Unit #23 - Sewage Lagoons, OU 8-03
  Author: N/A
  Recipient: N/A
  Date: 09/26/86

FILE NUMBER

AR2.4 EE/CA

- Document #: NRFEM-RR-1149
  Title: Submittal Of Engineering Cost Estimates For Track 1 Removal Actions For Information And Transmittal To The Administrative Record, Naval Reactors Facility
  Author: Nieslanik, R. W.
  Recipient: Manager, Operations
  Date: 04/12/94

AR3.5 TRACK 1 INVESTIGATIONS

- Document #: NR:IBO-93/046
  Title: Transmittal Letter and Track 1 Investigation for Unit 8-03-20
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/09/94

- Document #: 10183
  Title: Track 1 Investigations for Unit 8-03-22
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/09/94

- Document #: 5652
  Title: Track 1 Investigation of the S1W Acid Spill Area Unit 8-03-15
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/01/93

- Document #: 5723
  Title: Track 1 Investigation of the Spray Ponds Unit 8-03-18
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5724
  Title: Track 1 Investigation of the Sewage Lagoons Unit 8-03-23
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5725
  Title: Track 1 Investigation of the Site Incinerator Unit 8-03-45
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5726
  Title: Track 1 Investigation of the Degreasing Facility Unit 8-03-56
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5816
  Title: Track 1 Investigation of the Sand Blasting Slag Trench Unit 8-03-10
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/08/94

- Document #: 10048
  Title: No Further Action Determination of A1W Paint Locker French Drain, NRF-22
  Author: Rhodes, S.E.
  Recipient: Idaho Branch Office of Pittsburgh Naval Reactors Office
  Date: 06/23/95

- Document #: NR-IBO-95/003
  Title: Disposition of NRF Operable Unit 8-03-22, A1W Paint Locker French Drain
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/09/95

AR4.3 PROPOSED PLAN

- Document #: NR:IBO-94/034
  Title: Transmittal Letter and Draft Proposed Plan for NRF Operable Units 8-03, -20 and 22 (Track 1 Investigations), 8-05 and 06 (Landfill Site Track 2 Investigations, and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/28/94

FILE NUMBER

AR10.6 PRESS RELEASES

- Document #: 5640
  Title: DOE Seeks Public Comment on Industrial Waste Ditch
  Author: N/A
  Recipient: N/A
  Date: 03/01/94

AR11.4 *TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity Controls in Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

AR12.1 EPA COMMENTS

- Document #: 10265
  Title: EPA Comments on Removal Action at Operable Unit 8-03-22 Finalization
  Author: Pierre, W.
  Recipient: Newbry, R.D.E.
  Date: 03/08/95

AR12.2 IDHW COMMENTS

- Document #: 10266
  Title: IDHW Review of the Remedial Action Recommendations for the A1W Paint Locker French Drain (OU 8-03-22)
  Author: Nygard, D.
  Recipient: Newbry, R.D.E.
  Date: 04/10/95

*NOTE: This document can be found in the INEL OU 8-01 Administrative Record Binder.

NOTE: Sampling data are available upon request at NRF.

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TRACK 1 INVESTIGATION OPERABLE UNIT 8-04
08/18/95

ADMINISTRATIVE RECORD BINDER I
FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS

- Document #: 5644
  Title: Track 1 Investigation for the A1W Oily Waste Spill Unit 8-04-31
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/01/93

- Document #: 5648
  Title: Track 1 Investigation for the A1W Transformer Yard Unit 8-04-28
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5655
  Title: Track 1 Investigation for the ECF Acid Spill Unit 8-04-62
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 11/30/93

- Document #: 5727
  Title: Track 1 Investigation for the S5G Oily Waste Spill Unit 8-04-29
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5728
  Title: Track 1 Investigation for the Plant Service UST Diesel Spill Unit 8-04-69
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

- Document #: 5729
  Title: Track 1 Investigation for the Plant Service UST Gasoline Spill Unit 8-04-71
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 06/09/94

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5828
  Title: Track 1 Investigation for the S1W Industrial Wastewater Spill Area 8-04-44
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/08/94

- Document #: 5829
  Title: Track 1 Investigation for the S1W Fuel Oil Tank Spill Unit 8-04-58
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/25/94

- Document #: 5830
  Title: Track 1 Investigation for the Southeast Corner Oil Spill 8-04-65
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/26/94

