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Record of Decision

Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and Miscellaneous Sites

Operable Units 6-05 and 10-04
Idaho National Engineering and Environmental Laboratory
Idaho Falls, Idaho

DOE/ID-10980
September 2002

Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and Miscellaneous Sites

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Operable Units 6-05 and 10-04
Idaho National Engineering and Environmental Laboratory
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Part 1: Declaration

Site Name and Location

Waste Area Groups 6 and 10 Comprehensive Remedial Investigation/Feasibility Study, Operable Unit 10-04 (including Operable Unit 6-05)

Incorporating 50 individual sites in Operable Units 6-01 through 6-05 and 10-01 through 10-07.

Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho

CERCLIS ID 4890008952.

Statement of Basis and Purpose

This decision document presents the selected remedy for Operable Unit (OU) 6-05, Experimental Breeder Reactor-I/Boiling Water Reactor Experiment Area and OU 10-04, Miscellaneous Sites, at the Idaho National Engineering and Environmental Laboratory (INEEL), hereafter referred to as OU 10-04. The selected remedy comprises remedial action involving removal, treatment, and institutional controls at eight individual sites, remedial action involving removal and treatment at one specific site, remedial action involving institutional controls at seven additional sites, and no action with INEEL-wide long-term monitoring for ecological receptors. The components of the selected remedy were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan. The selected remedy is intended to be the final action for contamination at OU 10-04 sites.

The United States (U.S.) Department of Energy Idaho, Operations Office (DOE-ID), is the lead agency for this decision. The U.S. Environmental Protection Agency (EPA) approves the decision and the Idaho Department of Environmental Quality (IDEQ) concurs. The EPA and IDEQ have participated in the evaluation and selection of remedies for the OU 10-04 sites of concern, the no action and institutional control decisions, and the identification of sites that will be administered under other INEEL regulatory programs. The basis for decisions are established in this Record of Decision (ROD) and documented in the Administrative Record for Waste Area Groups (WAGs) 6 and 10.

Assessment of Site

The response action selected in this Record of Decision is necessary to protect the public health, welfare, or the environment from actual or threatened releases of hazardous substances into the environment. Such a release, or threat of release, may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

WAGs 6 and 10 at the INEEL, are two of 10 WAGs identified in the Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991). The FFA/CO, which provides the framework and schedule for the implementation of CERCLA at the INEEL, was negotiated and signed by DOE-ID, EPA Region 10, and the State of Idaho. The FFA/CO required development of the OU 10-04 Comprehensive Remedial Investigation/Feasibility Study (RI/FS) for WAGs 6 and 10.

The FFA/CO states that WAG 10 includes miscellaneous surface sites and liquid disposal areas throughout the INEEL that are not included within other WAGs. It also states that the boundary of

WAG 10 is the INEEL boundary or beyond, as necessary, to encompass real or potential impact from INEEL activities and areas within the INEEL not covered by other WAGs. Additionally, the FFA/CO stated that the WAG 6 Comprehensive RI/FS would be incorporated into the OU 10-04 RI/FS. Waste Area Group 6 consists of the Experimental Breeder Reactor No. I (EBR-I) and the Boiling Water Reactor Experiment (BORAX) areas. Waste Area Group 10 also includes regional Snake River Plain aquifer concerns related to the INEEL that cannot be addressed on a WAG-specific basis. The other WAGs have addressed aquifer concerns on a WAG-specific basis and WAG 10 has evaluated aquifer concerns for the OU 10-04 sites. However, to address Site-wide groundwater issues and potential new sites, an additional operable unit, OU 10-08, was added under WAG 10. OU 10-08 will be responsible for the evaluation of Site-wide groundwater concerns and evaluation of new sites that are passed to WAG 10 by other WAGs, and sites discovered during the development of the OU 10-08 ROD, as well as sites discovered after the OU 10-08 ROD is finalized. Information from the OU 10-08 investigation will be used to develop a baseline for groundwater information that will be used for institutional control and monitoring at the INEEL.

The OU 10-04 also evaluated the risk to ecological receptors across the INEEL. The INEEL-wide ecological risk assessment was the culmination of all Site-specific ecological risk assessments carried out at the INEEL.

The OU 10-04 evaluated 50 potential release sites in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). The Comprehensive RI/FS tasks included estimating the individual and cumulative risks associated with all 50 sites and identifying and evaluating appropriate remedial actions for those sites posing unacceptable risk. The OU 10-04 Proposed Plan, which was issued for public review in January 2002, summarized the RI/FS results and the preferred remedial alternatives.

The selected remedy for OU 10-04 comprises two remedial actions involving removal, treatment, and institutional controls to mitigate the risk associated with eight specific sites, one remedial action involving removal and treatment to mitigate the risk at one specific site, remedial action to implement institutional controls at seven sites, and no action with INEEL-wide long-term ecological monitoring. The first remedial action involving removal, treatment, and institutional controls addresses three extensive artillery and bombing ranges dating from World War II. The possible presence of unexploded ordnance (UXO) at various locations within these sites may pose a risk to human health. The second remedial action involving removal, treatment, and institutional controls will mitigate five sites for trinitrotoluene (TNT)/Royal Demolition Explosive (RDX) soil contamination from U.S. Army and U.S. Navy ordnance testing, detonation research, and demolition of explosives. The third remedial action involving removal and treatment will address unacceptable levels of lead contamination from spent bullets in the soil at the Security Training Facility (STF) Gun Range. Remedial action will be performed to implement institutional controls at seven additional sites at WAGs 6 and 10, which will be referred to as a limited action remedy. OU 10-04 will also develop and implement an INEEL-wide institutional control plan for all CERCLA sites at the INEEL that require institutional control. While no action is required for protection of ecological receptors, long-term ecological monitoring at the INEEL will be performed to address uncertainties identified during the ecological assessment and ensure protection of the ecosystem.

Selected Remedy for the Ordnance Areas

The ordnance areas include three extensive artillery testing and bombing ranges used by the U.S. Navy and U.S. Army Air Corps during the WW II period. They are the Naval Proving Ground (NPG), which encompasses 172,495 acres along the central corridor of the INEEL; the Arco High-Altitude Bombing Range, a 26,406-acre area to the west; and the Twin Buttes Bombing Range, which encloses 9,291 acres on the southeast periphery of the INEEL. Activities that may have left UXO behind include aerial bombing practice, naval artillery testing, detonation research, explosives storage bunker testing, and ordnance disposal. Any UXO remaining in these areas can pose a physical risk to human safety if an explosion is triggered from handling or contact, especially by machinery. Remedial action is required to protect human health and welfare from physical injury due to inadvertent detonation of any UXO that may be present.

The selected remedial action at the ordnance areas is UXO detection, removal, and institutional controls, and will include the following:

- Implement and maintain institutional controls until the UXO hazard is removed or reduced to acceptable levels. Institutional controls can include access restrictions, excavation restrictions, restrictive covenants, and other restrictions such as signage and educational programs.
- Perform a visual or geophysical survey for the presence of UXO. Before any aerial UXO detection methods are used, a demonstration will be performed over a specially designed test area and over a known high-impact area of ordnance testing to confirm effectiveness under site-specific conditions.
- Investigate potential UXO targets identified during the survey.
- Identify and define the boundaries of the firing and bombing impact areas and the weapons testing and detonation areas.
- Determine the ordnance density, explosive characteristics of the UXO, and ordnance accessibility.
- Determine the relative risks of land use and determine the extent of UXO removal required to meet desired land use objectives.
- Perform surface clearance and intrusive UXO removal with disposal by detonation at the Mass Detonation Area (MDA) or in-place detonation. Waste generated during detonation activities will be addressed using current disposal practices.
- Dispose of other non-ordnance items recovered, such as shrapnel at a landfill on the INEEL or sent off the INEEL for recycling. If secondary explosive contamination, such as TNT or RDX is discovered, perform remediation as described for the TNT/RDX contaminated soil sites.
- As appropriate, backfill excavated areas deeper than 1 ft contour to match the surrounding terrain and vegetate.

Selected Remedy for TNT/RDX Contaminated Soil Sites

Unacceptable risk to human health or the environment from TNT/RDX contaminated soil sites designated as the Experimental Field Station, the Fire Station II Zone and Range Fire Burn Area, the Land Mine Fuze Burn Area, the National Oceanic and Atmospheric Administration (NOAA), and the Naval Ordnance Disposal Area (NODA) have been identified. The human health risk associated with these sites is primarily through ingestion of TNT and/or RDX in homegrown produce, soil and groundwater exposure pathways. Adverse effects to ecological receptors are associated with exposure to RDX, TNT, and 1,3 dinitrobenzene at these same sites. Removing soil that is contaminated with concentrations in excess of the remediation goals will mitigate these threats.

The selected remedial action at the TNT/RDX sites is removal, treatment of TNT/RDX fragments, disposal of soil, and institutional controls, and will include the following activities:

- Perform a visual survey for UXO and TNT/RDX fragments or stained soil and a geophysical survey for UXO.

- Excavate soil contaminated with concentrations in excess of the remediation goals, by hand, unless it is determined that mechanical excavation equipment may be safely used. UXO will be removed, if required, to proceed with soil excavation. Otherwise, UXO removal will be performed during remediation of the Ordnance Areas.

- Manually segregate fragments of TNT/RDX from the soil unless safety analysis indicates it is safe to mechanically screen the soil.

- Dispose of fragments of TNT/RDX by detonation at the MDA. Waste generated during detonation activities will be addressed using current disposal practices.

- Use field screening methods and soil sampling with laboratory analysis to determine the extent of soil removal required to meet remediation goals.

- Sample and analyze removed soil by standard laboratory methods to determine the TNT and RDX concentrations and if the soil exhibits any RCRA hazardous waste characteristics. If the TNT/RDX concentration is less than 10% and not regulated under RCRA as characteristic waste, it will be sent to an approved disposal facility on or off the INEEL. If the concentration of TNT/RDX is above 10% and, hence, regulated under RCRA, the soil will be sent off the INEEL to an approved treatment, storage, and disposal (TSD) facility for thermal treatment and disposal.

- Backfill areas that have been excavated during remediation to depths greater than 0.3 m (1 ft) with uncontaminated soil or contoured to match the surrounding terrain and vegetate.

- Monitor air and soil until the TNT/RDX contamination is removed or reduced to acceptable levels.

Selected Remedy for the STF-02 Gun Range

The STF-02 Gun Range will be remediated to mitigate risk to human health and ecological receptors from lead. The Gun Range was used between 1983 and 1990 by INEEL security personnel who fired approximately 4 to 5 million rounds into targets erected on six earthen berms and in a wooden building. Pieces of lead were also found in a nearby dry pond. Exposure can result from breathing or ingesting contaminated soil, dust, or air, or from eating food covered with lead-containing dust grown in soil containing lead. If the lead contamination is not remediated, it could also result in groundwater contamination.

The selected remedy for the STF-02 Gun Range is removal and treatment, which will include the following activities:

- Excavate the berms, surrounding soil, and the adjacent pond with mechanical equipment to remove soil above the final remediation goal for lead. Field screening will be used to initially identify the extent of soil excavation required to meet the remediation goal.

- Perform physical separation to remove copper and lead fragments (bullets, casings, etc.) from the soil. Transport the recovered copper and lead off the INEEL for recycling, if allowed by the U.S. Department of Energy (DOE) policy. If DOE policy prohibits recycling of the recovered metal, it will be stabilized to meet RCRA disposal criteria and disposed in an approved compliant facility on or off the INEEL.

- After sorting, return soil containing lead in concentrations below the remediation goal of 400 ppm to the site. Stabilize soil that is RCRA characteristic for lead and send to a waste disposal facility located on of off the INEEL for permanent disposal. Probable disposal locations on the INEEL include the Central Facilities Area (CFA) landfill or the proposed INEEL CERCLA Disposal

Facility (ICDF). Dispose of soil above the remediation goal, but not RCRA characteristic for lead, without further treatment at the CFA landfill, the ICDF, or another approved location on or off the INEEL.

- Encapsulate the railroad ties and send to an approved compliant landfill on or off the INEEL.
- Dispose of the wooden building and asphalt pads as non-hazardous construction debris on the INEEL in an appropriate landfill, such as the CFA landfill or the ICDF.
- Sample and analyze soil to verify the remediation goal has been achieved.
- Contour the excavated areas to match the surrounding terrain and vegetate.

Limited Action

No additional remediation will be conducted under CERCLA for the remaining 41 of the 50 sites in OU 10-04. However, institutional controls will be maintained at the seven sites listed in the table below because residual contamination precludes unrestricted land use and action is required to minimize potential human exposure to contamination. These seven sites present risk greater than 1E-06 but less than 1E-04 and a hazard index (HI) of less than 1 for the future residential scenario. Only institutional controls are required to ensure protection of human health and the environment. In April 1999, the EPA Region 10 developed a policy for institutional controls. During the OU 10-04 remedial design/remedial action (RD/RA) phase, an operation and maintenance (O&M) plan will be developed which will contain the institutional controls for OU 10-04 institutional control sites as well as all other INEEL CERCLA sites that will follow the guidelines in the policy. This plan will establish uniform requirements of the institutional control remedy components of all CERCLA FFA/CO institutional control sites, at the INEEL, and specify the monitoring and maintenance requirements.

Institutional control sites at Waste Area Groups 6 and 10.

Site Code	Description
BORAX-01	BORAX II through V Leach Pond
BORAX-02	BORAX I Buried Reactor
BORAX-08	BORAX V Ditch
BORAX-09	BORAX II through V Reactor Building
EBR-08	EBR-I Fuel Oil Tank (WMO-703)
OMRE-01	Organic-Moderated Reactor Experiment Leach Pond
ORD-21	Juniper Mine

Institutional controls will reside with DOE or another government agency until 2095, based on the Comprehensive Facility and Land Use Plan, or until a remedy review or INEEL-wide 5-year statutory review concludes unrestricted land use is allowable. It is anticipated that industrial use will continue at the INEEL for the institutional control period and beyond.

No Action with Site-Wide Ecological Monitoring

As part of the overarching concerns at the INEEL for sustaining a healthy environment, the OU 10-04 comprehensive investigation included an analysis of ecological risk. The OU 10-04 INEEL-wide ecological risk assessment (ERA) compiled information from previous investigations of risk to ecological receptors at each WAG into a depiction of the effects of contamination on the environment of the INEEL as a whole. The risk assessment was based on population level endpoints and concluded that less than 20% of the habitats present on the INEEL are lost to facility activities and, therefore, minimal risk is expected to the diverse plant and animal communities at the INEEL. This conclusion was supported using results of other investigations performed on the INEEL in a multiple line of evidence approach. This required the use of assumptions in the assessment resulting in considerable uncertainty in the conclusion. Based on the multiple uncertainties and assumptions in the assessment, it was determined that INEEL-wide ecological monitoring would be implemented. The monitoring will ensure that expectations regarding the protectiveness of the no action approach to the INEEL-wide ERA are met.

Additional Components of the Selected Remedy

In addition to remediation of specific sites, several activities will be implemented at WAG 10 to complete the selected remedy. These activities, including disposition of stored and investigation-derived waste and groundwater monitoring, are discussed below.

Investigation and Remediation-Derived Waste. Contaminated media such as soil, debris, liquids, sample residue, sampling equipment, and personnel protective equipment not specifically identified by the INEEL FFA/CO or in this comprehensive investigation may be generated as a result of RD/RA activities at WAG 10. Procedures to address the remediation-derived waste will be documented in the OU 10-04 remedial action work plan. In addition, waste that has been generated during previous sampling activities at WAG 10 will be appropriately characterized, assessed, and dispositioned in accordance with regulatory requirements to achieve remediation goals consistent with remedies selected for the sites in this ROD.

Groundwater. The existing wells downgradient from the TNT/RDX contamination areas will be sampled and analyzed for explosive contaminants and degradation products. If no secondary explosive contamination or degradation products are present in the groundwater samples, then no further groundwater monitoring for these contaminants will be required. In the event contamination is detected in any groundwater sample, monitoring will be continued as part of the OU 10-08 INEEL groundwater monitoring plan. If contamination is detected at or above the remediation goals, a supplemental evaluation will be performed to determine if remedial action is required and if so, alternatives will be evaluated, a preferred remedy will be selected, and this ROD will be amended to implement the selected remedial action.

Statutory Determinations

Statutory Requirements

The selected remedies are protective of human health and the environment, are compliant with federal and state requirements that are applicable or relevant and appropriate (ARAR) to the remedial actions, are cost-effective, and are using permanent solutions and alternative treatments (or resource recovery) technologies to the maximum extent practicable.

Statutory Preference for Treatment

The selected remedy for the ordnance areas satisfies the statutory preference for treatment as a principal element of the remedy because the remedy reduces the toxicity, mobility, or volume through treatment of the principal threat waste UXO. The UXO will be detected, removed, and detonated, or detonated in place if too high a risk is associated with removal.

The selected remedy for the TNT and RDX contaminated sites satisfies the CERCLA statutory preference for treatment as a principal element of the remedy. The TNT and RDX fragments, which are a significant source of the soil contamination and a principal threat waste, will be gathered and detonated. Unexploded ordnance at the TNT/RDX sites will be located, removed, and detonated.

The selected remedy for the STF-02 Gun Range satisfies the statutory preference for treatment as a principal element of the remedy. The lead fragments, a principal threat waste, separated from the soil will be sent off the INEEL for recycling or stabilized to meet RCRA disposal requirements, and disposed in a secure, approved landfill on or off the INEEL. Any soil determined, through sampling and analysis, to be RCRA characteristic for lead, a principal threat waste, will be treated to meet RCRA disposal criteria by stabilization with a material such as Portland cement and disposed in an approved landfill on or off the INEEL.

Five-Year Review Requirements

Because components of the selected remedy for OU 10-04 will result in hazardous substances, pollutants, or contaminants remaining at levels greater than allowed for unrestricted use, periodic remedy reviews will be conducted after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Results of the OU 10-04 remedy reviews will be included in the statutory 5-year review, which is performed on an INEEL-wide basis.

Most remediation goals are based on soil concentrations equivalent to a risk of 1E-04 (1 in 10,000) to a hypothetical resident 100 years in the future. Therefore, residual contamination and UXO may remain after remediation that precludes immediate unrestricted land use, and institutional controls will be applicable. Remedy reviews will be conducted periodically for remediated sites with institutional controls until it is determined, during a remedy review or a 5-year statutory INEEL-wide review, that controls and reviews are no longer necessary.

As discussed above, limited action will be implemented to manage the residual contamination at seven OU 10-04 sites in WAG 10. These sites will also be subject to periodic remedy reviews to support the 5-year statutory INEEL-wide review. Controls such as access restrictions will be maintained until it is determined, during a periodic remedy review or the INEEL 5-year statutory review, that controls are no longer necessary.

The status of these sites will be examined during the periodic remedy reviews for OU 10-04 to ensure that site conditions have not changed significantly and that the status of each site remains consistent with this ROD. The reviews will include an assessment of maintenance requirements such as fencing repairs, sign replacement, and control to prevent soil erosion.

Record of Decision Data Certification Checklist

The information listed below is included in the Decision Summary (Part 2) of this ROD:

- Contaminants of concern (COCs) and their respective concentrations (Sections 8, 9, and 10)
- Baseline risks represented by the COCs (Sections 8, 9, and 10)
- Cleanup levels established for the COCs and the basis for the levels (Sections 8.4, 9.6, and 10.4)
- How source materials constituting principal threats are addressed (Sections 8.7, 9.9, and 10.7)
- Current and reasonably anticipated future land-use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD (Section 6)
- Potential land and groundwater use that will be available at the site as a result of the selected remedy (Sections 6, 8.7, 9.9, and 10.7)

- Estimated capital, annual operation and maintenance, and total net present value costs; the discount rate; and the number of years over which the remedy cost estimates are projected (Sections 8.7, 9.9, and 10.7)

- Key factors that led to selecting the remedies (i.e., how the selected remedy provides the best balance of tradeoffs relative to the balancing and modifying criteria) (Sections 8.6, 9.8, and 10.6).

Additional information can be found in the Administrative Record for WAG 10.

Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 10-04 (including Operable Unit 6-05), Waste Area Groups 6 and 10 consisting of the Experimental Breeder Reactor-I, the Boiling Water Reactor Experiment areas, the miscellaneous surface sites and liquid disposal areas not included in other WAGs, the Liquid Corrosive Chemical Disposal Area, the Organic Moderated Reactor Experiment, the Security Training Facility Sumps, Pits, and Gun Range, and the ordnance areas of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy, Idaho Operations Office, and the U.S. Environmental Protection Agency Region 10, with concurrence by the Idaho Department of Environmental Quality.

Warren E. Bergholz, Jr. Acting Manager U.S. Department of Energy, Idaho Operations Office	Date

Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 10-04 (including Operable Unit 6-05), Waste Area Groups 6 and 10 consisting of the Experimental Breeder Reactor-I, the Boiling Water Reactor Experiment areas, the miscellaneous surface sites and liquid disposal areas not included in other WAGs, the Liquid Corrosive Chemical Disposal Area, the Organic Moderated Reactor Experiment, the Security Training Facility Sumps, Pits, and Gun Range, and the ordnance areas of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy, Idaho Operations Office, and the U.S. Environmental Protection Agency Region 10, with concurrence by the Idaho Department of Environmental Quality.