ADMINISTRATIVE RECORD BINDER II

- Document #: 5831
  Title: Track 1 Investigation for the Boiler House Fuel Oil Release 8-04-70
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/27/94

- Document #: 5832
  Title: Track 1 Investigation for the NRF Waste Oil Tank 8-04-72
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/26/94

- Document #: 5833
  Title: Track 1 Investigation for the NRF Plant Services Varnish Tank 8-04-73
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/08/94

FILE NUMBER

AR3.5 TRACK 1 INVESTIGATIONS (continued)

- Document #: 5834
  Title: Track 1 Investigation for the Fuel Oil Revetment Oil Releases Unit 8-04-75
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 12/08/94

- Document #: 5835
  Title: Track 1 Investigation for the Vehicle Barrier Removal Unit 8-04-76
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/26/94

- Document #: 5836
  Title: Track 1 Investigation for the Fuel Oil Revetment Oil Releases 8-04-77
  Author: Westinghouse Electric Corporation - Naval Reactors Facility
  Recipient: N/A
  Date: 10/26/94

- Document #: 10049
  Title: No Further Action Determination for the Underground Storage Tanks Between the Perimeter Fences
  Author: Rhodes, S.E.
  Recipient: Idaho Branch Office of Pittsburgh Naval Reactors Office
  Date: 06/23/95

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: This document can be found in the INEL OU 8-01 Administrative Record.

NOTE: Sampling data are available upon request at NRF.

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TRACK 2 INVESTIGATION OPERABLE UNIT 8-05
11/04/94

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5443
  Title: NRF-1, SWMU Unit #1, Field Area North of S1W, OU 8-05
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

AR3.14 TRACK 2 SUMMARY REPORT

- Document #: NR:IBO-93/301
  Title: Track 2 Summary Report for NRF Operable Unit 8-05
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 11/15/93

AR3.22 TRACK 2 DECISION STATEMENT

- Document #: NR:IBO-94/082
  Title: DOE Decision Statement and Feasibility Study for OU 8-05 and 8-06, and Summary Report for Operable Unit 8-06
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 04/11/94

- Document #: 5657
  Title: IDHW-DEQ Recommendations for Track-Two OUs 8-05 and 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/23/94

- Document #: 5636
  Title: Track 2 Summary Report for the NRF OU 8-05
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 12/20/93

FILE NUMBER

AR4.2 FEASIBILITY STUDY REPORTS

- Document #: NR-IBO-94-048
  Title: Draft Feasibility Study for NRF Landfill Areas (Operable Units 8-05 and 8-06)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 03/11/94

- Document #: 5668
  Title: Feasibility Study for NRF Landfill Areas (Operable Units 8-05 and 8-06)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 11/15/93

AR4.3 PROPOSED PLAN

- Document #: NR:IBO-94/034
  Title: Transmittal Letter for NRF Operable Units 8-03,-20 and 22 (Track 1 Investigations), 8-05 and 06 (Landfill Site Track 2 Investigations, and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/28/94

- Document #: 5770
  Title: Proposed Plan for NRF OU 8-03, Sites 20 and 22 (Track 1), 8-05 and 8-06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: INEL Community Relations
  Recipient: N/A
  Date: 04/01/94

AR5.1 RECORD OF DECISION

- Document #: 5781
  Title: Record of Decision for the NRF Industrial Waste Ditch and the Landfill Areas
  Author: Naval Reactors Facility
  Recipient: N/A
  Date: 09/28/94

NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-07, Volume VIII

FILE NUMBER

AR10.4 PUBLIC MEETING TRANSCRIPTS

- Document #: 5703
  Title: Public Meeting Transcripts for the NRF Industrial Waste Ditch and Landfill Areas
  Author: Ecology and Environment, Inc.
  Recipient: N/A
  Date: 05/24/94

NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-07, Volume VIII

AR10.6 PRESS RELEASES

- Document #: 5640
  Title: DOE Seeks Public Comment on Industrial Waste Ditch and Landfills at the NRF
  Author: N/A
  Recipient: N/A
  Date: 03/01/94

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I

AR12.1 EPA COMMENTS

- Document #: 5663
  Title: Draft Feasibility Study for NRF Landfill Areas (Operable Units (OU) 8-05 and 8-06)
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 03/29/94

FILE NUMBER

AR12.2 IDHW COMMENTS

- Document #: 5664
  Title: Review of the Draft Proposed Plan for OU 8-05, 8-06, and 8-07
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/31/94