L. John Iani, Regional Administrator Region 10 U.S. Environmental Protection Agency	Date

Signature Sheet

Signature sheet for the Record of Decision for Operable Unit 10-04 (including Operable Unit 6-05), Waste Area Groups 6 and 10 consisting of the Experimental Breeder Reactor-I, the Boiling Water Reactor Experiment areas, the miscellaneous surface sites and liquid disposal areas not included in other WAGs, the Liquid Corrosive Chemical Disposal Area, the Organic Moderated Reactor Experiment, the Security Training Facility Sumps, Pits, and Gun Range, and the ordnance areas of the Idaho National Engineering and Environmental Laboratory, between the U.S. Department of Energy, Idaho Operations Office, and the U.S. Environmental Protection Agency Region 10, with concurrence by the Idaho Department of Environmental Quality.

C. Stephen Allred, Administrator Idaho Department of Environmental Quality	Date

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FIGURES

TABLES

ACRONYMS

ABS	absorbed through skin
AEC	Atomic Energy Commission
AEF	Argonne Experimental Facility
AFSR	Argonne Fast Source Reactor
AF	adjustment factors
ANL	Argonne National Laboratory
ANL-W	Argonne National Laboratory-West
ANP	Aircraft Nuclear Propulsion
ARAR	applicable or relevant and appropriate requirements
ATSDR	Agency for Toxic Substance Disease Registry
AT&T	American Telephone and Telegraph Company
BAF	bioaccumulation factor
BBS	breeding bird survey
BLM	U.S. Bureau of Land Management
BORAX	Boiling Water Reactor Experiment
BRA	baseline risk assessment
BW	body weight
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CFSGF	Coal-fired Steam Generation Facility
COC	contaminant of concern
COPC	contaminant of potential concern
CSM	conceptual site model
CTT	closed, transferred, and transferring

D&D	decontamination and decommissioning
1,3 DNB	1,3 dinitrobenzene
2,4 DNT	2,4 dinitrotoluene
2,6 DNT	2,6 dinitrotoluene
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
DQO	data quality objectives
EBR-I	Experimental Breeder Reactor-I
EG&G	Edgerton, Germeshausen, and Grier
EOCR	Experimental Organic-Cooled Reactor
EP	Environmental Programs
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
FFA/CO	Federal Facility Agreement and Consent Order
FR	Federal Register
FS	feasibility study
G&A	General and Administrative
Ge-spectrometer	germanium-spectrometer
GIS	geographical information system
GPRS	global positioning radiometric scanner
HA	health advisory
HE	high explosives
HEAST	Health Effects Assessment Summary Tables
HHRA	human health risk assessments

HI	hazard index
HQ	hazard quotient
HSDB	Hazardous Substance Data Bank
HTRE	Heat Transfer Reactor Experiment
HWMA	Hazardous Waste Management Act
HWPB	Hazardous Waste Permitting Bureau
ICPP	Idaho Chemical Processing Plant
ICDF	INEEL CERCLA Disposal Facility
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IEUBK	Integrated Exposure Uptake Biokinectic
INEL	Idaho National Engineering Laboratory
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IRIS	Integrated Risk Information System
LCCDA	Liquid Corrosive Chemical Disposal Area
LMITCO	Lockheed Martin Idaho Technologies Company
LOAEL	lowest observed adverse effect level
MDA	Mass Detonation Area
MOU	Memorandum of Understanding
MTRU	mixed transuranic
NaK	sodium potassium
NCP	National Oil and Hazardous Substances Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration

NOAEL	no observed adverse effect level
NODA	Naval Ordnance Disposal Area
NPG	Naval Proving Ground
NRF	Naval Reactor Facility
NRTS	National Reactor Testing Station
NTCRA	none-time-critical removal action
O&M	operations and maintenance
OMRE	Organic Moderated Reactor Experiment
OU	operable unit
PBF	Power Burst Facility
PCB	polychlorinated biphenyl
PRG	preliminary remediation goals
PUF	plant uptake factors
RAGS	Risk Assessment Guidance for Superfund
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RDX	Royal Demolition Explosive
RESL	Radiological and Environmental Science Laboratory
RFD	reference dose
RI/FS	remedial investigation/feasibility study
RME	reasonable maximum exposure
ROD	record of decision
RTF	Reactor Training Facility
RWMC	Radioactive Waste Management Complex
SMDP	scientific management decision points

SRP	Snake River Plain
SRPA	Snake River Plain Aquifer
STF	Security Training Facility
TAN	Test Area North
TBC	to-be-considered guidance
TCRA	time-critical removal action
TNT	trinitrotoluene
TNB	trinitrobenzene
TRA	Test Reactor Area
TRU	transuranic
TRV	toxicity reference value
TSD	treatment, storage, and disposal
UCL	upper confidence limit on the mean
USC	U.S. Code
USGS	United States Geological Survey
UST	underground storage tank
UXO	unexploded ordnance
WAG	waste area group
WMO	waste management operations
WROC	Waste Reduction Operations Complex
ZPR-III	Zero Power Reactor No. 3

Part 2: Decision Summary

1. SITE NAME, LOCATION, AND BRIEF DESCRIPTION

Operable Unit (OU) 10-04, comprises the miscellaneous sites including, Waste Area Group (WAG) 6-the former Boiling Water Reactor Experiment (BORAX) and Experimental Breeder Reactor No. I (EBR-I) facilities–as well as surface contamination sites in WAG 10, at the Idaho National Engineering and Environmental Laboratory (INEEL). The INEEL is located in southeastern Idaho and occupies 2,305 km^2 (890 m^2) in the northeastern region of the Snake River Plain (see Figure 1). The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (40 USC 9601) identification number for the INEEL is 1000305. Land use at the INEEL is classified as industrial (DOE-ID 1997).

Two broader investigations were also part of OU 10-04. First, the Shoshone-Bannock Tribes (the Tribes) of the Fort Hall Indian Reservation, whose members traditionally occupied the INEEL area and continue to use parts of it for many cultural and economic purposes, contributed a summary of what is important to them in defining and remediating risks to human health and the environment. This summary is presented in whole as Appendix A of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). Second, OU 10-04 also investigated the risks to ecological receptors across the INEEL from all contaminated areas combined. This INEEL-wide ecological risk assessment (ERA) was the culmination of all site-specific ecological risk assessments carried out at the INEEL.

WAG 6 sites are located in the southwest portion of the INEEL, approximately 3.2 km (2 mi) from U.S. Highway 20, as shown in Figure 2. WAG 6 consists of sites related to the EBR-I and the nearby BORAX areas. The WAG 6 boundary encompasses both facilities and the immediately adjacent surface and subsurface areas (FFA/CO and Action Plan [DOE-ID 1991]). The BORAX area, located approximately 1.21 km (0.75 mi) northwest of the EBR-I facility, was the site of five reactor experiments (BORAX-I, -II, -III, -IV, and -V) conducted between 1953 and 1964.

WAG 10 comprises miscellaneous surface sites and liquid disposal areas throughout the INEEL that are not included within other WAGs (WAGs 1 through 9) as shown in Figure 2. WAG 10 also includes regional Snake River Plain Aquifer (SRPA) concerns related to the INEEL that cannot be addressed on a WAG-specific basis. The scope of WAG 10 was expanded from the original Federal Facility Agreement and Consent Order (FFA/CO) concept (DOE-ID 2001). As discussed in the OU 10-04 Comprehensive Remedial Investigation and Feasibility Study (RI/FS) (DOE-ID 2001) since the initial signing of the FFA/CO agreement, several new sites were identified and a facility assessment completed. Other changes in scope have resulted in creation of OU 10-08 in WAG 10. OU 10-08 will evaluate Site-wide groundwater concerns. The WAG 6 Comprehensive RI/FS (OU 6-05) was incorporated into OU 10-04 in accordance with the FFA/CO (DOE-ID 1991).

The OU 10-04 Comprehensive RI/FS (DOE-ID 2001) evaluated 50 potential release sites. These potential release sites are listed in Table 1-1 of the OU 10-04 Comprehensive RI/FS Work Plan (DOE-ID 2001) and include 22 sites at WAG 6 (14 at EBR-I and 8 at the BORAX area); and 28 sites at WAG 10 (10 at miscellaneous sites, 2 at LCCDA, 1 at OMRE, 2 at STF, 3 large [primary] ordnance areas [one of which includes 16 smaller ordnance areas], 9 ordnance areas either laying outside the boundaries of the larger ordnance areas or possessing soil contamination and the Idaho Chemical Processing Plant (ICPP), and the Fly Ash Pit [added to OU 10-04 for an ecological risk assessment]). The three primary ordnance areas include, the Naval Proving Ground (NPG) (not specifically listed as a site) also known as the Naval Gun Range, the Arco High Altitude Bombing Range, and the Twin Buttes Bombing Range. Most of the ordnance, unexploded ordnance (UXO), and ordnance-related areas at the INEEL result from ordnance testing, demolition of explosives, and bombing practice, conducted at the NPG in the 1940s. To date, 29 smaller ordnance areas have been identified primarily in the NPG (see Figure 2) that were listed

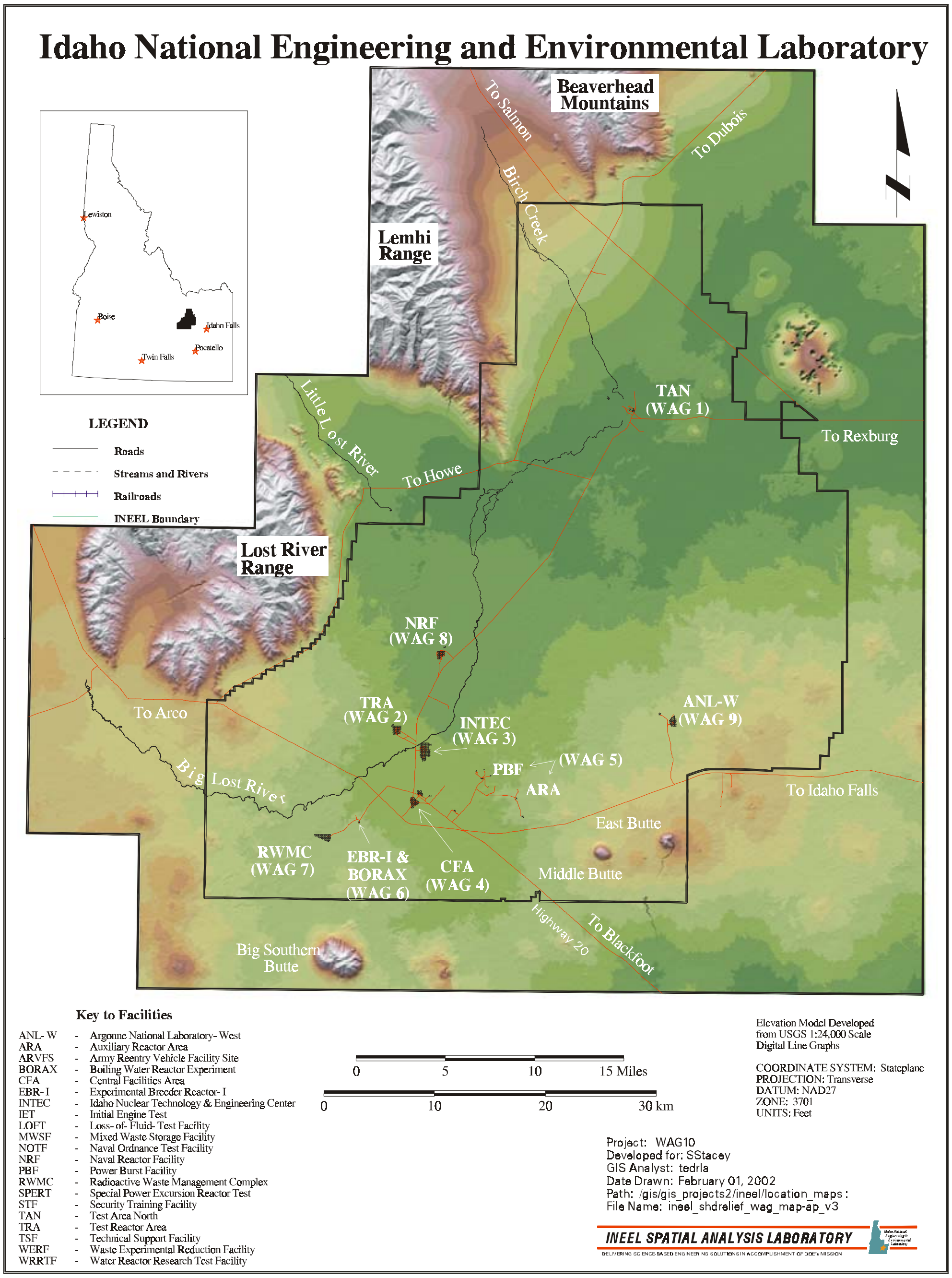

Figure 1. Location of INEEL facilities and general area of WAGs 6 and 10.

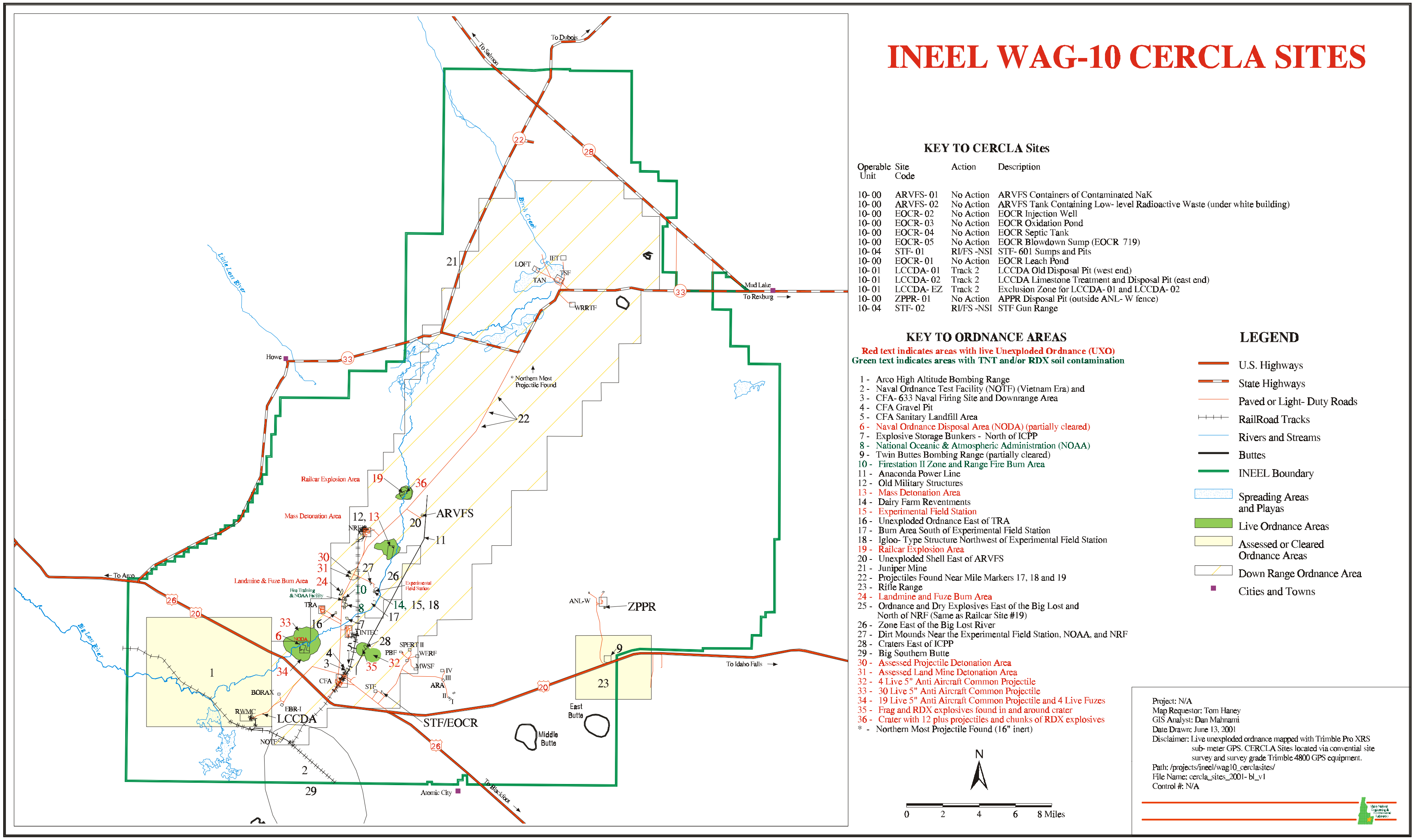

Figure 2. Location of WAG 10 CERCLA Sites at the Idaho National Engineering and Environmental Laboratory.

in Table 1-1 of the OU 10-04 RI/FS Work Plan (DOE-ID 1999a). In 2000, WAG 10 conducted a UXO walk-down at several ordnance sites to assess the extent of UXO. The walk-down sites included the NODA, Craters East of ICPP, Craters West of Powerline Road, Area by Lincoln Boulevard and the Experimental Field Station, Mass Detonation Area (MDA), and Railcar Explosion Area. During the walk-down, additional UXO, bomb craters, fragmented metal debris, TNT, and RDX were identified. These seven additional locations are identified in Figure 2. Activities during World War II also included aerial bombing practice at two other bombing ranges established by the U.S. Army Air Corps. The Arco High Altitude Bombing Range was located adjacent to the southwest end of the NPG (see Figure 2); the Twin Buttes Bombing Range was located east of the southern end of the NPG, near the present-day Argonne National Laboratory-West (ANL-W) complex.

The U.S. Department of Energy, Idaho Operations Office (DOE-ID), is the lead agency for the decisions presented in this Record of Decision (ROD). The U.S. Environmental Protection Agency (EPA) Region 10 approves of the decision and the Idaho Department of Environmental Quality (IDEQ), concurs. Both EPA and IDEQ participated in the evaluation and selection of remedies for WAG 10.

2. SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 INEEL History

The INEEL, established in 1949 as the National Reactor Testing Station (NRTS), is a U.S. Department of Energy (DOE) managed reservation that is devoted to energy research and environmental-related activities. The NRTS was renamed the Idaho National Engineering Laboratory (INEL) in 1974 to reflect the engineering activities being conducted. In 1997, the INEL was changed to the Idaho National Engineering and Environmental Laboratory to reflect an emphasis on environmental research as well as the continued engineering and reactor research.

Historically, facilities at the INEEL were dedicated to developing and testing peaceful applications of nuclear power. Throughout the 50 years of INEEL operations, disposal practices have been implemented in compliance with state and federal regulations and policies established by DOE and its predecessors. Though reflective of the best technology of the day, some of these past practices are not acceptable by contemporary standards and have been discontinued. Contaminated structures and environmental media such as soil and water are the legacy of historical disposals. Occasional accidental releases have also occurred over time. In keeping with an emphasis on environmental issues, INEEL research is now focused on environmental restoration to address these contaminated media and waste management issues to minimize the potential for additional contaminant releases from current and future operations. Spent nuclear fuel management, hazardous and mixed waste management and minimization, cultural resource preservation, environmental engineering, protection of the environment, and remediation are also challenges addressed by current INEEL activities (DOE-ID 1997).

2.2 Waste Area Group 6 History

EBR-I and BORAX areas are located close together and have similar operational backgrounds and sources of contamination. Therefore, EBR-I and BORAX areas were consolidated into one waste area group for comprehensive evaluation (DOE-ID 1991). Other than limited action consisting of institutional controls, such as fences and warning signs, all remedial actions have been completed at the WAG 6 sites. A synopsis of the history for each facility is given below.

2.2.1 Experimental Breeder Reactor-I Area

The EBR-I complex is in the southwest portion of the INEEL approximately 3.2 km (2 mi) from U.S. Highway 20. The idea for a breeder reactor (a reactor that could produce more fuel that it uses) first occurred to scientists working on the nation’s wartime atomic energy program in the 1940s when uranium was in short supply and the large bodies of uranium ore found in the 1950s were yet unknown. It was decided that the first power reactor would attempt to prove the theory of fuel breeding. In 1953, EBR-I scientists proved that a reactor could create more fuel than it used even while it created electricity. The first electricity ever generated from nuclear power occurred at EBR-I on December 20, 1951. Scientists continued to conduct reactor experiments at EBR-I until 1963.

The CERCLA sites related to EBR-I were underground storage tanks (USTs), septic systems, and radionuclide-contaminated soil as shown in Figure 3. Except for the active septic system that supports the EBR-I National Historic Landmark, most of the USTs and inactive septic systems have been removed from the EBR-I area. The radionuclide contaminated soil outside the EBR-I building was remediated in a removal action in 1995.