- Document #: 5666
  Title: IDHW Comments - Review of the Draft Focused Feasibility Study for Operable Units (OU) 8-05 and 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 04/04/94

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TRACK 2 INVESTIGATION OPERABLE UNIT 8-06
11/04/94

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FILE NUMBER

AR3.14 TRACK 2 SUMMARY REPORT

- Document #: 5669
  Title: Track 2 Summary Report for Naval Reactors Facility OU 8-06
  Author: Golder Associates, Inc.
  Recipient: N/A
  Date: 04/01/94

ADMINISTRATIVE RECORD VOLUME II

AR3.21 SCHEDULES

- Document #: NR:IBO-94/018
  Title: Revised Schedules for OU 8-06 and 8-09 Track 2 Investigations
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/07/94

AR3.22 TRACK 2 DECISION STATEMENT

- Document #: NR:IBO-94/082
  Title: DOE Decision Statement and Feasibility Study for Operable Units 8-05 and 8-06 and Summary Report for Operable Unit 8-06
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 04/11/94

- Document #: 5657
  Title: IDHW-DEQ Recommendations for Track-Two Operable Units 8-05 and 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/23/94

- Document #: 5667
  Title: EPA's Preliminary Draft Track 2 Summary Report Comments for the Naval Reactors Facility Operable Unit (OU) 8-06 and Position Statement for OU 8-06 Units
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 03/30/94

FILE NUMBER

AR4.2 FEASIBILITY STUDY REPORTS

- Document #: NR-IBO-94/048
  Title: Draft Feasibility Study for NRF Landfill Areas (Operable Units 8-05 and 8-06)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D., Pierre, W.
  Date: 03/11/94

NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-05, Volume I

- Document #: 5668
  Title: Feasibility Study for NRF Landfill Areas (Operable Units 8-05 and 8-06)
  Author: Newbry, R.D.E.
  Recipient: N/A
  Date: 04/01/94

AR4.3 PROPOSED PLAN

- Document #: NR:IBO-94/034
  Title: Transmittal Letter and Draft Proposed Plan for NRF OU 8-03,-20 and 22 (Track 1), 8-05 and 06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/28/94

- Document #: 5770
  Title: Proposed Plan for NRF OU 8-03,-20 and 22 (Track 1), 8-05 and 06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: INEL Community Relations
  Recipient: N/A
  Date: 04/01/94

AR5.1 RECORD OF DECISION

- Document #: 5781
  Title: Record of Decision for the NRF Industrial Waste Ditch and the Landfill Areas
  Author: Naval Reactors Facility
  Recipient: N/A
  Date: 09/28/94

NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-07, Volume VIII

FILE NUMBER

AR10.4 PUBLIC MEETING TRANSCRIPTS

- Document #: 5703
  Title: Public Meeting Transcripts for the NRF Industrial Waste Ditch and Landfill Areas
  Author: Ecology and Environment, Inc.
  Recipient: N/A
  Date: 05/24/94

NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-07, Volume VIII

AR10.6 PRESS RELEASES

- Document #: 5640
  Title: DOE Seeks Public Comment on Industrial Waste Ditch
  Author: N/A
  Recipient: N/A
  Date: 03/01/94

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I

AR12.1 EPA COMMENTS

- Document #: 5663
  Title: Draft Feasibility Study for NRF Landfill Areas (Operable Units (OU) 8-05 and 8-06)
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 03/29/94

TRACK 2 INVESTIGATION OPERABLE UNIT 8-06 11/04/94

FILE NUMBER

AR12.2 IDHW COMMENTS

- Document #: 5664
  Title: Review of the Draft Proposed Plan for Operable Units (OU) 8-05, 8-06, and 8-07
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/31/94

- Document #: 5665
  Title: Review of the Preliminary Draft Track 2 Summary Report for Operable Unit (OU) 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 04/04/94

- Document #: 5666
  Title: IDHW Comments - Review of the Draft Focused Feasibility Study for Operable Units (OU) 8-05 and 8-06
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 04/04/94

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EXTERIOR INDUSTRIAL WASTE DITCH RI/FS OPERABLE UNIT 8-07
04/02/96

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5468
  Title: NRF-26, LDU #1 - Industrial Waste Ditch, OU 8-07
  Author: N/A
  Recipient: N/A
  Date: 09/26/86

AR3.3 RI/FS WORK PLAN

- Document #: 5195
  Title: RI/FS Final Work Plan For the Exterior Industrial Waste Ditch (IWD) OU 8-07, Naval Reactors Facility, Idaho Falls, Idaho
  Author: Westinghouse Electric Corporation
  Recipient: N/A
  Date: 09/24/92