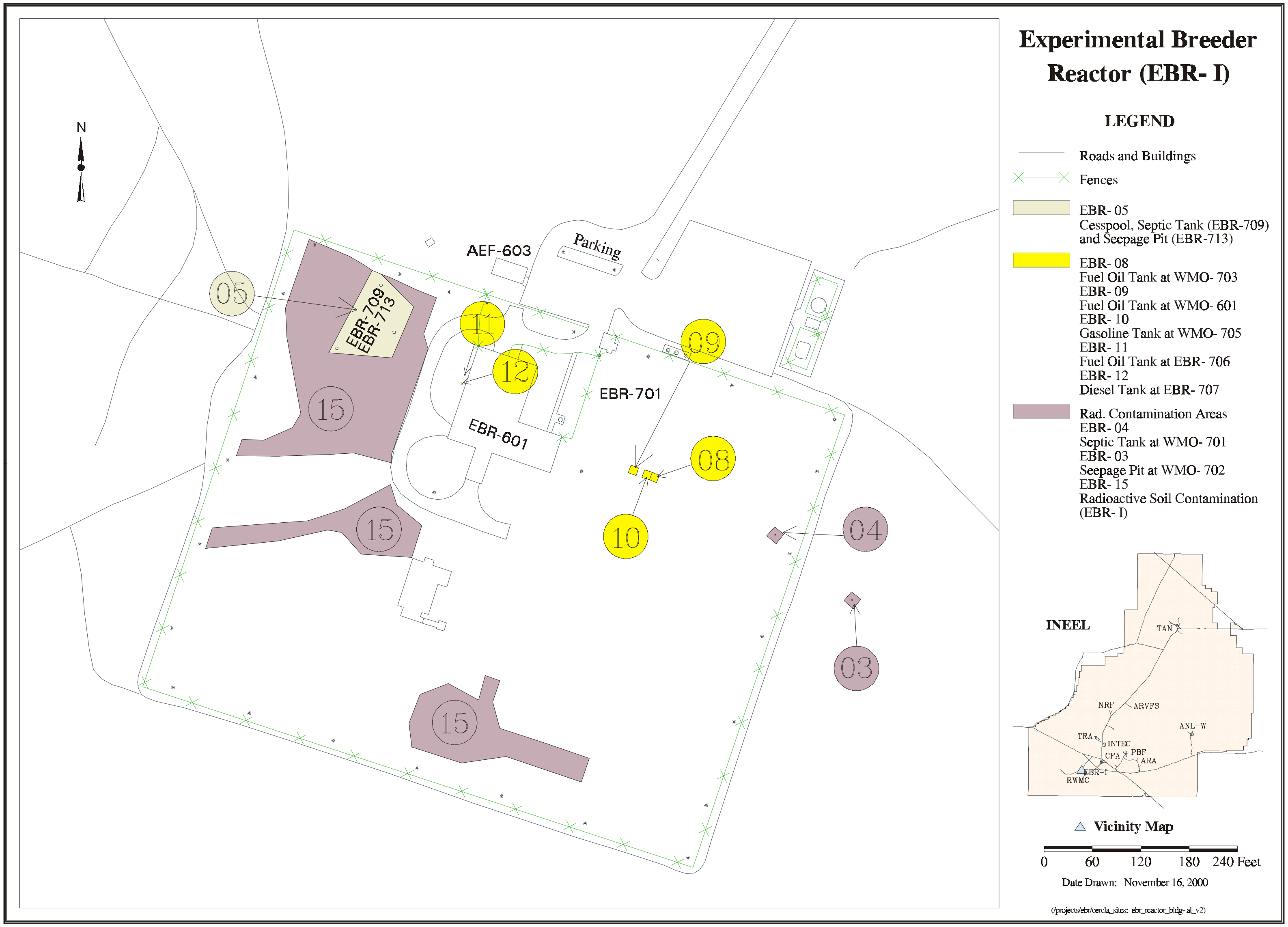

Figure 3. Physical configuration and location of CERCLA sites at the EBR-I area.

As shown in Figure 4, project buildings once included the EBR-I reactor building (EBR-601); two additions to EBR-601, a fuel storage facility, and personnel offices; the Zero Power Reactor No. 3 (ZPR-III) Reactor Training Facility (RTF) Building RTF-601 (later designated Waste Management Operations [WMO]-601); the Argonne Fast Source Reactor (AFSR) shielding building (EBR-605); the sodium potassium (NaK) storage pit; and the NaK disposal pad. Of the many buildings that once populated the EBR-I complex, only a small guardhouse, the original reactor building (EBR-601), and its office additions remain along with two nuclear jet engines, Heat Transfer Reactor Experiment (HTRE) assemblies HTRE-2 and HTRE-3, that are on display outside the EBR-I perimeter fence were moved from the Aircraft Nuclear Propulsion (ANP) program at Test Area North (TAN) to EBR-I in the 1980s.

Following its dedication as a Registered National Historic Landmark on August 25, 1966, by President Lyndon Johnson, EBR-I was also dedicated as a National Historic Mechanical Engineering Landmark in 1979 by the American Society of Mechanical Engineers, as a Historic Landmark for Advances in Materials Technology in 1979 by the American Society of Metals, and as a Nuclear Historic Landmark by the American Nuclear Society in 1987. The two Aircraft Nuclear Propulsion (ANP) engines are also part of the National Historic Landmark. The EBR-I reactor building and the ANP assemblies will be maintained and operated as a National Historic Landmark into the foreseeable future.

2.2.2 Boiling Water Reactor Experiment Area

The BORAX area, located approximately 1.21 km (0.75 mi) north of the EBR-I facility, was the site of five (BORAX-I, -II, -III, -IV, and -V) reactor experiments conducted between 1953 and 1964. These experiments began with BORAX-I, which was used to demonstrate the feasibility of boiling water reactors. Before this experiment, it had generally been thought that steam formation in a core would result in nuclear instabilities, but the BORAX series conclusively proved that steam actually helped stabilize nuclear reactions. The BORAX-I reactor was intentionally destroyed in 1954 to determine its inherent safety under extreme conditions and afterward was buried in place.

In late 1954, another BORAX facility was constructed a few hundred feet northeast of BORAX-I. Over the next 10 years, three reactors, BORAX-II, -III, and -IV, shared the same reactor vessel in this facility, but the experiments used different fuel designs and core configurations. The BORAX-V reactor used the same facility but used a new reactor vessel and core system. On July 17, 1955, the BORAX-III reactor gained historical significance as the first nuclear reactor in the world to supply electricity to a community (Arco, Idaho).

The CERCLA sites related to BORAX include USTs, septic systems, a leach pond, a ditch, a trash dump, and two former reactor sites as shown in Figure 5. Other than fences, none of the aboveground structures related to BORAX remain. All the USTs and septic systems have been removed. The BORAX leach pond was filled with clean dirt in 1985. The radionuclide contaminated soil in the BORAX ditch was remediated in a removal action in 1995. All the waste material was removed from the BORAX trash dump in 1985. The BORAX-I, II, -III, and -IV reactor fuels and vessel components were dispositioned by ANL personnel at the completion of each respective experiment. At the completion of the BORAX-V experiments, all the reactor fuel and portions of the internal reactor were removed by ANL-W personnel for dispositioning. Later, several phases of decontamination and decommissioning (D&D) removed the BORAX-V aboveground facility structures, stabilized the remaining underground structures, filled the basement with soil, and replaced concrete foundation blocks over the basement. The radionuclide-contaminated soil related to the BORAX-I reactor was remediated in 1997 (DOE-ID 1997) under the OU 5-05/6-01 ROD (DOE-ID 1996) and an engineered barrier cap was placed over the former reactor site.

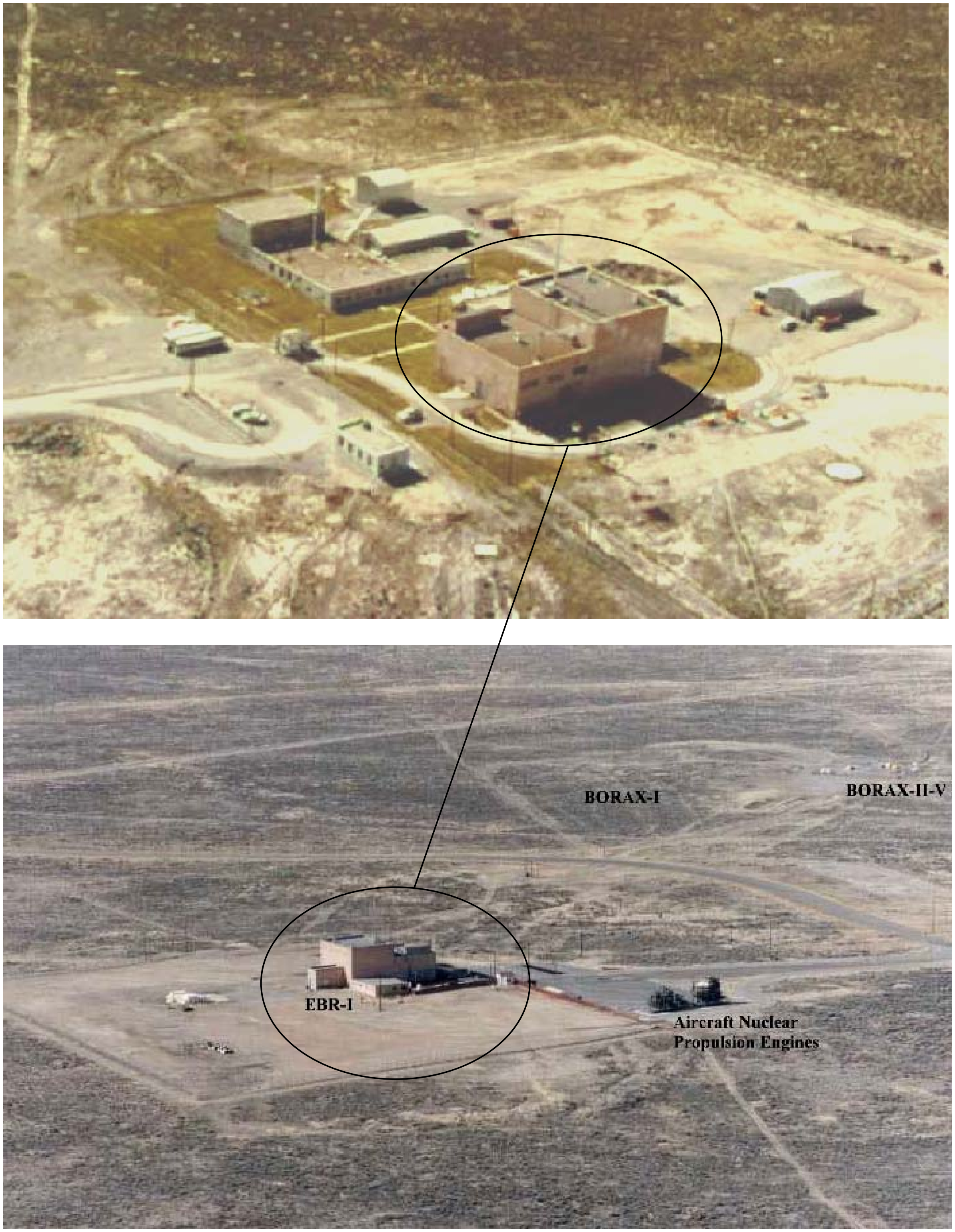

Figure 4. Aerial photographs of EBR-I facility before and after the D&D. The BORAX area after D&D is also shown in the top right corner of the bottom photograph.

Figure 5. Physical configuration and location of CERCLA Sites at the BORAX area.

The BORAX-08 and 09 sites, the BORAX ditch and the BORAX-V reactor building, respectively, were added to WAG 6 after the signing of the Federal Facility Agreement and Consent Order (FFA/CO). A non-time-critical removal action (NTCRA) was conducted at the BORAX-08 Ditch between August 28 and September 18, 1995. A D&D removal and containment action was conducted at BORAX-09 beginning in April 1996, and concluding in May 1997. The photo presented in Figure 4 shows the EBR-I site as it appeared before and after D&D and the BORAX area after D&D. Figure 6 shows BORAX-I before and after remediation and the BORAX II-V facility before D&D.

2.3 Waste Area Group 10 History

WAG 10 includes miscellaneous INEEL sites and the portions of the SRPA outside the other WAGs. As discussed previously, the assessment of the SRPA and any new sites identified after the development of the OU 10-04 will be prepared under OU 10-08. The WAG 10 sites assessed under OU 10-04, include the LCCDA; the OMRE leach pond; the sites related to the EOCR, later called the Security Training Facility (STF); the STF sumps, pits, and gun range; and numerous ordnance areas. In addition, the ICPP Fly Ash Pit (CPP-66) was added to OU 10-04 for an ecological risk assessment (ERA).

The LCCDA consisted of two surface pits that were used to dispose of a variety of liquid corrosive chemicals. The LCCDA-01 “Old Disposal Pit” was an unlined pit that was used for disposal of corrosive liquids from 1960 to 1971. The LCCDA-02 “Limestone Treatment and Disposal Pit” was used from 1971 until 1980. The LCCDA-01 pit was abandoned and backfilled in 1971 and LCCDA-02 was graded flat and revegetated in 1980.

The OMRE was a nuclear reactor that operated from 1957 to 1963 approximately 3.25 km (2 mi) southeast of the Central Facilities Area (CFA). The OMRE leach pond was used for wastewater disposal from the OMRE reactor. The most contaminated portion of the pond soil was excavated in 1979 and sent to the Radioactive Waste Management Complex (RWMC). The pond has since been backfilled, and the entire area was revegetated with grass, but low levels of radionuclide contaminated soil is still present.

Construction of the EOCR was nearing completion when the program was cancelled. Because the EOCR was never an operating nuclear reactor, the sites related to the EOCR never received waste associated with the EOCR program. Some of the EOCR sites were removed during the D&D of the EOCR facility in 1999. All that remain are the empty and unused ponds and a septic tank. The STF Sumps and Pits were removed as part of the EOCR facility D&D. The STF Gun Range was used from about 1983 to 1990. Several million rounds of small-arms bullets were fired into targets set on the gun range berm.

Most ordnance, UXO, and UXO-related areas at the INEEL result from activities conducted at the NPG in the 1940s. Between 1942 and 1950, approximately 1,650 minor (3 to 5-in.) and major (16-in.) guns were tested at the NPG. Most of the projectiles were nonexplosive. However, experimental and test work was also preformed using explosives and live ordnance, primarily in mass detonations. During these large-scale mass detonation tests, hundreds of thousands of pounds of explosives in land mines, smokeless powder, and bombs were placed in explosives storage bunkers or open areas and detonated to determine the effects on collocated bunkers and facilities. In addition, stacks of ammunition were shot with high explosive projectiles to test their susceptibility to enemy fire. As a result of activities at the NPG, many projectiles (explosive and inert), explosive materials, pieces of explosives, UXO, NPG structures, and debris remain. At locations where these materials remain from explosive testing activities, UXO is visibly obvious and have undergone some limited remediation, such as at the Naval Ordnance Disposal Area (NODA). In other locations, where UXO remains from firing activities, projectiles have become imbedded in the ground (such as in large portions of the Naval Firing Range); therefore, UXO is not nearly as visibly obvious since debris from explosions will not exist.

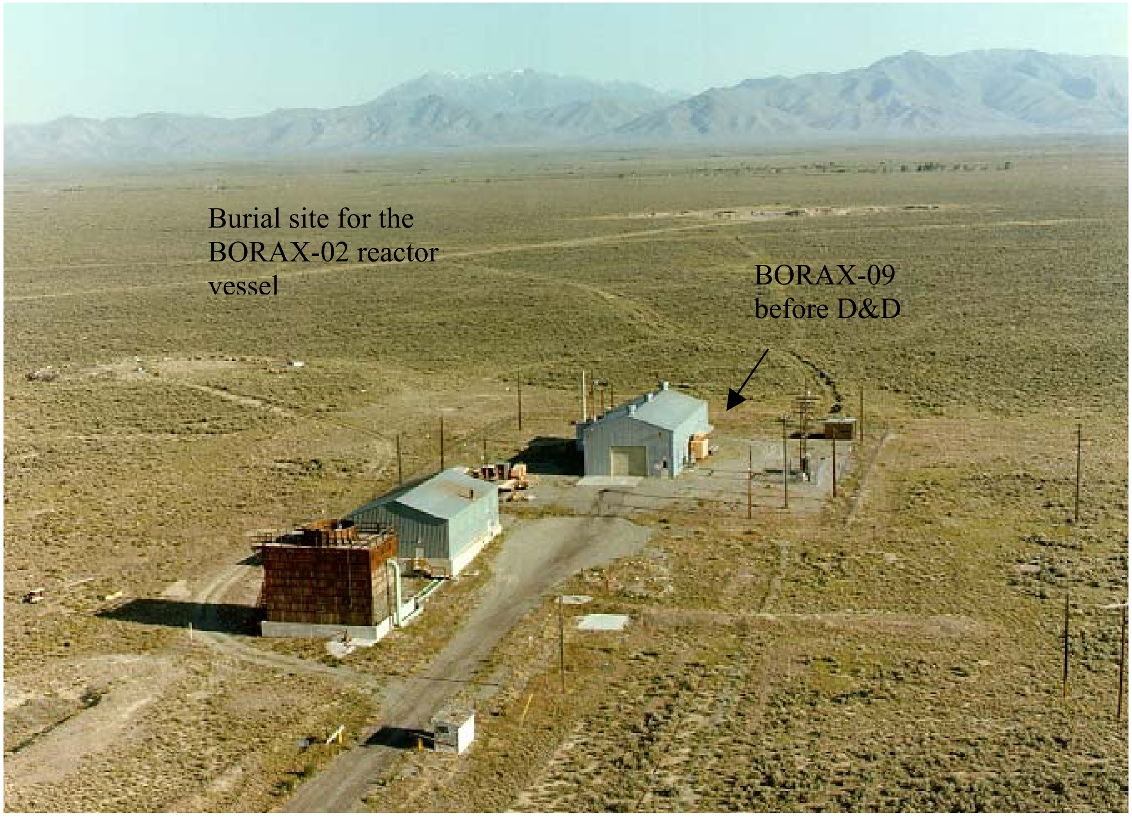

Figure 6. The BORAX facilities. The top photograph is an aerial view of the BORAX-I burial site and the BORAX-II-V facility before D&D in 1979. The bottom photograph is the BORAX-I burial site (site BORAX-02) taken in 2001 post remedial action.

The OU 10-06 was developed to assess radionuclide-contaminated soil areas at several of the WAGs. The OU 10-06 also included a non-time critical removal action (NTCRA) that remediated radionuclide contaminated soil at several sites in different WAGs. The "ownership" of the sites outside of WAG 6 and 10 reverted to the respective WAGs after the OU 10-06 NTCRA was complete. The residual risk at the two WAG 6 sites that were remediated under OU 10-06, EBR-15 and BORAX-08, were also evaluated in the Comprehensive OU 10-04 RI/FS.

The OU 10-07 U.S. West buried telecommunications cable was installed by the American Telephone and Telegraph Company (AT&T) in the early 1950s. The cable is approximately 58.7 km (36.5 mi) long and is buried approximately 0.9 to 1.2 m (3 to 4 ft) deep, parallel to and approximately 91 m (100 yd) east of Lincoln Boulevard at the INEEL. The cable consists of copper wiring, paper insulation, and lead sheathing approximately 1/8 in. thick. It is wrapped in spiraled steel and enclosed in jute wrapping impregnated with an asphalt-like substance. The cable originates at CFA and extends along Lincoln Boulevard to INTEC, TRA, the NRF, and TAN. The cable was cut and abandoned by U.S. West in 1990 when they installed a new fiber optic cable.

The CPP-66 (Fly Ash Pit) was identified in the OU 3-13 Final ROD (DOE-ID 1999b) as an OU 10-04 site of concern for ecological receptors. CPP-66 is the site of a pit used for disposal of ash generated by the ICPP Coal-Fired Steam Generation Facility (CFSGF), designated CPP-687, located southeast of the main INTEC security fence. Between 1984 and 1998, the CFSGF generated about 1,000 tons of ash per year. This ash was hydrated and placed into CPP-66, located due east of CFSGF. CPP-66 is approximately 244 × 122 × 3.4 m (800 × 400 × 11 ft) in size. The original ash pit built in 1984 had a capacity of 53,500 m^3 (70,000 yd^3) in 1991. It was enlarged to a total volume of 91,750 m^3 (120,000 yd^3). CPP-66 was retained and evaluated as a site of potential concern for ecological risk in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001).

2.4 Enforcement Activities

In January 1986, hazardous substance disposal sites within the INEEL that could pose an unacceptable risk to human health and safety or the environment were identified (EG&G 1986). The sites were ranked using either the EPA hazard ranking system for sites with chemical contamination or the DOE modified hazard ranking system for sites with radiological contamination. Based on the results of the hazard ranking, DOE-ID entered into a Consent Order and Compliance Agreement with Region 10 of the EPA and the U.S. Geological Survey (USGS) on July 28, 1986 (DOE-ID 1986). The agreement called for implementing an action plan to remediate active and inactive waste disposal sites at the INEEL under the authority of the Resource Conservation and Recovery Act (RCRA) (42 USC 6901 et seq.), which regulates the generation, transportation, treatment, storage, and disposal of hazardous waste. A hazard ranking score of 28.5 or higher qualifies a site for the National Priorities List (54 FR 48184) as amended by CERCLA (42 USC 9601 et seq.). Because several sites within the INEEL received scores in excess of 28.5, the INEEL in its entirety became a candidate for the National Priorities List.

On November 15, 1989, the EPA added the INEEL to the National Priorities List under CERCLA (42 USC 9601 et seq.). The FFA/CO (DOE-ID 1991) was negotiated and signed by DOE-ID, EPA, and the IDEQ, formerly the Idaho Department of Health and Welfare (IDHW), in December 1991 to implement the remediation of the INEEL under CERCLA. Effective December 9, 1991, the FFA/CO superseded parts of the Consent Order and Compliance Agreement.

The Secretary of Energy's policy statement (DOE 1994) on the National Environmental Policy Act (NEPA) (42 USC 4321 et seq.) stipulates that DOE will rely on the CERCLA process for review of actions to be taken under CERCLA. The policy statement also requires that DOE address NEPA values by incorporating such values, to the extent practicable, in documents and public involvement activities generated under CERCLA.