- Document #: NR:IBO-92/328
  Title: DOE/IBO Transmittal of Final Work Plan for the RI/FS for the NRF IWD
  Author: Newbry, R.D.E., DOE-IBO
  Recipient: Nygard, D., EPA
  Date: 11/26/91

ADMINISTRATIVE RECORD VOLUME II

AR3.4 REMEDIAL INVESTIGATION REPORTS

- Document #: NR:IBO-93/198, VOL. 1
  Title: Transmittal Letter and Draft Remedial Investigation Report for NRF Operable Unit 8-07
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 07/15/93

ADMINISTRATIVE RECORD VOLUME III
FILE NUMBER

AR3.4 REMEDIAL INVESTIGATION REPORTS (continued)

- Document #: NR:IBO-93/198,VOL. 2
  Title: Draft Remedial Investigation Report for NRF OU 8-07
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 07/15/93

ADMINISTRATIVE RECORD VOLUME IV

AR3.12 RI/FS REPORTS

- Document #: NR:IBO-93/296,VOL. 1
  Title: Transmittal Letter and Draft Remedial Investigation / Feasibility Study Report for NRF Operable Unit 8-07 (Exterior Industrial Waste Ditch)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 11/08/93

ADMINISTRATIVE RECORD VOLUME V

- Document #: NR:IBO-93/296,VOL. 2
  Title: Draft Remedial Investigation / Feasibility Study Report for NRF Operable Unit 8-07 (Exterior Industrial Waste Ditch)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 11/08/93

ADMINISTRATIVE RECORD VOLUME VI

- Document #: 5626, VOL. 1
  Title: Final Remedial Investigation/Feasibility Study Report for NRF Operable Unit 8-07 (Exterior Industrial Waste Ditch)
  Author: Lee, S.D.
  Recipient: N/A
  Date: 02/01/94

ADMINISTRATIVE RECORD VOLUME VII
FILE NUMBER

AR3.12 RI/FS REPORTS (continued)

- Document #: 5626, VOL. 2
  Title: Final Remedial Investigation / Feasibility Study Report for NRF Operable Unit 8-07 (Exterior Industrial Waste Ditch)
  Author: Lee, S.D.
  Recipient: N/A
  Date: 02/01/94

ADMINISTRATIVE RECORD VOLUME VIII

AR4.3 PROPOSED PLAN

- Document #: NR:IBO-94/034
  Title: Transmittal Letter and Draft Proposed Plan for NRF OU 8-03,-20 and 22 (Track 1), 8-05 and 06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/28/94

- Document #: 5770
  Title: Proposed Plan for NRF OU 8-03,-20 and 22 (Track 1), 8-05 and 06 (Landfill Site Track 2) and 8-07 (Exterior Industrial Waste Ditch RI/FS)
  Author: INEL Community Relations
  Recipient: N/A
  Date: 04/01/94

AR5.1 RECORD OF DECISION

- Document #: 5781
  Title: Record of Decision for the NRF Industrial Waste Ditch and the Landfill Areas
  Author: Naval Reactors Facility
  Recipient: N/A
  Date: 09/28/94

FILE NUMBER

AR10.4 PUBLIC MEETING TRANSCRIPTS

- Document #: 5703
  Title: Public Meeting Transcripts for the NRF IWD and Landfill Areas
  Author: Ecology and Environment, Inc.
  Recipient: N/A
  Date: 05/24/94

AR10.6 PRESS RELEASES

- Document #: 5640
  Title: DOE Seeks Public Comment on Industrial Waste Ditch
  Author: N/A
  Recipient: N/A
  Date: 03/01/94

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

NOTE: **This document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I**

AR12.0 EPA AND IDHW REVIEWS

- Document #: 5196
  Title: Correspondence between EPA, State of Idaho, and DOE-IBO
  Author: N/A
  Recipient: N/A
  Date: 09/24/92

AR12.1 EPA COMMENTS

- Document #: 5634
  Title: EPA Comments: Draft Remedial Investigation for the Exterior Industrial Waste Ditch Operable Unit 8-07
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 09/02/93

FILE NUMBER

AR12.1 EPA COMMENTS (continued)

- Document #: 5638
  Title: EPA Comments: Draft Remedial Investigation/Feasibility Study for the Exterior Industrial Waste Ditch
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 12/23/93