In the Action Plan of the FFA/CO (DOE-ID 1991), potential source areas (sites) within each WAG were assigned to an OU for investigation or remedial activities. The assignments were designed to match the rigor of the assessment process with the complexity of each site and to allow for flexibility in determining appropriate further action as each assessment or action was completed.

The FFA/CO originally identified 23 release sites under WAG 6, which were divided into one no action OU (called OU none) and five action OUs (6-01, 6-02, 6-03, 6-04, and 6-05). However, subsequent to the FFA/CO, two additional sites, BORAX-08: BORAX Ditch and BORAX-09: BORAX II-V Reactor Building, were added to WAG 6, OU 6-02. The FFA/CO specified that OU 6-05, the Comprehensive RI/FS for WAG 6, would be incorporated into the OU 10-04 Comprehensive RI/FS.

The FFA/CO originally identified 42 release sites under WAG 10, which were divided into one no action OU (called "OU none") and five action OUs (10-01, 10-02, 10-03, 10-04, and 10-05). However, since the first writing of the FFA/CO (DOE-ID 1991), additional sites and OUs have been added to WAG 10. Three OUs were added, OU 10-06, 10-07 and 10-08. The comprehensive investigation of the SRPA and the evaluation of potential new sites identified after the OU 10-04 RI/FS Work Plan was finalized, will take place in the OU 10-08 RI/FS.

The comprehensive investigation is the final action for WAG 10 identified in the FFA/CO (excluding OU 10-08). Several actions have already been implemented under environmental authorities at WAG 10. The actions conducted under the authority of CERCLA, RCRA, and a State of Idaho investigation are summarized below. Cleanup actions conducted under the authority of DOE management also are listed.

2.4.1 CERCLA Authority

WAGs 6 and 10 have completed one record of decision with an interim action, two time-critical removal actions (TCRA), and three NTCRA under CERCLA. Additionally, the ROD for OU 5-05 and OU 6-01 (DOE-ID 1996) addressed the BORAX-02: BORAX-I Burial site. The remedial action prescribed by the ROD consisted of consolidating the contaminated soil over the former reactor site and capping the soil with an engineered barrier. The remedy was implemented in 1996.

In 1998, a ROD and Interim Action for OU 10-05 (DOE-ID 1992) addressed 170 acres with six ordnance sites including the CFA-633 Naval Firing Site, the CFA Gravel Pit and French Drain, the Explosive Storage Bunkers, the National Oceanic and Atmospheric Administration site (NOAA), the Fire Station II and Range Fire Burn Area, and the Anaconda Power Line. During the interim action prescribed by the ROD, the action destroyed 130 UXO, detonated 61 kg (134 lb) of TNT and 47 kg (104 lb) of RDX, incinerated (off-Site) 141 m^3 (185 yd^3) of contaminated soil, and landfilled 3821 kg (8,423 lb) of metal fragments.

A 1994 CERCLA TCRA addressed 141 acres consisting of three ordnance sites, including NODA (surface only), the CFA Landfill, and the Twin Buttes Bombing Range. The action destroyed 1,408 UXO, detonated 10 kg (22 lb) bulk high explosives (HE), and landfilled 31,950 kg (70,440 lb) of metal fragments.

A 1995 CERCLA TCRA addressed 22.56 acres of subsurface ordnance at NODA. The action destroyed 462 UXO, detonated 8 kg (18 lb) bulk HE, and landfilled 17,900 kg (39,470 lb) of metal fragments.

A 1996 CERCLA NTCRA addressed 45 acres consisting of four ordnance sites including UXO East of TRA, Rail Car Explosion Area, Land Mine Fuze Burn Area, and Projectiles in the Riverbed adjacent to Rail Car Area. The action destroyed 221 UXO, detonated 29 kg (64 lb) bulk HE, and landfilled 18,260 kg (40,250 lb) of metal fragments.

A 1997 CERCLA Removal Action addressed 204 acres consisting of eight ordnance sites including NODA, Rail Car Explosion Area, MDA, NOAA, Experimental Field Station, Fire Station II, Craters East of INTEC, and Land Mine Fuze Burn Area. The action destroyed 146 UXO, detonated 156 kg (343 lb) bulk HE, and landfilled 18,226 kg (40,182 lb) of scrap.

A 1995 CERCLA NTCRA addressed radionuclide contaminated soil under OU 10-06 at two WAG 6 sites: the EBR-15 site and the BORAX-08 Ditch. The action removed approximately 900 m^3 (1,178 yd^3) of contaminated soil from the BORAX Ditch and 980 m^3 (1,279 yd^3) of contaminated soil from the EBR-15 area. The contaminated soil was placed in the Test Reactor Area (TRA) Warm Waste Pond, which was later capped. Concentrations of radionuclide contaminated soil (chiefly Cs-137) remaining at EBR-15 and BORAX-08 are less than the remediation goal of 16.7 pCi/g (DOE-ID 2001).

2.4.2 Other Programmatic Activities

Cleanup activities have been conducted under several other programs at WAG 10. The achievements of the D&D program, the underground tank management program, and other DOE activities are summarized below.

2.4.2.1 Decontamination and Dismantlement. Over time, the D&D program has conducted numerous cleanup activities within WAGs 6 and 10. For example, the D&D program completed demolition of the BORAX II-V facility in 1997 (Rodman 1996) and the EOCR reactor facilities in 1999 (Peatross 1997) and completed partial D&D of the OMRE-01 Leach Pond in 1979 (Chapin 1979). In addition, the following tanks and pits were removed as part of the D&D of facilities and structures at EBR-I or BORAX in 1995 (Burket 1995).

- EBR-02, the EBR-1 Septic Tank (AEF-702) and Seepage Pit (AEF-703).
- EBR-03, the EBR-1 Seepage Pit (WMO-702).
- EBR-04, the EBR-1 Septic Tank (WMO-701).
- EBR-06, the EBR-1 Septic Tank (EBR-714) and Seepage Pit (EBR-716).
- BORAX-03, the BORAX AEF Septic Tank (AEF-703).

2.4.2.2 Underground Storage Tank Program Action Authority. Most underground storage tanks within WAGs 6 and 10 have been removed. The following WAG 6 and 10 sites are tank sites that were removed by the "Tank Program" in 1990.

- BORAX-05, the BORAX Fuel Oil Tank, SW of AEF-602
- BORAX-07, the BORAX Inactive Fuel Oil Tank by AEF-601
- EBR-07, the EBR-1 (AEF-704) Fuel Oil Tank at AEF-603
- EBR-08, EBR-1 (WMO-703) Fuel Oil Tank
- EBR-10, the EBR-1 (WMO-705) Gasoline Tank
- EBR-11, the EBR-1 Fuel Oil Tank (EBR-706)

- EBR-12, the EBR-1 Diesel Tank (EBR-707)

- EBR-13, the EBR-1 Gasoline Tank (EBR-708)

2.4.2.3 Treatability Studies. One treatability study was completed under OU 10-04 to assess the treatment of explosives contaminated soil through composting. Conventional composting of explosives-contaminated soil can be an effective treatment, but explosives fragments can survive the composting process. A fundamental objective of this study was to determine if the increased efficiency of explosive compound biodegradation afforded by the use of a solvent, such as acetone, was warranted. Acetone pretreatments were found effective in dissolving TNT chunks into soil slurries, which were amenable to composting. (Radtke 2000). Section 9.7 discusses the development and evaluation of a remedial alternative using this technology to remediate the TNT/RDX contaminated soil.

2.4.2.4 Resource Conservation Recovery Act Authority. One clean closure under the resource conservation recovery act (RCRA) was completed in 1996 when the ARVFS-01 "Containers of Contaminated NaK" was shipped to ANL-W for treatment (Theil 1997).

In 1985, the NODA was added to the INEL's RCRA, Part A, permit application as a thermal treatment unit. The last treatment of hazardous waste occurred in 1988 (except for one emergency action/detonation in 1990). In June 1990, a Memorandum of Understanding (MOU) was developed between Environmental Programs (EP) and Waste Reduction Operations Complex (WROC). The MOU followed a joint decision between EPA and WROC to close the RCRA units in the NODA. EP agreed to fund and manage all activities necessary to formally close the NODA, including soil sampling and analysis, removal of contaminated soil, emergency removal of ordnance, maintenance of access signs and barricades, and preparation and submittal of all required documentation. WROC retained RCRA-operational responsibility for the NODA in the interim (PNP-03-94).

February 25, 1997, a letter was sent from Brian R. Monson, Chief of the Hazardous Waste Permitting Bureau (HWPB) of the IDEQ to Donald N. Rasch of DOE-ID. This letter was being sent in response to DOE's submittal of "*Reports and Summaries of Reports Describing the Federal Facility Agreement/Consent Order (FFA/CO) Actions Taken to Remove Hazardous Waste Residues from the Naval Ordinance Disposal Area at the Idaho National Engineering Laboratory*." The letter states that the DEQ, Air and Hazardous Waste Division, HWPB has reviewed the reports and determined that it appears all hazardous wastes and hazardous waste residues have been removed. Therefore, the HWPB terminated the Interim Status for the NODA, EPA ID No. ID 4890008952 with the understanding that the CERCLA program shall perform the final evaluation of the site in accordance with the FFA/CO and shall include any requisite ARAR and HWMA reviews prior to issuance of the final Record of Decision.

3. COMMUNITY PARTICIPATION

In accordance with CERCLA § 113(k)(2)(B)(i-v) and § 117 and the INEEL Community Relations Plan (DOE-ID 1995), opportunities for the public to obtain information and participate in the remedial investigation and decision process for OU 10-04 were provided from January 2002 through the present. The documents providing information and opportunities to provide input included a “kick-off” fact sheet, which briefly discussed the results of the RI/FS (DOE-ID 2001); briefings and presentations to interested groups; and public meetings.

In August 1999, a “kickoff” fact sheet about the OU 10-04 RI/FS was mailed to about 1,100 members of the public and INEEL employees. It was the initial opportunity for citizens to get involved in how the RI/FS would be conducted. The fact sheet encouraged interested citizens to submit initial comments on the investigation and request a briefing. No comments were received and no one requested a briefing.

In 2000 and 2001, a status of the RI/FS was discussed in the EM Progress issue. This annual newsletter was mailed to about 1,100 members of the public and INEEL employees. It was also posted on the INEEL’s EM Internet page.

In early 2002, an “update fact sheet” about the OU 10-04 RI/FS was mailed to about 600 members of the public and more than 200 INEEL employees. This fact sheet also offered briefings to those interested in the OU 10-04 comprehensive investigation. It was the initial opportunity for the public to be involved in how the remedial actions would be conducted. No one requested a briefing at the time, but briefings were conducted later in the investigation process.

The DOE-ID briefed the INEEL Citizens Advisory Board and its Environmental Restoration Program Subcommittee on the OU 10-04 investigation. The citizen’s advisory board is a group of 15 people who represent the citizens of Idaho and who make recommendations to DOE-ID, EPA, and the IDEQ on environmental restoration activities at the INEEL. The subcommittee reviewed a draft proposed plan and the majority of its comments have been incorporated into this ROD (DOE-ID 2002). In March 2002, the INEEL Citizens Advisory Board met again to finalize and submit its formal recommendations on the draft proposed plan to DOE-ID. The majority of comments from the Citizen’s Advisory Board on the Proposed Plan have been incorporated into this ROD.

Upon release of the proposed plan, DOE-ID sent a press release to over 100 news organizations, schools and universities, elected officials, and others to announce the availability of the document and the 30-day public comment period, which was extended to 60 days at the request of the public. Additionally, newspaper ads ran in Idaho Falls, Arco, Fort Hall, Pocatello (2), Boise, Moscow, and Jackson, Wyoming. At least one television station and several radio stations in eastern Idaho aired a story about the public meetings.

Post cards were also mailed to all citizens on the INEEL mailing list. The cards informed citizens about public meeting locations, dates, and times, the 30-day public period and comment period extension to 60 days, and where to find additional information on the WAG 10, OU 10-04 project.

Personal calls were made to stakeholders in the Idaho Falls, Pocatello, and Boise areas to inform individuals about the upcoming public meetings and to determine whether briefings were desired. Prior to the public meetings, briefings were held with members of an Idaho-based environmental organization and the Shoshone-Bannock tribes. In 1999, members of the Shoshone-Bannock tribes toured areas of OU 10-04. The Shoshone Bannock Tribes’ Tribal/DOE Agreement in Principle Program reviewed the Proposed Plan and provided comments.

Copies of the OU 10-04 Proposed Plan (DOE-ID 2002) were mailed to about 960 members of the public the week of January 21, 2002, urging citizens to comment on the Proposed Plan and to attend the public meetings. Public meetings were held in Boise on February 7 and Idaho Falls on February 12. Before the public meetings in each location, an availability session took place from 6 to 7 p.m. to allow for informal discussion of the issues. The public meetings began at 7 p.m. One Idaho Falls television station covered the February 12, 2002, meeting and aired the story on its 10 p.m. news and on the morning news program the next day.

For the general public, the activities associated with participating in the decision-making process included receiving the Update Fact Sheet or Proposed Plan, attending the availability sessions before the public meetings to informally discuss the issues, and submitting verbal and written comments to DOE-ID, EPA, and IDEQ during the 60-day public comment period.

Comment forms were available at the meeting locations (including a postage-paid business-reply form) to those attending the public meetings to submit written comments either at the meeting or by mail. A form for the public to use in evaluating the effectiveness of the meetings was on the reverse side of the meeting agenda. A court reporter was present at each meeting to take official transcripts of discussions and public comments. The meeting transcripts were placed in three INEEL information repositories in the Administrative Record section for the WAG 10 OU 10-04 Comprehensive RI/FS. 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 WAG 10, OU 10-04 Proposed Plan.

A total of about 22 people not associated with the project attended the public meetings. Overall, 8 citizens provided formal comments: 2 citizens provided oral comments and over 6 provided written comments (two people provided both oral and written comments). All comments received on the Proposed Plan were considered during the development of this ROD. The decision for this action is based on public input and on the information in the Administrative Record for WAG 10.

A Responsiveness Summary has been prepared as part of this ROD. All formal oral comments presented at the public meetings and all written comments received during the public comment period are included as Part 3 of this ROD and have been included in the Administrative Record for WAGs 6 and 10.

4. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

The Operable Unit 10-04 Comprehensive RI/FS (DOE-ID 2001) is the culmination of all of the CERCLA evaluations performed for WAG 10 with the exception of the SRPA evaluation and evaluations of potential new release sites, which will be addressed in the OU 10-08 RI/FS and subsequent ROD. According to the FFA/CO (DOE-ID 1991), WAG 10 includes miscellaneous surface sites and liquid disposal areas throughout the INEEL that are not included within other WAGs. The boundary of WAG 10 is the INEEL boundary, or beyond as necessary to encompass real or potential impact from INEEL activities and any areas within the INEEL not covered by other WAGs.

The issuance of the ROD for OU 10-04, the comprehensive WAG 10 operable unit, marks the beginning of final remedial activities with the exceptions noted above. As specified in the Action Plan attached to the FFA/CO (DOE-ID 1991), post-ROD activities will include remedial design/remedial action (RD/RA) phases. The RD/RA will commence with the development of a scope of work to identify and establish deadlines for submitting other documents and to outline the overall strategy for managing the RD/RA. A draft scope of work will be submitted to EPA and IDEQ for review within 21 days of the issuance of this ROD.

The selected remedy for OU 10-04 comprises remedial actions that are protective of human health and the environment. These remedial actions will be implemented to mitigate the unacceptable risks to human or ecological receptors associated within the specific sites identified in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001) and Proposed Plan (DOE-ID 2002). In addition, limited action and activities to complete the selected remedy will be implemented. The limited action comprising institutional controls at seven other sites and focused ecological monitoring are components of the selected remedy. In addition, several activities will be implemented at WAG 10 to complete the selected remedy for OU 10-04. These activities include disposition of stored and investigation-derived waste and groundwater monitoring.

The first remedial action will mitigate risk at three large ordnance areas where UXO may remain. The risk from UXO is the potential explosive hazard associated with uncontrolled detonation.

The second action addresses risk at five individual sites with soil contaminated with TNT and/or RDX. UXO is also likely to be present at these sites since they are within the ordnance areas.

The third action addresses risk at one site where contaminated soil is the only source medium. The soils are contaminated with lead fragments and particles. The lead will be separated from the soil. If allowed by DOE policy, the lead will be sent off the INEEL for recycling. If recycling is not permitted, the recovered lead will be stabilized to meet RCRA disposal criteria for waste that is RCRA characteristic for lead. After treatment to remove lead from the soil, it is anticipated the soil will not be RCRA characteristic for lead and can be managed as nonhazardous waste. However, if sampling and laboratory analysis indicates the soil is RCRA characteristic for lead, then the soil will be treated to meet RCRA disposal criteria and disposed in an approved facility on the INEEL.

The limited action implements institutional controls at seven additional sites at WAGs 6 and 10. Institutional controls will be maintained at these seven sites because residual contamination precludes unrestricted land use. In April 1999, the EPA Region 10 developed a policy for institutional controls. During the OU 10-04 remedial design/remedial action (RD/RA) phase, an O&M Plan, a FFA/CO primary document, will be developed. The OU 10-04 O&M Plan will contain the design and plans for implementation of institutional controls following the guidelines in the policy.

In addition to maintaining institutional controls for WAG 6 and 10 sites, OU 10-04 is responsible for developing and implementing an INEEL-wide institutional control O&M plan for all other CERCLA sites requiring institutional controls. This INEEL-wide O&M plan will be developed in accordance with the EPA Region 10 policy during the OU 10-04 RD/RA phase.

Institutional controls will reside with DOE or other government agency until 2095, based on the Comprehensive Facility and Land Use Plan, or until a 5-year review concludes unrestricted land use is allowable. It is anticipated that industrial use will continue at the INEEL for the period of institutional control and beyond.

In addition to maintaining institutional controls, OU 10-04 will implement long-term ecological monitoring at the INEEL. Based on the multiple uncertainties and assumptions in the OU 10-04 INEEL-wide ERA risk assessment, it was determined that ecological monitoring would be critical to ensure protection of this important ecosystem.

Groundwater will be sampled in existing wells downgradient from the TNT/RDX sites. If TNT, RDX, and/or degradation products are detected in any groundwater samples, monitoring will be continued as part of the OU 10-08 groundwater monitoring plan. If TNT, RDX, and/or degradation products are not detected in any groundwater sample, monitoring for these contaminants will not be continued.

5. GENERAL SITE CHARACTERISTICS

Section 5 describes general site characteristics including physical characteristics, climate, flora and fauna, demography, cultural resources, and conceptual site models.

5.1 Physical Characteristics

The Snake River Plain (SRP) is the largest continuous physiographic feature in southern Idaho. This large topographic depression extends from the Oregon border across southern Idaho to Yellowstone National Park and northwestern Wyoming.

The SRP slopes upward from an elevation of about 750 m (2,500 ft) at the Oregon border to more than 1,500 m (5,000 ft) at Ashton northeast of the INEEL. The SRP is composed of two structurally dissimilar segments, with the division occurring between the towns of Bliss and Twin Falls, Idaho. West of Twin Falls, the Snake River has cut a valley through tertiary basin fill sediments and interbedded volcanic rocks. The stream drainage is well developed, except in a few areas covered by recent thin basalt flows. East of Bliss, Idaho, the complexion of the plain changes as the Snake River locally carves a vertical-walled canyon through thick sequences of quaternary basalt with few interbedded sedimentary deposits.

The INEEL is located on the northern edge of the eastern SRP, a northeastern-trending basin, 80 to 110 km (50 to 70 mi) wide, extending from the vicinity of Bliss on the southwest to the Yellowstone Plateau on the northeast. Three mountain ranges end at the northern and northwestern boundaries of the INEEL: the Lost River Range, the Lemhi Range, and the Beaverhead Mountains of the Bitterroot Range (see Figure 1). Between the ranges and the relatively flat plain is a relief of 1,207 to 1,408 m (3,960 to 4,620 ft) (Hull 1989). Saddle Mountain, near the southern end of the Lemhi Range, reaches an altitude of 3,295 m (10,810 ft) and is the highest point in the immediate INEEL area. The east and middle buttes have elevations of 2,003 and 1,949 m (6,572 and 6,394 ft), respectively.

The portion of the SRP occupied by the INEEL may be divided into three minor physiographic provinces. The first province is a central trough, often referred to as the Pioneer Basin, that extends to the northeast through the INEEL. Two flanking slopes descend to the trough, one from the mountains to the northwest and the other from a broad ridge on the plain to the southeast. The slopes on the northwestern flank of the trough are mainly alluvial fans originating from sediments of Birch Creek and the Little Lost River. Also forming these gentle slopes are basalt flows that have spread onto the plain. The land-forms on the southeast flank of the trough are formed by basalt flows, which spread from a volcanic zone that extends northeastward from Cedar Butte. The lavas that erupted along this zone built up a broad topographic swell directing the Snake River to its current course along the southern and southeastern edges of the plain. This topographic swell effectively separates the drainage of mountain ranges northwest of the INEEL from the Snake River.

The Pioneer Basin of the INEEL broadens to the northeast and joins the extensive Mud Lake Basin. The Big and Little Lost Rivers and Birch Creek drain into this basin from the mountains to the north and west. The intermittently flowing waters of the Big Lost River have formed a flood plain in this trough, consisting primarily of fine sands, silt, and clay. Streams flow to the Big Lost River and Birch Creek sinks, a system of playa depressions in the west-central portion of the INEEL, southeast of the town of Howe, Idaho. The sinks area covers several hundred acres and is flat, consisting of significant thicknesses of fluvial and lacustrine (lake) sediments.

5.2 Climate

Meteorological and climatological data for the INEEL and the surrounding region are collected and compiled from several meteorological stations operated by the National Oceanic and Atmospheric Administration field office in Idaho Falls, Idaho. Three stations are located at the INEEL.

Annual precipitation at the INEEL is light, with an annual average of 22.1 cm (8.7 in.). Therefore, the region is classified as semiarid to arid (Clawson, Start, and Ricks 1989). The rates of precipitation are highest during the months of May and June and lowest during July. Normal winter snowfall occurs from November through April, though occasional snowstorms occur in May, June, and October. Snowfall at the INEEL ranges from about 17.3 cm (6.8 in.) per year to about 151.6 cm (59.7 in.) per year, and the annual average is 70.1 cm (27.6 in.) (Clawson, Start, and Ricks 1989). The INEEL is subject to severe weather episodes throughout the year. Thunderstorms are observed mostly during the spring and summer. An average of two to three thunderstorms occurs during each of the months from June through August (EG&G 1981). Thunderstorms are often accompanied by strong gusty winds that may produce local dust storms. Precipitation from thunderstorms at the INEEL is generally light. Occasionally, however, rain resulting from a single thunderstorm on the INEEL exceeds the average monthly total precipitation (Bowman et al. 1984).

The moderating influence of the Pacific Ocean produces a climate at the INEEL that is usually warmer in the winter and cooler in summer than locations of similar latitude in the United States east of the Continental Divide. The mountain ranges north of the INEEL act as an effective barrier to the movement of most of the intensely cold winter air masses entering the United States from Canada. Occasionally, however, cold air spills over the mountains and is trapped in the plain. The INEEL then experiences below-normal temperatures usually lasting from 1 week to 10 days. The relatively dry air and infrequent low clouds permit intense solar heating of the surface during the day and rapid radiant cooling at night. These factors combine to give a large diurnal range in temperature near the ground. The average summer daytime maximum temperature is 28°C (83°F), while the average winter daytime maximum temperature is −0.6°C (31°F). Recorded temperature extremes at the INEEL vary from a low of −44°C (−47°F) in January to a high of 38°C (101°F) in July (Clawson, Start, and Ricks 1989).

The relative humidity at the INEEL ranges from a monthly average minimum of 18% during the summer months to a monthly average maximum of 55% during the winter. The relative humidity is directly related to diurnal temperature fluctuations. Relative humidity reaches a maximum just before sunrise (the time of lowest daily temperature) and a minimum in midafternoon (the time of maximum daily temperature) (Clawson, Start, and Ricks 1989).

The INEEL is in the belt of prevailing westerly winds, which are channeled within the eastern Snake River Plain to produce a west-southwest or southwest wind approximately 40% of the time. Local mountain valley features exhibit a strong influence on the wind flow under other meteorological conditions as well. The average midspring wind speed recorded at a height of 6 m (20 ft) is 9.3 mph, while the average midwinter wind speed is 5.1 mph (Irving 1993).

5.3 Flora and Fauna

Six broad vegetation categories representing nearly 20 distinct habitats have been identified on the INEEL: juniper-woodland, native grassland, shrub-steppe off lava, shrub-steppe on lava, modified, and wetlands. Though small riparian and wetland regions exist along the Big Lost River and Birch Creek, nearly 90% of the Site, including WAG 10, is covered by shrub-steppe vegetation. Big sagebrush, saltbush, rabbitbrush, and native grasses are the most common varieties.

The central part of the INEEL is a place of safety for wildlife because it is undeveloped, has restricted human access, and grazing and hunting are prohibited. Mostly undeveloped, this central tract may be the largest relatively undisturbed sagebrush steppe in the Intermountain West outside the national parklands (DOE-ID 1997). More than 270 vertebrate species including 43 mammalian, 210 avian, 11 reptilian, nine fish, and two amphibious species have been observed on the Site. During some years, hundreds of birds of prey and thousands of pronghorn antelope and sage grouse winter on the INEEL. Mule deer and elk also reside at the Site. Observed predators include bobcats, mountain lions, badgers, and coyotes. Bald eagles, classified as a threatened species, are commonly observed on or near the Site each winter. Peregrine falcons, recently removed from the federal endangered species list, also have been observed. In addition, other species that are candidates for listing as threatened or endangered by the U.S. Fish and Wildlife Service may either inhabit or migrate through the area. Candidate species that may frequent the area include ferruginous hawks, pygmy rabbits, Townsend's big-eared bats, burrowing owls, and loggerhead shrikes.

5.4 Demography

The populations potentially affected by INEEL activities include INEEL employees, ranchers who graze livestock in areas on or near the INEEL, hunters on or near the Site, residential populations in neighboring communities, and highway travelers.

Nine separate facilities at the INEEL include approximately 450 buildings and more than 2,000 other support facilities. In January 1996, the INEEL employed 8,616 contractor and government personnel. Approximately 60% of the total work force is employed at the INEEL Site and 40% is located in Idaho Falls, Idaho (DOE-ID 1997). Nearly all the facilities within WAGs 6 and 10 are on inactive status. The only employees who regularly work there are tour guides who escort visitors through the EBR-I Visitors Center from Memorial Day to Labor Day.

The INEEL Site is bordered by five counties: Bingham, Bonneville, Butte, Clark, and Jefferson. Major communities include Blackfoot and Shelley in Bingham County, Idaho Falls and Ammon in Bonneville County, Arco in Butte County, and Rigby in Jefferson County. The nearest community to the INEEL is Atomic City, located south of the Site border on U.S. Highway 26. Other population centers near the INEEL include Arco, 11 km (7 mi) west of the Site; Howe, west of the Site on U.S. Highway 22/33; and Mud Lake and Terreton on the northeast border of the Site.

5.5 Cultural Resources

Cultural resources are numerous on the INEEL and within WAGs 6 and 10 (Pace 2000). Resources that have been identified include archaeological sites, contemporary historic sites, and Native American cultural sites. Many of these resources are eligible for nomination to the National Register of Historic Places. One property, EBR-I within WAG 6, has been designated as a National Historic Landmark for its important contributions to the development of nuclear science and technology.

Over the past two decades, detailed inventories of archaeological sites have been assembled for some parts of the INEEL. Most of these survey efforts have focused on areas within and around major operating facilities and proposed future construction areas. As of January 1999, approximately 7.5% of the INEEL (17,400 ha [43,000 acres]) had been systematically surveyed and 1,884 significant archaeological localities ranging in age from 50 to 12,000 years had been identified. Inventories of contemporary historic resources important for their association with World War II, the Cold War, and U.S. nuclear science and technology have also been initiated. Reconnaissance surveys have been completed for all buildings currently under DOE-ID administration and are in progress at the NRF and ANL-W. Among the hundreds of buildings surveyed, 217 have been determined to be historically significant.

Far less is known about the nature and distribution of Native American cultural resources at the INEEL. However, ongoing consultation and cooperation under the Agreement in Principle between DOE-ID and the Shoshone-Bannock Tribes (DOE-ID 2000) has shown that many archaeological sites located on the INEEL are regarded as ancestral and important to tribal culture. Natural landforms and native plants and animals in the INEEL region are also of sacred and traditional importance.

5.6 Conceptual Site Models

The conceptual site models for OU 10-04 reflect the types of receptors that could be affected by exposures to contaminants in the area. Two human health conceptual site models are illustrated graphically in Figures 7 and 8. One model represents a hypothetical future residential scenario beginning 100 years in the future, and the other reflects current and future occupational scenarios. The models are based on land-use assumptions and the exposure assessment conducted for the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). Further discussion of INEEL land use appears in Section 6, and the exposure assessment is summarized in Section 7. The human health conceptual site models reflect the following land-use assumptions:

- The INEEL will remain under government ownership and institutional control for at least the next 100 years (i.e., until the year 2095, 100 years from the date of INEEL land-use projections [DOE-ID 1997]).

- No residential development (e.g., housing) will occur within the INEEL boundaries within the institutional control period.

- Future industrial development will most likely be concentrated in the central portion of the INEEL and within existing major facility areas, as compared to other portions of the INEEL.

The conceptual site models for the ecological risk assessment reflect the locations of contaminated media that ecological receptors may be exposed to surface sediments comprising the top 0.15 m (0.5 ft) of soil and subsurface soil. The complete ecological conceptual site model is shown pictorially in Figure 9. The two components of the model are illustrated graphically in Figures 10 and 11, and a summary of the exposure media and ingestion routes for INEEL ecological receptors is given in Table 1.

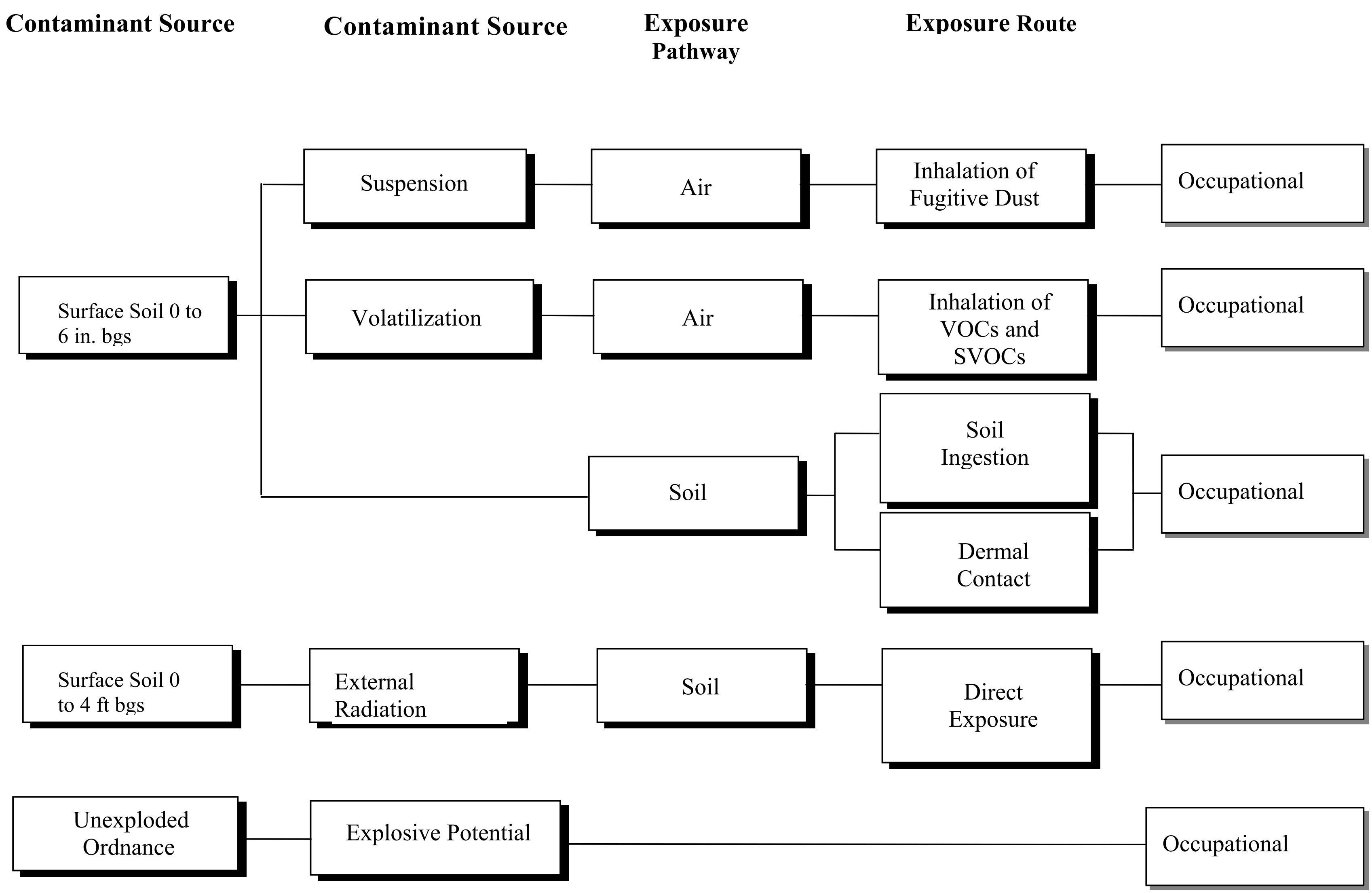

Figure 7. Human health conceptual site model for the current and future occupational exposure scenario.

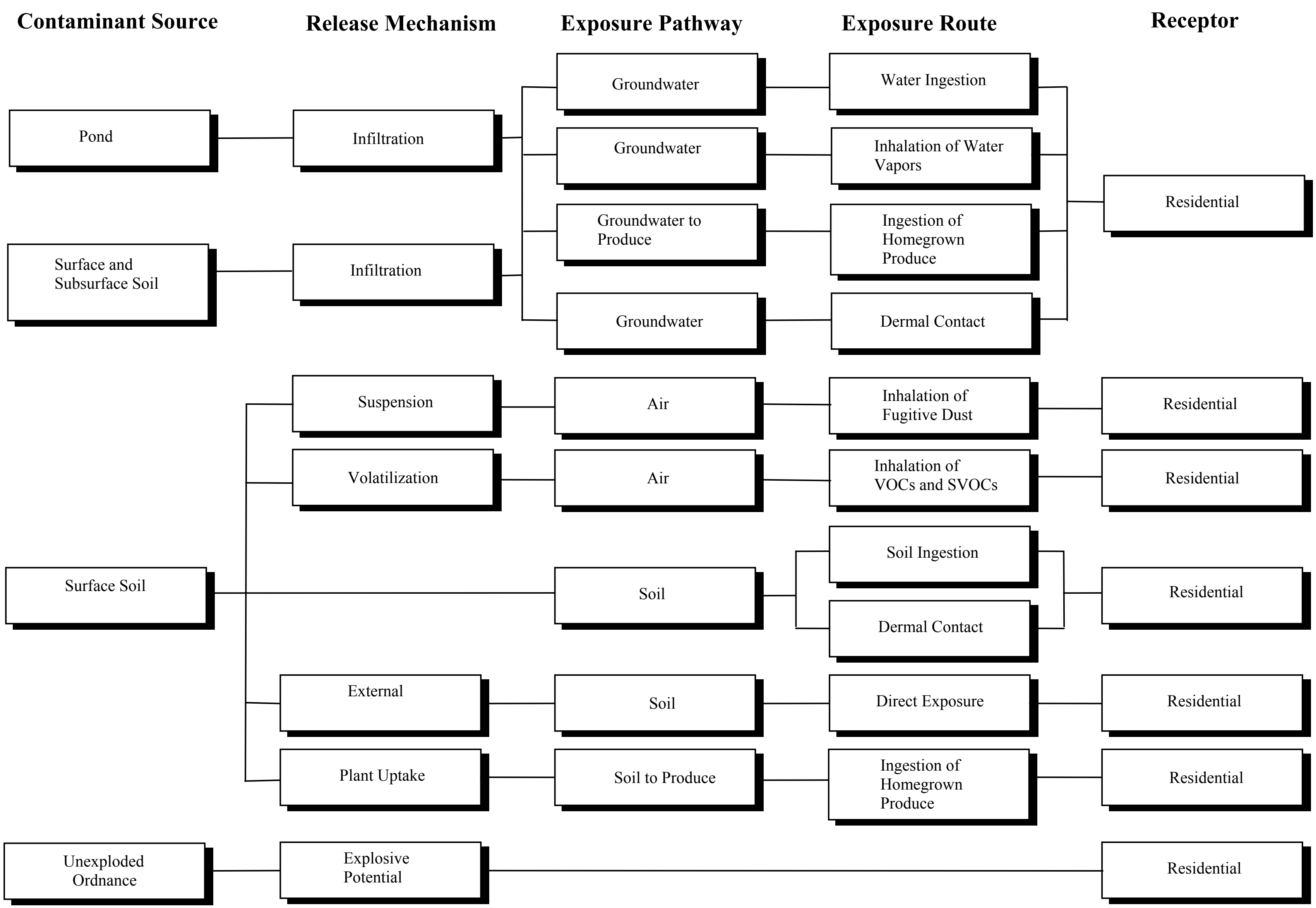

Figure 8. Human health conceptual site model for the hypothetical future residential scenario.

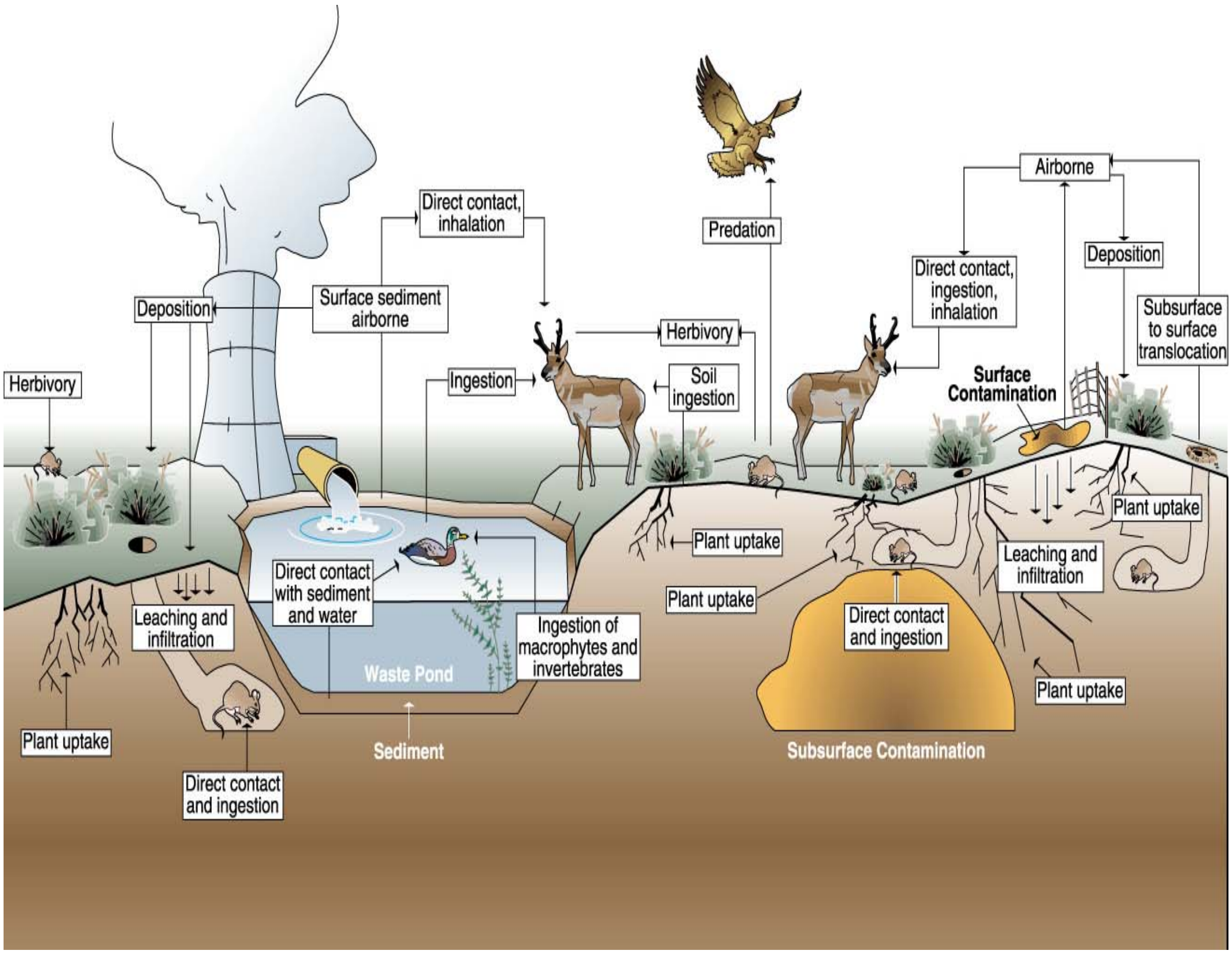

Figure 9. Ecological conceptual site model.