AR12.2 IDHW COMMENTS

- Document #: 5635
  Title: IDHW Comments: Technical Review of the Draft RI/FS
  Author: English, M.
  Recipient: Bradley, T.M.
  Date: 09/02/93

- Document #: 5637
  Title: IDHW Comments: Technical Review of the Draft RI/FS
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 12/21/93

- Document #: 5664
  Title: Review of the Draft Proposed Plan for Operable Units (OU) 8-05, 8-06, and 8-07
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 03/31/94

AR12.3 DOE RESOLUTIONS TO COMMENTS

- Document #: NR-IBO-93/272
  Title: Response to EPA/IDHW Comments On IWD RI Report
  Author: Newbry, R.D. E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 10/04/93

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01/12/98

ADMINISTRATIVE RECORD VOLUME I
FILE NUMBER

AR1.7 INITIAL ASSESSMENTS

- Document #: 5444
  Title: NRF-2, SWMU Unit #2 - Old Ditch Surge Pond, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/17/86

- Document #: 5453
  Title: NRF-11, SWMU Unit #11 - S1W SB#1: Tile Drain Field, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5454
  Title: NRF-12, SWMU Unit #12 - S1W SB#2: Leaching Pit, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5455
  Title: NRF-13, SWMU Unit #13 - S1W SB#3: Temporary Leaching Pit, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5456
  Title: NRF-14, SWMU Unit #14 - S1W SB#4: Industrial Waste Lagoons, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

FILE NUMBER

AR1.7 INITIAL ASSESSMENTS (continued)

- Document #: 5458
  Title: NRF-16, SWMU Unit #16 - S1W Radiography Building Collection Tanks, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5459
  Title: NRF-17, SWMU Unit #17 - S1W Retention Basins, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5461
  Title: NRF-19, SWMU Unit #19 - A1W Leaching Bed, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

- Document #: 5463
  Title: NRF-21, SWMU Unit #21 - Old Sewage Treatment Plant, OU 8-08
  Author: N/A
  Recipient: N/A
  Date: 09/29/86

ADMINISTRATIVE RECORD VOLUME II

AR3.3 WORK PLAN

- Document #: 10150
  Title: Comprehensive Remedial Investigation and Feasibility Study Final Work Plan
  Author: N/A
  Recipient: N/A
  Date: 10/01/95

FILE NUMBER

AR3.10 SCOPE OF WORK

- Document #: 10010
  Title: Scope of Work for the Comprehensive Remedial Investigation/Feasibility Study at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: N/A
  Date: 03/01/95

ADMINISTRATIVE RECORD VOLUME III

AR3.12 RI/FS REPORTS

- Document #: 10432
  Title: Final NRF Comprehensive Remedial Investigation/Feasibility Study Report, Appendices A through E, Vol. 1
  Author: Hutchison, M.E.
  Recipient: Not specified
  Date: 10/28/97

ADMINISTRATIVE RECORD VOLUME IV

- Document #: 10432
  Title: Final NRF Comprehensive Remedial Investigation/Feasibility Study Report, Appendices E through M, Vol. 2
  Author: Hutchison, M.E.
  Recipient: Not specified
  Date: 10/28/97

ADMINISTRATIVE RECORD VOLUME V

- Document #: 10432
  Title: Final NRF Comprehensive Remedial Investigation/Feasibility Study Report, Feasibility Study, Vol. 3
  Author: Hutchison, M.E.
  Recipient: Not specified
  Date: 10/28/97

FILE NUMBER

AR3.21 SCHEDULE

- Document #: NR-IBO-96/126
  Title: Revision to the NRF Comprehensive Remedial Investigation and Feasibility Study Schedule for Operable Unit 8-08
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 08/07/96

AR4.3 PROPOSED PLAN

- Document #: 10440
  Title: Proposed Plan for Waste Area Group 8 - Naval Reactors Facility Idaho National Engineering and Environmental Laboratory
  Author: Hutchison, M.E.
  Recipient: Not specified
  Date: 01/01/98

AR5.4 RECORD OF DECISION REVIEW COMMENTS

- Document #: 10533
  Title: EPA Comments on Draft Record of Decision (ROD) for the Naval Reactors Facility, OU 8-08 at INEEL
  Author: Rose, K.A.
  Recipient: Richardson, A.N.
  Date: 07/06/98