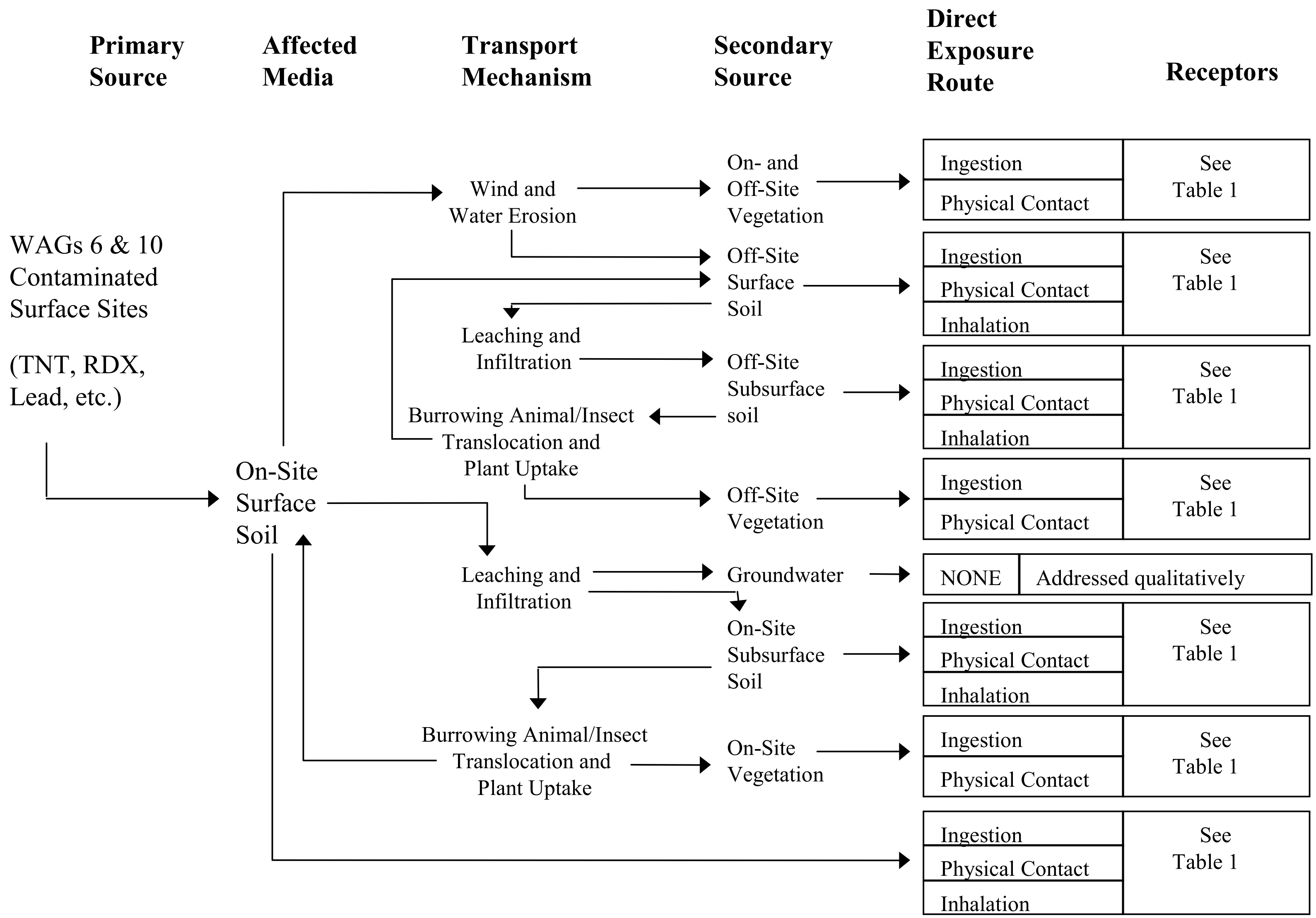

Figure 10. Model for screening level ecological risk assessment pathways and exposure for WAGs 6 and 10 surface contamination.

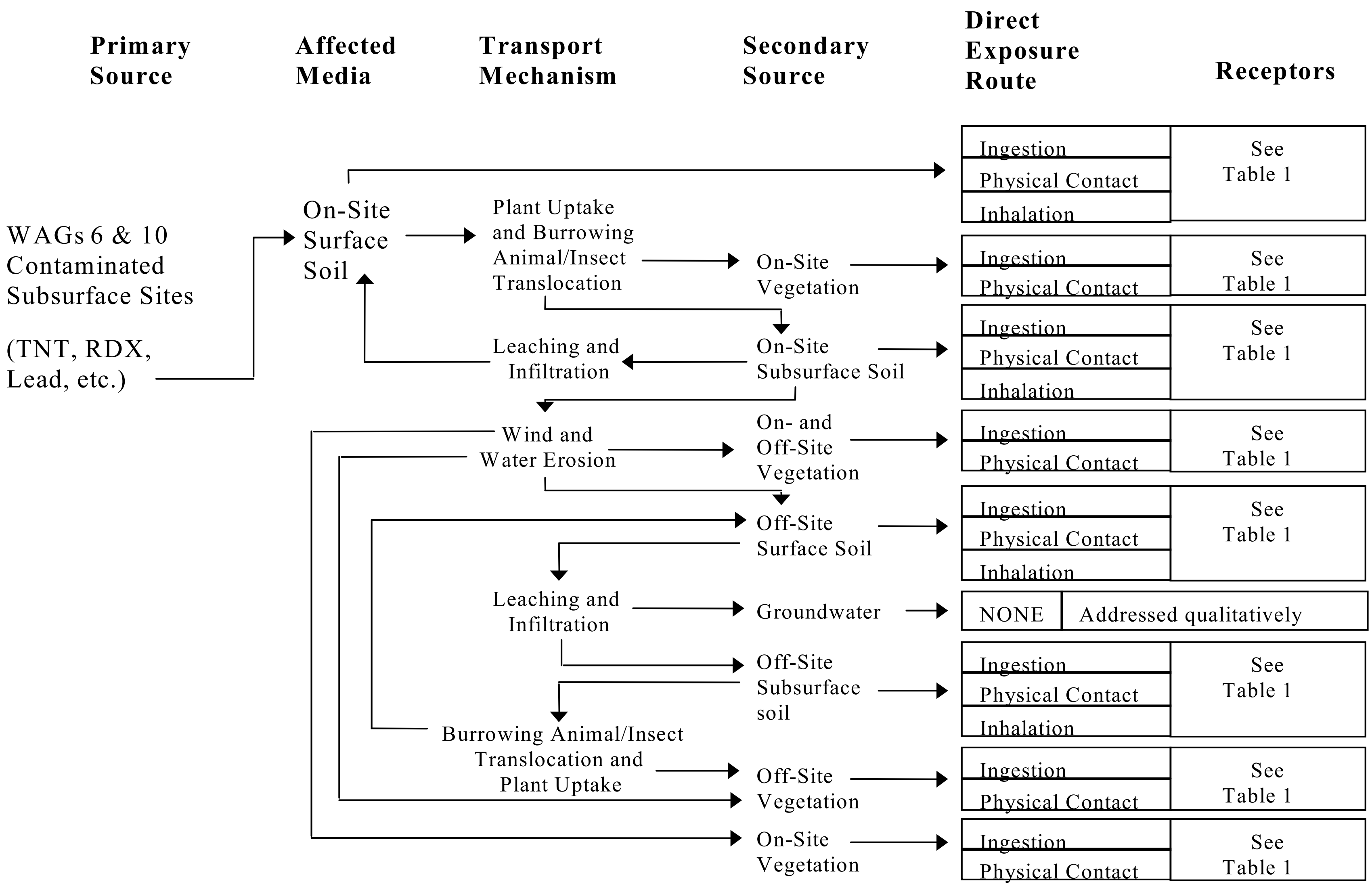

Figure 11. Model for screening level ecological risk assessment pathways and exposure for WAG 6 and 10 subsurface contamination.

Table 1. Summary of exposure media and ingestion routes for INEEL functional groups.

Receptor	Surface Soils	Subsurface Soils	Vegetation	Sediments	Prey Consumption: Invertebrates	Prey Consumption: Mammals	Prey Consumption: Birds
Amphibians (A232)	X	X			X		
Great Basin spadefoot toad	X	X			X		
Avian herbivores (AV122)	X						
Mourning Dove	X						
Avian (aquatic) herbivores (AV143)			X	X			
Blue-winged teal			X	X			
Avian insectivores (AV222)	X				X		
Sage sparrow	X				X		
Avian carnivores (AV322)						X	
Loggerhead shrike						X	X
Ferruginous hawk						X	
Avian carnivores (AV322A)	X	X			X	X	
Burrowing owl	X	X			X	X	
Avian omnivores (AV422)			X		X	X	X
Black-billed magpie			X		X	X	X
Mammalian herbivores (M122)	X		X				
Mule deer	X		X				
Mammalian herbivores (M122A)	X	X	X				
Pygmy rabbit	X	X	X				
Mammalian insectivores (M210A)	X				X		
Townsend's western big-eared bat	X				X		
Mammalian carnivore (M322)	X					X	
Coyote	X					X	
Mammalian omnivores (M422)	X	X	X		X		
Deer mouse	X	X	X		X		
Reptilian insectivores (R222)	X	X			X		
Sagebrush lizard	X	X			X		
Plants	X	X					

6. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

The INEEL land area consists of approximately 2,305 km^2 (890 mi^2) (230,266 ha [569,000 acres]). The majority of this land, approximately 98%, has not been disturbed by Site operations. Land use on the entire INEEL is restricted, and access to the INEEL and WAG 10 is controlled. Although public highways pass through the INEEL, public access beyond the highway right-of-way is not allowed. Access to INEEL facilities requires proper clearance, training or an escort, and controls to limit exposures. Current land use and projections are summarized below.

6.1 Current Land Use

The acreage within the INEEL is classified as industrial and mixed use by the Bureau of Land Management (BLM) (DOE-ID 1997). Typical INEEL land use consists of wildlife management areas, government industrial operations areas, and waste management areas. No residential areas are contained within the INEEL boundaries. As shown in Figure 12, large tracts of land are reserved as buffer and safety zones, and operations are generally restricted to the central area. Aside from the facilities, the remaining land is largely undeveloped and is used for environmental research, ecological preservation, and sociocultural preservation. Any future construction of new facilities at the INEEL likely will occur within preferred development corridors.

The buffer consists of 1,295 km^2 (500 mi^2) of grazing land (DOE-ID 1997) administered by the Bureau of Land Management. Grazing areas at the INEEL support cattle and sheep, especially during dry conditions. Depredation hunts of game animals managed by the Idaho Department of Fish and Game are permitted on the INEEL within the buffer zone during selected years (DOE-ID 1997). Hunters are allowed access to an area that extends 0.8 km (0.5 mi) inside the INEEL boundary on portions of the Site’s northeastern and western borders (DOE-ID 1997).

State Highways 22, 28, and 33 cross the Site’s northeastern portion, and U.S. Highways 20 and 26 cross the southern portion (see Figure 2). One hundred forty-five km (90 mi) of paved highways used by the general public pass through the INEEL (DOE-ID 1997), and 23 km (14 mi) of Union Pacific Railroad tracks pass through the southern portion of the Site. A government-owned railroad passes from the Union Pacific Railroad through the Central Facilities Area to NRF, and a spur runs from the Union Pacific Railroad to the RWMC.

Approximately 45% of the land surrounding the INEEL is used for agriculture, 45% is open land, and 10% is urban (DOE-ID 1997). Livestock uses include sheep, cattle, hog, poultry, and dairy cattle production (Bowman et al. 1984). The major crops on land surrounding the INEEL include wheat, alfalfa, barley, potatoes, oats, and corn. Sugar beets are grown within about 40 mi of the INEEL near Rockford, Idaho, southeast of the INEEL in central Bingham County (Idaho 1996). Most of the land surrounding the INEEL is owned by private individuals or the U.S. government. The BLM administers the government land on the INEEL (DOE-ID 1997).

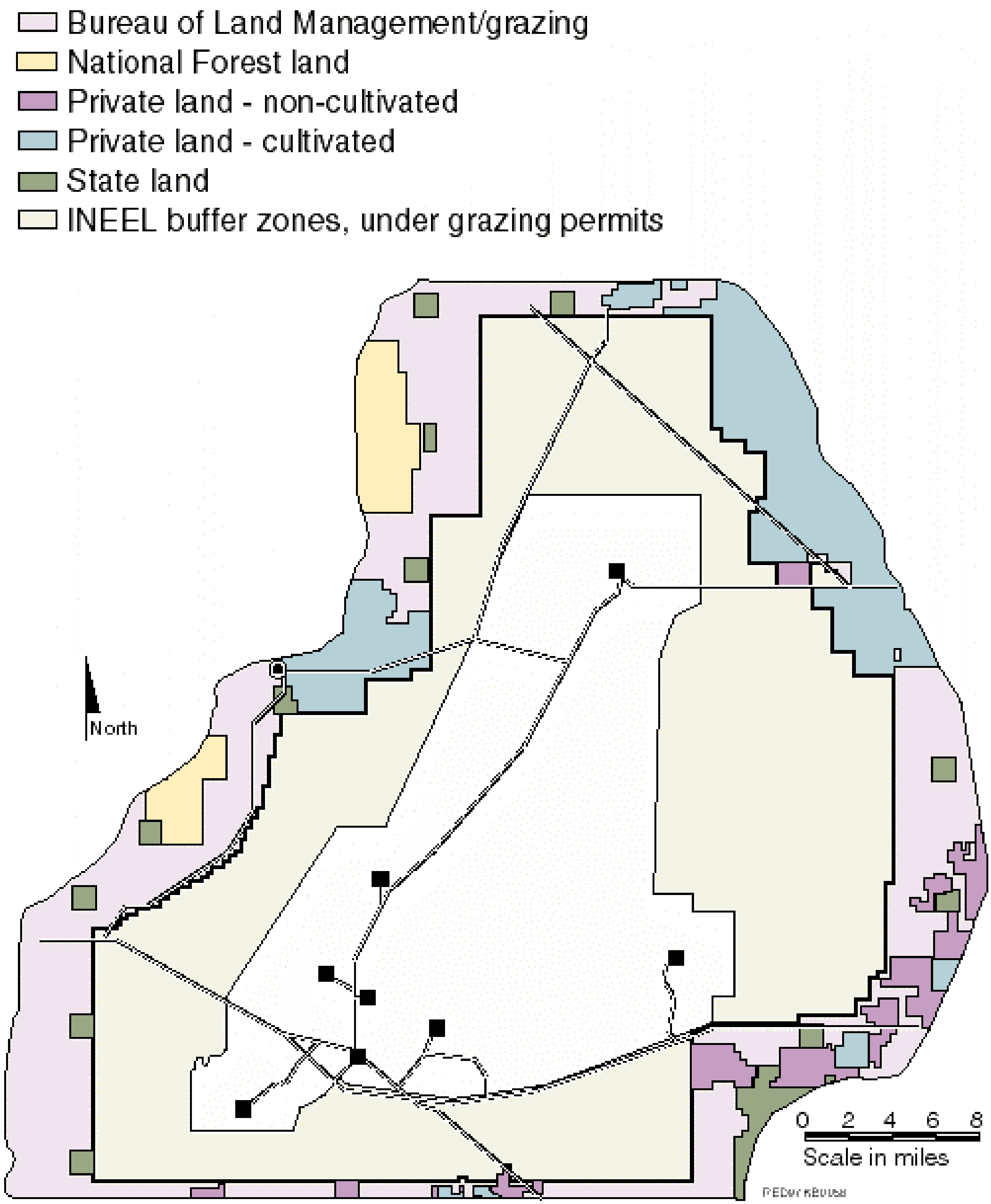

Figure 12. INEEL neighbors' lands (DOE-ID 1997).

6.2 Future Land Use

The projections for future land use at the INEEL area are influenced by the following assumptions and factors (DOE-ID 1997):

- Department of Energy projections for the future of its national laboratory research and development activities and nuclear reactor programs
- The presence of active industrial and research facilities
- The presence of an industrial infrastructure
- The likely inability to "green field" (e.g., return to natural state with unrestricted land use) the industrial complex without total removal
- The likelihood of all land use remaining industrial, with the exception of grazing by permit (it should be noted that a more conservative risk evaluation was performed assuming a current residential scenario)
- Recommendations from the INEEL Citizen's Advisory Board and other stakeholders about future use assumptions.

Land-use projections in the INEEL Comprehensive Facility Land Use Plan (DOE-ID 1997) incorporate the assumption that the INEEL will remain under government management and control for at least the next 100 years. Therefore, the baseline risk assessment (DOE-ID 2001) simulates a hypothetical residential scenario beginning in 100 years (until 2095). However, implementation of this management and control becomes increasingly uncertain over this time period. Regardless of the future use of the land now occupied by the INEEL, the federal government has an obligation to provide adequate institutional controls (i.e., limit access) to areas that pose unacceptable health or safety risks until those risks diminish to acceptable levels (see Section 12). Fulfillment of this obligation hinges on the continued viability of the federal government and on Congress appropriating sufficient funds to maintain the institutional controls for as long as necessary.

Generally, future land use within the INEEL will remain the same as current land use. Currently, the mix of land uses across the INEEL includes industrial areas, restricted and unrestricted use areas, wildlife management and conservation areas, and waste management areas. Other potential but less likely uses include agricultural applications and restoring areas to their natural undeveloped states. No residential development will be allowed within INEEL boundaries, and no new major private developments (residential or nonresidential) on public lands are expected in areas adjacent to the Site. Grazing will be allowed to continue in the buffer area. In addition, the INEEL is currently a National Environmental Research Park and is expected to remain so for the foreseeable future (DOE-ID 1997).

6.3 Groundwater Uses

The Snake River Plain Aquifer, consisting primarily of basalts and sediments and the groundwater stored in these materials, is among the nation's largest. Extending about 32 km (200 mi) through eastern Idaho and encompassing about 24,900 km^2 (9,600 m^2), the aquifer stores one to two billion acre-feet of water, which is roughly the same volume as Lake Erie. About 9% of the aquifer lies at depths ranging from 60 to 180 m (200 to 600 ft) beneath the INEEL site. The aquifer is the source of all water used at the INEEL site.

Based on a Federal Reserve Water Right, the DOE and the State of Idaho negotiated a State water right for the INEEL. The INEEL is permitted a water pumping capacity of 2.3 m^3 /sec (80 ft^3 /sec.) and a maximum water consumption of 35,000 acre feet per year. On average, though, the INEEL withdraws only 6,229 acre feet per year. About 65% of these withdrawals are eventually returned to the aquifer via percolation. Consequently, the annual consumptive usage of water withdrawn from the aquifer is about 2,200 acre feet per year (DOE-ID 1997). WAGs 6 and 10 are not major water users since all the facilities are inactive except for EBR-I, which is also inactive, but as a National Historic Landmark it is open to the public between Memorial Day and Labor Day. Most other water use by WAGs 6 and 10 is related to groundwater monitoring and other sampling events.

6.4 Groundwater Classification and Basis

All the WAG 10 sites are situated above the Snake River Plain Aquifer. The eastern portion of the aquifer was granted sole source status by the EPA on October 7, 1991 (56 FR 50634). Idaho water quality standards are identified in the Ground Water Quality Rule (IDAPA 58.01.11) and the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02). These standards and requirements can be accessed at the Internet address "http://www.idwr.state.id.us/apa/idapa."

Three categories of protectiveness apply to the aquifer and its associated resources under Idaho regulations: (1) Sensitive Resources, (2) General Resources, and (3) Other Resources. Because no previous action to categorize the Snake River Plain Aquifer under Idaho regulations has occurred, the aquifer defaults to the "General Resources" category. General Resource aquifers are protected to ensure that groundwater quality is not jeopardized. Idaho's groundwater standards incorporate federal radiation exposure and drinking water standards (10 CFR 20, Appendix B, Table 2, and 40 CFR 141 and 143). When the two federal standards are not in agreement, the more restrictive standard applies.

7. BASELINE RISK ASSESSMENT METHODOLOGY

This section of the ROD summarizes the results of the baseline risk assessment for all sites within OU 10-04. The baseline risk assessment estimates what risks the site poses if no action is taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial actions. The methodologies implemented to evaluate the baseline human health and ecological risks are outlined below, followed by a summary of the results for individual sites within OU 10-04. Components of the risk assessment specific to the selected remedies, such as contaminants of concern, contaminant concentrations, and risk estimates, are presented in more detail in Sections 8, 9, and 10.

In conjunction with the baseline risk assessment, two broader investigations were part of OU 10-04. First, the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation contributed a summary of what is important to them in defining and remediating risks to human health and the environment. Second, OU 10-04 contains the INEEL-wide ERA. The INEEL-wide ERA evaluated risk to Sitewide ecological resources. The results of the INEEL-wide ERA and the long-term monitoring alternative components are presented in Section 11.

7.1 Native American Risk Evaluation Summary

The INEEL lies within the original territories of the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation. A wide variety of natural and cultural resources and landscape features at the INEEL directly reflect tribal cultural heritage. These resources are important to the Tribes' spiritual and cultural values and activities, oral tradition and history, mental and economic well-being, and overall quality of life. The DOE is committed to protecting not only the health and safety of the Tribes, but also the environmental and cultural resources that are essential to their subsistence and culture (DOE-ID 2001).

To enhance understanding of Shoshone-Bannock concerns, particularly those directly associated with OU 10-04, the INEEL contracted directly with the Shoshone-Bannock Tribes to obtain unique input for the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). The Tribes' report is Appendix A to the OU 10-04 Comprehensive RI/FS (DOE-ID 2001).

In the holistic worldview of the Shoshone-Bannock Tribes, the health of the land, air, water, plants, animals, and humans are paramount and interconnected. Changes and losses in the landscape are seen as leading to an imbalance in nature that affects all things. The tribes have specific concerns about contamination of land, water, and air at the INEEL. These include the maintenance of healthy populations of game and other wildlife; the continued presence of plants and animals important for traditional ritual observations; the protection of human health, particularly the health of tribal members using the INEEL under the Agreement-in-Principle, and the protection of prehistoric and traditional cultural sites and significant landscapes; the use of land in the future; and the sustainable long-term stewardship of the land and its resources.

The tribal analysis completed for OU 10-04 makes it clear that the Tribes consider all contamination at the INEEL poses a threat to the traditional subsistence and spiritual ecosystem. The OU 10-04 investigation, therefore, concluded that contaminated sites that pose unacceptable risk to human health or ecological receptors are also unacceptable from the standpoint of Shoshone-Bannock tribal concerns. The investigation further recognized that some sites would be of concern for Shoshone-Bannock interests even though the CERCLA baseline risk assessment concluded that they do not require cleanup.

The tribal report emphasizes that actions can be taken to correct changes, disturbances, and voids in the native landscape ecology, and thereby restore traditional and sustainable harmony. The cultural concerns identified in the Shoshone-Bannock evaluation were factored into the remedial investigation risk assessment and feasibility study. It is understood that remedial actions to protect human health and the environment, in conjunction with ongoing communication and consultation with the Tribes under the Agreement-in-Principle, will address some Native American concerns regarding land contamination at the INEEL.

7.2 Human Health Risk Evaluation Summary

The human health risk assessment approach used in the OU 10-04 baseline risk assessment (BRA) was based on the EPA *Risk Assessment Guidance for Superfund* (RAGS) (EPA 1989, 1992a), INEEL Track 2 guidance (DOE-ID 1994), and INEEL cumulative risk assessment guidance protocol (LMITCO 1995). The tasks associated with development of the OU 10-04 human health risk assessment included the following:

- Data evaluation
- Exposure assessment
- Toxicity assessment
- Risk characterization
- Qualitative uncertainty analysis.

These tasks are described in the subsections below.

7.2.1 Data Evaluation

Data evaluation tasks that were completed as part of the BRA included site and contaminant screening and development of data sets for use in the risk assessment.

The site screening consisted of a review of risk assessments conducted for OU 10-04 sites identified in the FFA/CO and additional sites and OUs, which were added to WAG 6 and 10 since the first writing of the FFA/CO. As a result of the site screening, 28 of the individual sites identified in OU 10-04 were retained for quantitative risk assessment in the comprehensive BRA. The remaining sites either exhibited no risk potential (e.g., the site had no source of contamination) or a risk potential sufficiently below threshold values to preclude a significant contribution to cumulative risk. Individual sites with risk estimates greater than 1E-06 or hazard indices greater than 1.0 were retained.

Buildings and structures with a history of releases not subject to current management controls and those building and structures that possess the potential to impact cumulative risk at OU 10-04 sites were also evaluated for inclusion in the BRA. However, most WAG 6 facilities and structures have now been demolished and no longer present a hazard, and no WAG 10 facilities remain. The facility that was retained for facility assessment in the BRA was the EBR-I Reactor Facility (EBR-601/601A) and area structures, including the EBR-601 Reactor Building Annex, the EBR-602 Security Control House, and the two ANP jet engines displayed outside the EBR-I perimeter fence**.** The WAG 6 facility assessment sites are unique at the INEEL because they are part of a Registered National Historic Landmark to which the public has access. The risk issues for the EBR-I site and Heat Transfer Reactor Experiment (HTRE) assemblies are addressed by current management controls and are concluded to have no effect on the current or future risk calculated for the OU 10-04 CERCLA sites.

During the individual sites screening process, contaminants were eliminated after comparing detected concentrations with INEEL background concentrations (Rood, Harris, and White 1996) and with EPA 1E-06 risk-based concentrations (EPA 1995) for the most sensitive exposure pathway. Those contaminants that exceeded the screening criteria were identified as contaminants of potential concern and retained for quantitative analysis in the BRA. Potential exposure routes also were identified in conjunction with the contaminant screening.

All sampling data collected at OU 10-04 sites were evaluated to determine whether the data were appropriate and adequate for use in the BRA. This evaluation was conducted in general accordance with EPA guidance (EPA 1992a). As part of this analysis, sampling data sets were assumed to have lognormal distributions in accordance with EPA guidance on calculating concentration terms (EPA 1992a). However, true statistical distributions for the data were not determined. To calculate upper confidence limits on the means (UCLs), as recommended by EPA, sample results falling below the minimum detection limits were assigned a value of one-half the detection limit. Assigning a value of one-half the detection limit to all concentrations falling below the detection limits allowed the upper confidence limits to be calculated consistently for all of the sampling results.

Data evaluation for the UXO sites was limited by the insufficient amount of information collected during previous ground surveys. The geophysical ground surveys performed were for the most part adequate, but the areas covered by the surveys were very small compared to the areas suspected of having UXO present. This lack of information was discussed in the OU 10-04 RI/FS and will be addressed during the remedial action.

7.2.2 Exposure Assessment

An exposure assessment is a process that quantifies the receptor intake of contaminants of potential concern for those exposure pathways with a potential to cause adverse effects. The assessment consists of estimating the magnitude, frequency, duration, and exposure route of contaminants to receptors. The following exposure assessment characteristics were identified:

- Exposed populations
- Complete exposure pathways
- Contaminant concentrations at the points of exposure for the complete exposure pathways
- Intake rates
- Intake factors.

The land-use assumptions and projections discussed in Section 6 were used to identify exposure scenarios, pathways, and routes. The exposure scenarios and default soil depths evaluated in the OU 10-04 BRA are given in Table 2. The associated populations and exposure pathways are listed below and illustrated in Figures 7 and 8.

- Exposure scenarios
  - Occupational
  - Residential intrusion

Table 2. Exposure scenarios and soil depths used in the OU 10-04 baseline risk assessment.

Potentially Exposed Receptor	Land Use Scenario	Evaluated Exposure Pathways and Soil Depths
Occupational worker	Current industrial	Inhalation of volatiles (0–15 cm [0–0.5 ft])[a] Inhalation of fugitive dust (0–15 cm [0–0.5 ft])[a] Ingestion of surface soil (0–15 cm [0–0.5 ft])[a] External radiation (0–1.22 m [0–4 ft])[b]
Residential	Future residential	Inhalation of volatiles (0–3.05 m [0–10 ft])[c] Inhalation of fugitive dust (0–3.05 m [0–10 ft])[c] Ingestion of surface soil (0–3.05 m [0–10 ft])[c] Ingestion of homegrown produce (0–3.05 m [0–10 ft])[c] Ingestion of groundwater External radiation (0–3.05 m [0–10 ft])[c]
Occupational worker	Future industrial	Inhalation of volatiles (0–15 cm [0–0.5 ft])[a] Inhalation of fugitive dust (0–15 cm [0–0.5 ft])[a] Ingestion of surface soil (0–15 cm [0–0.5 ft])[a] External radiation (0–1.22 m 15 cm [0–4 ft])[b]

a. Exposure assessment considered the surface soil, defined as the top 0 to 15 cm (0 to 0.5 ft).

b. Exposure assessment considered the 0 to 1.22-m (0 to 4-ft) interval for undisturbed soil. Contamination below that depth is shielded by the topsoil.

c. Exposure assessment considered contamination within the 0 to 3.05-m (0 to 10-ft) interval because of the excavation required for a hypothetical basement.

- Exposure pathways
  - Groundwater pathway
  - Air pathway
  - Soil pathway
- Exposure routes
  - Soil ingestion
  - Inhalation of fugitive dust
  - Inhalation of volatiles
  - External radiation exposure
  - Dermal absorption from soil
  - Groundwater ingestion (residential scenario only)
  - Ingestion of homegrown produce (residential scenario only)
  - Dermal absorption of contaminants in groundwater (residential scenario only)
  - Inhalation of volatiles from indoor use of groundwater (residential scenario only).

Contaminant concentrations at the points of exposure for complete exposure pathways were based on detected concentrations as described in Section 7.2.1. If sufficient data were not available for calculating upper confidence limit concentrations, the maximum detected concentration was used. For radioactive contaminants, radioactive decay was incorporated into the intake calculations. Otherwise, no degradation mechanisms for reducing the toxicity of contaminants were considered.

Groundwater fate and transport modeling was used to predict the maximum contaminant concentrations that could occur in the aquifer from leaching and transport of nonradionuclide and radionuclide contaminants from OU 10-04. The GWSCREEN model was used to simulate the potential release of contaminants from the release sites and the transport of the contaminants through the vadose zone to the aquifer. The maximum 30-year average groundwater concentration for each contaminant of potential concern was estimated at 100 years in the future. The average concentrations at year 100 are used to calculate groundwater pathway risks for the residential exposure scenario, and the maximum average concentrations are used to calculate maximum expected groundwater risks (DOE-ID 2001).

To calculate intake rates, default intake factors from EPA guidance (EPA 1989, 1991, and 1992a) and Track 2 guidance for the INEEL (DOE-ID 1994) were used. In conjunction with conversion factors and site-specific contaminant concentrations, these values were used to calculate contaminant intakes used in the risk calculations. The specific exposure parameters used for each receptor and exposure pathway are given in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001, Appendix E). Generally, occupational scenarios simulate worker exposures for 8 hours/day, 250 days/year for 25 years and residential scenarios simulate exposures for 24 hours/day, 350 days/year, for 30 years. Standard values were used to simulate the human body (e.g., mass, skin area, inhalation rates, and soil ingestion rates).

To satisfy the objective of the OU 10-04 comprehensive risk assessment, risks produced through the air and groundwater exposure pathways were analyzed cumulatively. Cumulative risks were estimated by calculating one risk number for each contaminant of potential concern in each air and groundwater exposure route (e.g., inhalation of fugitive dust and ingestion of groundwater) for each collection of sites in close proximity to one another. Analyzing the cumulative risks for the air and groundwater pathways is necessary because contamination from all sites within an area can contribute to local air and groundwater contaminant concentrations. Conversely, individual sites within a WAG are typically isolated from one another relative to the soil pathway exposure routes (e.g., external exposure and ingestion of soil). As a result, site-specific soil pathway exposures were analyzed. Generally, however, the BRA is comprehensive because risks are evaluated from all known and potential sites within OU 10-04, and they are cumulative because risks from multiple sites are evaluated in the air and groundwater exposure pathways.

7.2.3 Conduct Toxicity Assessment

Toxicity assessment is the process of characterizing the relationship between the intake of a substance and the incidence of an adverse health effect in the exposed population. Toxicity assessments evaluate the results from studies with laboratory animals or from human epidemiological studies. These evaluations are used to extrapolate from high levels of exposure, for which adverse effects are known to occur, to low levels of environmental exposures, for which effects can be postulated. The results of these extrapolations are used to establish quantitative indicators of toxicity.

Health risks from all routes of exposure are characterized by combining the chemical intake information with numerical indicators of toxicity (i.e., slope factors for carcinogens and reference doses for noncarcinogens). The toxicity constants that were used in the OU 10-04 BRA were obtained from several sources. The primary source of information is the EPA online Integrated Risk Information System (IRIS). The IRIS database contains only those toxicity constants that have been verified by EPA work groups. The IRIS database is updated monthly and supersedes all other sources of toxicity information. If the necessary data are not available in IRIS, EPA Health Effects Assessment Summary Tables (HEAST) (EPA 1994a) are used. The toxicity constant tables are published annually and updated approximately twice per year. The HEAST contain a comprehensive listing of provisional risk assessment information that has been reviewed and accepted by individual EPA program offices, but has not had enough review to be recognized as high-quality, EPA-wide information (EPA 1994a). Summaries of the toxicity profiles for the contaminants addressed in the selected remedies to mitigate unacceptable human health risk are given below.

7.2.3.1 Lead. Lead is classified as a metal. No critical effects of lead have been reported; however, many organs and systems are adversely affected by lead exposures. The major target organs and systems are the central nervous system, the peripheral nerves, the kidneys, the gastrointestinal system, and the blood system (Sittig 1985). Anemia is one of the early manifestations of lead poisoning. Other early effects of lead poisoning can include decreased physical fitness, fatigue, sleep disturbance, headache, aching bones and muscles, digestive symptoms, abdominal pains, and decreased appetite. The major central nervous system effects can include dullness, irritability, headaches, muscular tremors, inability to coordinate voluntary muscles, and loss of memory. The most sensitive effect for adults in the general population may be hypertension (Amdur, Doull, and Klaassen 1991).

Ingestion and inhalation of lead have the same effects on the human body. Large amounts of lead can result in severe convulsions, coma, delirium, and possibly death. A high incidence of residual damage, similar to that following infections or traumatic damage or injury, is observed from sustained exposure to lead. Most of the body burden of lead is in the bone (ATSDR 1990a). Lead effects in the peripheral nervous system are primarily manifested by weakness of the exterior muscles and sensory disturbances. Lead also has been shown to adversely affect sperm and damage other parts of the male reproductive system (ATSDR 1990a). Dermal absorption of inorganic lead compounds is reported to be much less significant than absorption by inhalation or oral routes of exposure (ATSDR 1990a).

The behavioral effects of lead exposure are a major concern, particularly in children. Exposure to lead can cause damage to the central nervous system, mental retardation, and hearing impairment in children. Levels of exposure that may have little or no effect on adults can produce important biochemical alterations in growing children that may be expressed as altered neuropsychological behavior (Martin 1991).

Though an ability of lead to cause cancer in humans has not been shown, the EPA has classified lead as a probable human carcinogen through both the ingestion and inhalation routes of exposure. Lead classification is based on the available evidence of cancer from animal studies. Rats ingesting lead demonstrated statistically increased incidence of kidney tumors (ATSDR 1990a). According to some epidemiological studies, lead workers developed cancer, but the data are considered inadequate to demonstrate or refute the potential carcinogenicity of lead in humans. The EPA has not established toxicity values for lead.

7.2.3.2 RDX. RDX is a white, crystalline powder and is one of the most powerful and widely used military explosives. It can be used as base charge for detonators or as an ingredient of bursting charges and plastic explosives. RDX is a nonaromatic cyclic nitramine. RDX can be released to the environment during manufacturing or during explosive use (HSDB 2000).

The melting point of RDX ranges between 205 and 207º C. High explosives like RDX decompose by detonation. This detonation occurs almost instantaneously and is violent. The explosion may be initiated by sudden shock, high temperature or a combination of the two (Spectrum 2000).

The primary toxicity of RDX is the production of severe seizures. Status epilepticus (recurrent or continuous seizure activity lasting longer than 30 minutes in which the patient does not regain baseline mental status) has been observed following acute exposures in humans. Although the seizures produced from acute exposures seem to be completely reversible, animal data suggest that chronic exposure to doses lower than those required for seizure production may enhance the potential for other epileptogenic stimuli to produce seizures. The seizures are often accompanied by confusion, amnesia, and disorientation, and can be preceded by insomnia, restlessness, and irritability.

Other toxic effects that have been reported following exposure to RDX include changes in blood components including anemia manifested by decreased red blood cells, hemoglobin, and hematocrit. Toxic responses have also been noted in the liver, although those responses have generally not been as consistent as the convulsant responses (Lewis 2001).

The health advisory (HA) guideline for lifetime exposure is 2 ug/L (HSDB 2000). The lifetime HA is the concentration of a chemical in drinking water that is not expected to cause any adverse noncarcinogenic effects for a lifetime of exposure. Presently, there is no enforceable standard, such as an MCL for RDX.

7.2.3.3 TNT. 2,4,6-Trinitrotoluene (TNT) is a manmade, yellow crystalline solid used as a high explosive in military armaments and as a chemical intermediate in the manufacture of dyestuffs and photographic chemicals. TNT production in the United States occurs solely at military arsenals.

TNT is absorbed through the digestive tract, skin, and lungs. It is distributed primarily to the liver, kidneys, lungs, and fat, and is excreted mainly in the urine and bile (El-hawari et al. 1981). Workers involved in the production of explosives that were exposed to high concentrations of TNT in air experienced several harmful health effects, including anemia and abnormal liver function. Similar blood and liver effects, as well as spleen enlargement and other harmful effects on the immune system, have been observed in animals that ate or breathed TNT. Other effects in humans include skin irritation after prolonged skin contact and cataract development after long-term (365 days or longer) exposure. It is not known whether TNT can cause birth defects in humans. However, male animals treated with high doses of TNT have developed serious reproductive system effects. Information from occupational exposure studies suggests that TNT may cause menstrual disorders and male impotency (Zakhari and Villaume 1978; Jiang et al. 1991).

No epidemiological evidence is available showing an association between chronic TNT exposure and tumorigenicity in humans. In animal carcinogenicity studies, a significant increase in urinary bladder papillomas and carcinomas was seen in rats. TNT is classified in weight-of-evidence Group C, possible human carcinogen.

Laboratory animal studies indicate that many of the occupational epidemiological findings occur across species and from oral as well as inhalation plus dermal exposures. Laboratory studies have shown anemia in both beagle dogs and rats following oral exposures, as well as enlarged livers, and spleens, testicular atrophy and altered semen morphology.

TNT has been shown to interact with other toxic agents including ethanol, which is synergistic with TNT in producing liver disease. RDX, another high explosive that occurs frequently with TNT in environmental and workplace settings, has complex interactions with TNT and can either be additive or antagonistic depending on the effect (Lewis 2001). For the OU 10-04 evaluation the effects of TNT and RDX are assumed to be additive.

7.2.4 Risk Characterization

The characterization of risk involves combining the results of the toxicity and exposure assessments to estimate health risks. These estimates are either a comparison of exposure levels with appropriate toxicity criteria or an estimate of the lifetime cancer risk associated with a particular intake. The nature and weight of evidence supporting the risk estimate, as well as the magnitude of uncertainty surrounding the estimate, also are considered in risk assessment.

To quantify human health risks, contaminant intakes are calculated for each contaminant by way of each applicable exposure route. As discussed above, these contaminant intakes are calculated values based on measured concentration estimates. To estimate human health risks, the contaminant-specific intakes are compared to the applicable chemical-specific toxicity data. The complete results of the BRA risk characterization process, including risk estimates for each retained site and groundwater and air pathway risks for each collection of sites, are presented in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001, Appendix E). The generalized equations for calculating carcinogenic risk and noncarcinogenic hazard quotients are given below.

7.2.4.1 Carcinogenic Health Effects. The following calculations are used to obtain numerical estimates (i.e., unitless probability) of lifetime cancer risks. The risk probability is the product of the intake and the slope factor, as follows:

$$Risk = Intake \times SF \tag{1}$$

where

Risk = Potential lifetime cancer risk (unitless)

Intake = Chemical intake (mg/kg/day), or radionuclide intake (pCi)

SF = Slope factor, for chemicals $(mg/kg/day)^{-1}$, or radionuclides $(pCi)^{-1}$.

To develop a total risk estimate for a given site, cancer risks are summed separately across all potential carcinogens at the site, as shown in the following calculation:

$$Risk_T = \sum Risk_i \tag{2}$$

where

$Risk_T$ = Total cancer risk, expressed as a unitless probability

$Risk_i$ = Risk estimate for the i^{th} contaminant.

Similarly, risk values for each exposure route are summed to obtain the total cancer risk for each potential carcinogen.

7.2.4.2 Noncarcinogenic Effects. Health risks associated with exposure to individual noncarcinogenic compounds are evaluated by calculating hazard quotients (HQ). The HQ is the ratio of the intake rate to the reference dose, as follows:

$$HQ = Intake / RfD \tag{4}$$

where

HQ = Noncarcinogenic hazard quotient (unitless)

Intake = Chemical intake (mg/kg/day)

RfD = Reference dose (mg/kg/day).

Hazard indices are calculated by summing hazard quotients for each chemical across all exposure routes. If the hazard index for any contaminant of potential concern exceeds unity, potential health effects may be a concern from exposure to the contaminant of potential concern. The hazard index is calculated using the following equation:

$$HI = \sum \frac{Intake_i}{RfD_i} \quad (5)$$

where

HI = Hazard index (unitless)

$Intake_i$ = Exposure level (intake) for the i^{th} toxicant (mg/kg/day)

RfD_i = Reference dose for the i^{th} toxicant (mg/kg/day).

In the foregoing equation, intake and reference dose are expressed in the same units and represent the same exposure time period.

7.2.4.3 UXO Risk Characterization. Risk values based on combining toxicity and exposure could not be calculated for the ordnance areas because of the nature of the contaminant. Ordnance sites are evaluated in terms of three main components or events: UXO encounter, UXO detonation, and consequences of UXO detonation. Areas with a high potential for UXO would present a greater human health risk than areas with only a potential for UXO, and an even lower hazardous risk would apply for those areas with no known ordnance activities. A UXO encounter considers the likelihood that a person will come across UXO and will influence the UXO through some level of force, energy, motion, or other means. A UXO detonation is the likelihood that a UXO will detonate once an encounter has occurred. Consequences of UXO detonation encompass a wide range of possible outcomes or results, including bodily injury or death, health risks associated with exposure to chemical agents, and environmental degradation caused by the actual explosion and dispersal of chemicals to air, soil, surface water, and groundwater. UXO encounters are relatively uncommon, casual human contact has never caused a detonation at the INEEL.

7.2.5 Qualitative Uncertainty Analysis

The risk assessment results are very dependent on the methodologies applied to develop the risk estimates. These analysis methods were developed over a period of several years by INEEL risk management and risk assessment professionals to provide realistic, yet conservative estimates of human health risks at OU 10-04. Nonetheless, if different risk assessment methods had been used, the BRA likely would have produced different risk assessment results. To ensure that the risk estimates are conservative (i.e., generate upper-bound risk estimates), health protective assumptions that tend to bound the plausible upper limits of human health risks were applied throughout the BRA. Therefore, risk estimates that may be calculated by other risk assessment methods are not likely to be significantly higher than the estimates developed for the OU 10-04 Comprehensive RI/FS.

Uncertainty in the BRA is produced by uncertainty factors in all four stages of risk analysis (i.e., data collection and evaluation, exposure assessment, toxicity assessment, and risk characterization). The uncertainties associated with parameters used in the risk assessment are listed in Table 3. The conservative assumptions and uncertainties in the risk estimates for the nine sites identified for remediation based on human health risk estimates in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001) are summarized in Table 4. Qualitative consideration of the collective impact of all the assumptions indicates that the risks are more likely to be overestimated than underestimated.