- Document #: 10534
  Title: IDHW-DEQ Review of the Draft Record of Decision for the Naval Reactors Facility, Operable Unit (OU) 8-8
  Author: English, M.
  Recipient: Richardson, A.N.
  Date: 07/13/98

FILE NUMBER

AR10.4 PUBLIC MEETING TRANSCRIPTS

- Document #: 16084
  Title: Public Meeting Transcript for Proposed Cleanup Plans for Naval Reactors Facility and Argonne National Laboratory - West at Boise, Idaho
  Author: Community Relations
  Recipient: Not specified
  Date: 01/20/98

- Document #: 16085
  Title: Public Meeting Transcript for Proposed Cleanup Plans for Naval Reactors Facility and Argonne National Laboratory - West at Moscow, Idaho
  Author: Community Relations
  Recipient: Not specified
  Date: 01/21/98

- Document #: 16086
  Title: Public Meeting Transcript for Proposed Cleanup Plans for Naval Reactors Facility and Argonne National Laboratory - West at Idaho Falls, Idaho
  Author: Community Relations
  Recipient: Not specified
  Date: 01/22/98

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076*
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

***NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I**

FILE NUMBER

AR12.1 EPA COMMENTS

- Document #: 10267
  Title: EPA Comments on Comprehensive Remedial Investigation and Feasibility Study Draft Work Plan Operable Unit 8-08
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 08/28/95

AR12.2 IDHW COMMENTS

- Document #: 10268
  Title: IDHW Comments on Review of the Draft Comprehensive Work Plan for the Operable Unit 8-8 Remedial Investigation/Feasibility Study
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 08/28/95

AR12.3 DOE RESPONSE TO COMMENTS

- Document #: 10009*
  Title: DOE Response to Comments on Draft Scope of Work
  Author: Newbry, R.D.E.
  Recipient: N/A
  Date: 03/24/95

***NOTE: This document can be found in Administrative Record Binder, Operable Unit 8-01, Volume I.**

- Document #: NR:IBO-97/229
  Title: DOE Response to Comments from the Environmental Protection Agency and Idaho Department of Health and Welfare Concerning NRF Draft Proposed Plan
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 12/19/97

Note: Sampling data may be obtained at NRF.

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ADMINISTRATIVE RECORD FILE INDEX FOR THE NRF
TRACK 2 INVESTIGATION OPERABLE UNIT 8-09
08/26/98

FILE NUMBER

AR3.10 SCOPE OF WORK

- Document #: NR:IBO-93/157
  Title: Scope of Work for NRF Operable Unit 8-09 Track 2 Investigation
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 06/04/93

AR3.14 TRACK 2 SUMMARY REPORT

- Document #: NR:IBO-94/139
  Title: Preliminary Draft Track 2 Summary Report for NRF Operable Unit 8-09
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 06/27/94

- Document #: NR:IBO-94/187
  Title: Transmittal Letter and Track 2 Summary Report for NRF Operable Unit 8-09 (Interior Industrial Waste Ditch)
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 09/12/94

AR3.21 SCHEDULES

- Document #: NR:IBO-94/018
  Title: Revised Schedules for OU 8-06 and 8-09 Track 2 Investigations
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 02/07/94

FILE NUMBER

AR3.22 TRACK 2 DECISION STATEMENT

- Document #: 10007
  Title: Action Determination for Operable Unit (OU) 8-09, Interior Industrial Waste Ditch
  Author: Newbry, R.D.E.; Nygard, D.; Pierre, W.
  Recipient: NOT SPECIFIED
  Date: 03/23/95

AR11.4 TECHNICAL SOURCES

- Document #: NR-IBO-94-076*
  Title: Radioactivity controls In Prototype Plants at the Naval Reactors Facility
  Author: Newbry, R.D.E.
  Recipient: Nygard, D.; Pierre, W.
  Date: 03/31/94

***NOTE: This Document can be found in INEL OU 8-01 Administrative Record Binder Volume I**

AR12.1 EPA COMMENTS

- Document #: 10536
  Title: EPA Comments on the Draft Track 2 Summary Report for Naval Reactors Facility Operable Unit 8-09
  Author: Meyer, L.
  Recipient: Newbry, R.D.E.
  Date: 08/10/94

AR12.2 IDHW COMMENTS

- Document #: 10535
  Title: IDHW-DEQ Review of the Draft Track-2 Summary Report for Operable Unit (OU) 8-9: Interior Industrial Waste Ditch
  Author: English, M.
  Recipient: Newbry, R.D.E.
  Date: 08/11/94