7.3 Ecological Risk Evaluation Summary

The WAG 6 and 10 ecological risk assessment (ERA) is a component of the phased approach developed for ERA at the INEEL. The results of the WAG 6 and 10 ERA were integrated into an INEEL-wide evaluation of potential risks to ecological receptors in the OU 10-04 RI/FS. The results and methodology of this evaluation can be found in Section 11 of this ROD. The ERA was conducted as outlined in the guidance for the INEEL (VanHorn, Hampton, and Morris 1995).

An ecological site and contaminant screening was conducted to determine which sites and contaminants would be subjected to further analysis in the OU 10-04 Comprehensive RI/FS. The screening was completed and documented as part of the Work Plan for OU 10-04 (DOE-ID 1999a). A site-by-site evaluation of the risks to ecological resources as a result of exposure to contaminants at OU 10-04 was developed in the RI/FS. The evaluation included a review of the screening completed in the Work Plan to ensure that sites or contaminants were not inappropriately omitted from further evaluation. Complete details of the ERA are presented in Appendices F and G of the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001). The primary components of the ERA, discussed below, include problem formulation, analysis, risk characterization, and transition to the INEEL-wide ERA.

7.3.1 Problem Formulation

The goal of the problem formulation step is to investigate the interactions between the stressor characteristics (i.e., contaminant characteristics), the ecosystem potentially at risk, and the potential ecological effects (EPA 1992b). Site screening was conducted to identify the sites that could pose unacceptable risk. Of the 50 sites in OU 10-04, 29 were retained for quantitative evaluation in the ERA.

Contaminant screening and data evaluation were conducted to identify contaminants of potential concern and define exposure point concentrations. For the most part, the results of the data evaluation conducted for the human health BRA (see Section 7.2.1) were applied to the ERA. For those contaminants that were not retained for evaluation in the human health risk assessment, additional data evaluation to support the completion of the ERA was performed. Contaminant concentrations were compared to background concentrations and ecologically based screening levels. All radioactive contaminants were eliminated on the basis of this comparison.

Table 3. Human health baseline risk assessment uncertainty factors.

Uncertainty Factor	Effect of Uncertainty	Comment
Source term assumptions	May overestimate risk.	All contaminants are assumed completely available for transportation away from the source zone. In reality, some contaminants may be chemically or physically bound to the source zone and unavailable for transport.
Natural infiltration rate	May overestimate risk.	A conservative value of 10 cm/year was used for this parameter.
Moisture content	May overestimate or underestimate risk.	Soil moisture contents vary seasonally in the upper vadose zone and may be subject to measurement error.
Water table fluctuations	May slightly overestimate or underestimate risk.	The average value used is expected to be representative of the depth over the 30-year exposure period.
The mass of contaminants in soil was estimated by assuming a uniform contamination concentration in the source zone.	May overestimate or underestimate risk.	While not likely, most of the mass of a given contaminant at a given site may exist in a hotspot that was not detected by sampling. Such a condition could result in underestimating the mass of the contaminant used in the analysis. Assigning zero values to concentrations below detection limits also may cause mass to be underestimated. However, the 95% upper confidence limit on the mean (UCL) or the maximum detected contamination levels were used for all mass calculations. These concentrations are assumed to exist at every point in each waste site; therefore, the mass of contaminants used in the analysis is probably overestimated.
Plug flow assumption in groundwater transport	May overestimate or underestimate risk.	Plug flow models such as GWSCREEN (Rood 1994) are conservative relative to concentrations because dispersion is neglected and mass fluxes from the source to the aquifer differ only by the time delay in the unsaturated zone (the magnitude of the flux remains unchanged). For nonradiological contaminants, the plug flow assumption is conservative because dispersion is not allowed to dilute the contaminant groundwater concentrations. For radionuclides, the plug flow assumption may or may not be conservative. Based on actual travel time, the radionuclide groundwater concentrations could be overestimated or underestimated because a longer travel time allows for more decay. If the concentration decrease from the travel time delay is larger than the neglected dilution from dispersion, the model will not be conservative.
Chemical form assumptions	May overestimate or underestimate risk.	In general, the methods and inputs used in contaminant migration calculations, including assumptions about chemical forms of contaminants, were chosen to err on the protective side. All contaminant concentration and mass are assumed available for transport. This assumption results in a probable overestimate of risk.

Table 3. (continued).

Uncertainty Factor	Effect of Uncertainty	Comment
Exposure scenario assumptions	May overestimate risk.	The likelihood of future scenarios has been qualitatively evaluated as follows: Resident—improbable Industrial—credible. The likelihood of future residential development at the INEEL is small. If future residential use of this site does not occur, then the risk estimates calculated for future residents are likely to overestimate the risk associated with future use of this site.
Exposure parameter assumptions	May overestimate risk.	Assumptions about media intake, population characteristics, and exposure patterns may not characterize actual exposures.
Receptor locations	May overestimate risk.	Groundwater ingestion risks are calculated for a point at the downgradient edge of an equivalent rectangular area. The groundwater risk at this point is assumed to be the risk from groundwater ingestion at every point within WAG 6 and 10 boundaries. Changing the receptor location will affect only the risks calculated for the groundwater pathway because all other risks are site specific or assumed constant at every point within the WAG 6 and 10 boundaries.
For the groundwater pathway analysis, homogeneous distribution in a large mass of soil was assumed for all contaminants.	May overestimate or underestimate risk.	Homogeneous distribution in the soil volume beneath WAGs 6 and 10 is assumed for the total mass of each contaminant of potential concern. This assumption tends to maximize the estimated groundwater concentrations produced by the contaminant inventories because homogeneously distributed contaminants would not have to travel far to reach a groundwater well drilled anywhere within the WAG 6 or 10 boundary. However, groundwater concentrations may be underestimated for a large mass of contamination (located in a small area with a groundwater well drilled directly downgradient).
The entire inventory of each contaminant was assumed to be available for transport along each pathway.	May overestimate risk.	Only a portion of the inventory of each contaminant will be transported by each pathway.
Exposure duration	May overestimate risk.	The assumption that an individual will work or reside at a site for 25 or 30 years is conservative. Short-term exposures involve comparison to subchronic toxicity values, which are generally less restrictive than chronic values.
Conservative values were used to represent constants not dependent on contaminant properties.	May overestimate risk.	Conservative or upper-bound values were used for all parameters incorporated into intake calculations.
Some hypothetical pathways were excluded from the exposure scenarios.	May underestimate risk.	Exposure pathways are considered for each scenario and eliminated only if the pathway is either incomplete or negligible compared to other evaluated pathways.
Biotic decay was not considered.	May overestimate risk.	Biotic decay would tend to reduce contamination over time.

Table 3. (continued).

Uncertainty Factor	Effect of Uncertainty	Comment
Occupational intake value for inhalation is conservative.	May slightly overestimate risk.	Standard exposure factors for inhalation have the same value for occupational as for residential scenarios though occupational workers would not be onsite all day.
Use of cancer slope factors	May overestimate risk.	Slope factors are associated with 95% UCLs. They are considered unlikely to underestimate risk.
Toxicity values were derived primarily from animal studies for nonradioactive contaminants.	May overestimate or underestimate risk.	Extrapolation from animal to humans may induce error from differences in absorption, pharmacokinetics, target organs, enzymes, and population variability.
Toxicity values were derived primarily from high doses; however, most exposures are at low doses.	May overestimate or underestimate risk.	Linearity was assumed at low doses. The effect tends toward conservative exposure assumptions.
Toxicity values and classification of carcinogens	May overestimate or underestimate risk.	Not all values represent the same degree of certainty. All are subject to change as new evidence becomes available.
Lack of slope factors	May underestimate risk.	Contaminants of potential concern without slope factors may or may not be carcinogenic through the oral pathway.

Table 4. Summary of site-specific uncertainties and conservative assumptions for the human health baseline risk assessment.

Site	Uncertainties and Conservative Assumptions
Naval Proving Ground	This large area encompasses several (23) identified smaller areas. These areas include; CFA-633 Naval Firing Site and Downrange Area; CFA Gravel Pit; CFA Sanitary Landfill Area; Naval Ordnance Disposal Area (NODA) ; Explosive Storage Bunkers north of INTEC; National Oceanic & Atmospheric Administration site (NOAA) ; Fire Station II Zone & Range Fire Burn Area; Anaconda Power Line; Old Military Structure; Mass Detonation Area; Dairy Farm Revetments; Experimental Field Station; UXO east of TRA; Burn Ring south of Experimental Field Station; Igloo-Type Structures northwest of Experimental Field Station; Rail Car Explosion Area; UXO east of ARVFS; projectiles found near mile markers 17 and 19; Land Mine Fuze Burn Area; ordnance and dry explosives east of the Big Lost River; zone east of the Big Lost River; dirt mounds near the Experimental Field Station, NOAA, and NRF; and craters east of INTEC.
	Following the OU 10-04 Work Plan, more ordnance have been located within the Naval Proving Ground (325 square miles). Because much of the land falling within the Naval Proving Ground has not been well characterized, the possibility for detecting more UXO is high. Estimation of risk for potential UXO based on the currently known ordnance areas would underestimate the total risk.
	The boundaries for the firing fan of the Naval Proving Ground have not yet been clearly defined. The potential for undetected UXO is assumed to be over the entire area. This conservative assumption would probably lead to an overestimation of risk.
	Ground surveys used to detect potential UXO have already been carried out for a few of the smaller ordnance areas listed above; however, because of the uncertainties in the detection methods, the success of these surveys are not 100% effective. There remains a risk for additional UXO to be located in six ordnance areas where "live" ordnance is known to have been used. These areas include: NODA, NOAA, Mass Detonation Area (MDA), Experimental Field Station, Rail Car Explosion Area, and Land Mine Fuze Burn Area.
	UXO buried below the surface soil may become exposed to the ground surface through erosion or frost heave, which would lead to an underestimation of risk.
	Risk values could not be calculated for this site similar to those sites with chemical or radiological contamination.
Arco High Altitude Bombing Range	No UXO has been found in this area; however, there is a potential for UXO to be located within the subsurface soil at this site. This conservative assumption could lead to an overestimation of risk.
	UXO buried below the surface soil may become exposed to the ground surface through erosion or frost heave, which would lead to an underestimation of risk.
	Risk values could not be calculated for this site because the contaminant (UXO) is not a quantifiable chemical.

Table 4. (continued).

Site	Uncertainties and Conservative Assumptions
Naval Ordnance Disposal Area	The 95% UCL or maximum contaminant concentrations were assumed to exist over a large portion of the sampling . This conservative assumption would probably lead to an overestimation of risk.
	Sampling was performed at various depths throughout the area. For the risk assessment, homogeneous contaminant concentrations were assumed for the entire soil interval to the furthest sample depth taken. This assumption may overestimate the risk.
	Sampling was concentrated in the craters where the greatest amount of ordnance activity took place, which would lead to an overestimation in risk.
	Samples were taken directly from the stained soil, but TNT and RDX chunks were intentionally avoided. This would lead to an underestimation in risk at this site.
	TNT or RDX buried below the surface soil may become exposed to the ground surface through erosion or frost heave, which would lead to an underestimation of risk.
National Oceanic & Atmospheric Administration	The 95% UCL or maximum contaminant concentrations were assumed to exist over a large portion of the sampling grid. This conservative assumption would probably lead to an overestimation of risk.
	Sampling was performed at various depths throughout the area. For the risk assessment, homogeneous contaminant concentrations were assumed for the entire soil interval to the furthest sample depth taken. This assumption may overestimate the risk.
	Samples were taken directly from the stained soil, but TNT and RDX chunks were intentionally avoided. This would lead to an underestimation in risk at this site.
	TNT or RDX buried below the surface soil may become exposed to the ground surface through erosion or frost heave, which would lead to an underestimation of risk.
Twin Buttes Bombing Range	No UXO has been found in this area, however there is a potential for UXO to be located within the subsurface soil at this site. This conservative assumption could lead to an overestimation of risk.
	UXO buried below the surface soil may become exposed to the ground surface through erosion or frost heave, which would lead to an underestimation of risk.
	Risk values could not be calculated for this site because the contaminant (UXO) is not a quantifiable chemical.

Table 4. (continued).

Site	Uncertainties and Conservative Assumptions
Fire Station II Zone & Range Fire Burn Area	The 95% UCL or maximum contaminant concentrations were assumed to exist over the entire site. This conservative assumption would probably lead to an overestimation of risk.
	Sampling was performed at various depths throughout the area. For the risk assessment, homogeneous contaminant concentrations were assumed for the entire soil interval to the furthest sample depth taken. This assumption may overestimate the risk.
	Samples were taken directly from the stained soil, but TNT and RDX chunks were intentionally avoided. This would lead to an underestimation in risk at this site.
	TNT or RDX buried below the surface soil may become exposed to the ground surface through erosion or frost heave, which would lead to an underestimation of risk.
Experimental Field Station	The 95% UCL or maximum contaminant concentrations were assumed to exist over a large portion of the sampling grid. This conservative assumption would probably lead to an overestimation of risk.
	Sampling was performed at various depths throughout the area. For the risk assessment, homogeneous contaminant concentrations were assumed for the entire soil interval to the furthest sample depth taken. This assumption may overestimate the risk.
	Samples were taken directly from the stained soil, but TNT and RDX chunks were intentionally avoided. This would lead to an underestimation in risk at this site.
	TNT or RDX buried below the surface soil may become exposed to the ground surface through erosion or frost heave, which would lead to an underestimation of risk.
Land Mine Fuze Burn Area	The 95% UCL or maximum contaminant concentrations were assumed to exist over the entire site. This conservative assumption would probably lead to an overestimation of risk.
	Sampling was performed at various depths throughout the area. For the risk assessment, homogeneous contaminant concentrations were assumed for the entire soil interval to the furthest sample depth taken. This assumption may overestimate the risk.
	Samples were taken directly from the stained soil, but TNT and RDX chunks were intentionally avoided. This would lead to an underestimation in risk at this site.
	TNT or RDX buried below the surface soil may become exposed to the ground surface through erosion or frost heave, which would lead to an underestimation of risk.

Table 4. (continued).

Site	Uncertainties and Conservative Assumptions
STF-02: Security Training Facility (STF) Gun Range	The 95% UCL or maximum contaminant concentrations were assumed to exist over the entire site. This conservative assumption would probably lead to an overestimation of risk. In the absence of historical disposal data, the contaminant mass associated with the site was estimated based on source term volume and detected concentrations. This approach may result in an underestimate of risk. No risk values were calculated for this site because the maximum detected concentration for lead, 24,400 mg/kg, was well above the EPA's (1994 screening level value (400 mg/kg).

Site-specific data characterizing contaminant concentration in biota for the INEEL ERAs are sparse. Consequently, the definition of assessment and measurement endpoints (i.e., ecological receptors) is based primarily on pathway and exposure analyses. Pathway and exposure models for contaminated surface and subsurface media (see Figures 10 and 11) were combined with a food web analysis to characterize the potential risks illustrated in the ERA conceptual site model (see Figure 9).

7.3.2 Analysis

In the analysis component of the ERA, the likelihood and significance of an adverse reaction from exposure to stressors were evaluated. The exposure assessment involves relating contaminant migration to exposure pathways for ecological receptors. The behavior and fate of contaminants of potential concern in the terrestrial environment were presented in a general manner because formal fate and transport modeling was not conducted for the WAG ERA (DOE-ID 2001). The ecological effects assessment consisted of a hazard evaluation and a dose-response assessment. The hazard evaluation involved a comprehensive review of toxicity data for contaminants to identify the nature and severity of toxic properties. The dose from multiple media (surface and subsurface soil) identified at WAG 6 and 10 sites was developed and used to assess the potential risk to receptors. Because dose-based toxicological criteria exist for few ecological receptors, development of appropriate toxicity reference values (TRVs) was necessary for the contaminants and functional groups at the INEEL. A semi-quantitative analysis was used, augmented by qualitative information and professional judgment as necessary.

Exposures for each functional group, threatened or endangered species, and sensitive species were estimated based on site-specific life history and, when possible, feeding habits. Quantification of group and individual exposures incorporated species-specific numerical exposure factors including body weight, ingestion rate, and the fraction of diet composed of vegetation or prey and soil consumed from the affected area. Parameters used to model contaminant intakes by the functional groups were derived from a combination of parameters that produced the most conservative overall exposure for the group. Parameter values and associated information sources are discussed in further detail in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001, Appendix F). The development of the TRVs for those contaminants targeted for remediation based on unacceptable ecological risks is described below.

7.3.2.1 1,3-Dinitrobenzene. 1,3-Dinitrobenzene (1,3-DNB) is one of several compounds that have been released to the environment during the manufacture of explosives and in load, assembly, and pack activities at military installations. The compound has a close structural relationship with the military explosive TNT, of which 1,3-DNB is a manufacturing by-product and an environmental degradation product.

1,3-DNB appears to be a neurological toxicant, with pronounced histopathological lesions induced in various regions of the brain as a consequence of acute dosing (Philbert et al. 1987). Numerous investigators have also studied the adverse effects of 1,3-DNB on male rat reproductive function (USEPA 1991b). These effects include Sertoli cell damage, damage to the seminiferous epithelium, reduction in late pachytene spermatocytes, decreased testicular weights, impairments in sperm morphology and motility, and reduced fertility. The lowest acute and subchronic doses associated with these effects were 15 mg/kg and 0.54 mg/kg/day, respectively. Adequate chronic data and information on effects about the female reproductive system were not available (USACE 1993). Other adverse effects associated with exposure to 1,3-DNB are decreased growth rate, weight loss, anemia, methemoglobinemia, nephropathy, and cyanosis (HSDB 2000). DNB is readily absorbed through the skin. The primary routes of metabolism involve reduction of the nitro groups and oxidation of the aromatic ring to a phenol, and data suggest that excretion is predominantly by the urinary tract (Layton et al. 1987). Results from rat studies were used to develop mammalian TRVs (Cody et al., 1981).

Due to the lack of toxicity data for birds, TRVs could not be developed for avian species. However, as reported by researchers with the U.S. Fish and Wildlife Service (Schafer, 1972; Schafer et al., 1983) LD_{50}s for RDX in Red-winged Blackbirds (*agelaius phoeniceus*) and European Starlings (*Sturnus vulgaris*) were 42 and >100 mg/kg, respectively.

7.3.2.2 Lead. Lead is a ubiquitous trace constituent in rocks, soil, plants, water, and air. Lead is neither essential nor beneficial to living organisms. For plants, the recommended screening benchmark concentration for phytotoxicity in soil for lead of 50 mg/kg was used as the TRV for terrestrial plants (Suter, Will, and Evans 1993).

In birds and mammals, lead affects the kidneys, blood, bone, and the central nervous system. Ingestion of lead shot is a significant cause of mortality among waterfowl that are partially or completely protected by law. Lead toxicity varies widely with the form and dose of administered lead. Generally, organic compounds are more toxic than inorganic compounds. For avian herbivores, a TRV was estimated using a study of mallards (Dieter and Finley 1978). The results of studies of avian insectivores (Eisler 1988), European starlings (Osborn, Eney, and Bull 1983), and American kestrels (*Falco sparverius*) (Colle et al. 1980) were used to develop TRVs for avian functional groups. Studies of rats administered lead in drinking water (Kimmel et al. 1980), lead toxicity of calves (Zmudzki et al. 1983), and lead toxicity of dogs (DeMayo et al. 1982) were used to develop TRVs for mammalian receptors.

7.3.2.3 RDX. RDX is a white, crystalline powder and is one of the most powerful and widely used military explosives. It can be used as base charge for detonators or as an ingredient of bursting charges and plastic explosives.

Data indicate there is no bioconcentration of RDX in plants, with metabolism and release to the atmosphere being the primary sources of clearance from plant tissues. In addition, there are no data to indicate biomagnification of RDX in fish and other animal tissues (ATSDR 1995).

RDX elicits similar toxic responses across a variety of species following both oral and inhalation exposures. The primary toxicity is the production of seizures following both acute and chronic exposures. Chronic exposure of rats to doses of RDX that are below the threshold to produce seizures, however, have been shown to enhance the potential for other epileptogenic stimuli to produce seizures. Other toxic effects occurring less reliably include changes in a variety of circulatory systems components. These have included anemia manifested by reduction in red blood cells, hemoglobin, and hematocrit.

Rats, mice, and dogs exposed to high single oral doses show central nervous toxicity, labored breathing and convulsions (EPA 1988a). The expression of toxicity depends on the particle size of the RDX preparation, with fine powders showing the greatest effect (Schneider et al. 1977). Based on chronic dietary studies, the rat lowest observed adverse effect level (LOAEL) (associated with prostate inflammation) was 1.5 mg/kg/day (Levine et al. 1983a) and the mouse LOAEL (associated with testicular atrophy) was 35 mg/kg/day. These doses resulted in hyperirritability, weight loss, convulsions, and severe gastrointestinal irritation (von Oettingen et al. 1949).

Rats show an increase in mortality following gestational exposure to 20 mg/kg/day (Burdette, et al., 1988) and chronic exposure to 40 mg/kg/day (Army, 1983). At 300 mg/kg/day, all rats died within 3 weeks (Levine, et al., 1990). Lethality of RDX has also been demonstrated following oral administration in other species including the mouse (80 to 500 mg/kg), cat (100 mg/kg), and rabbit (500 mg/kg). Intravenous administration has been acutely lethal in the guinea pig (25 mg/kg) and the dog (40 mg/kg) (Etnier 1989). Mammalian TRVs were developed from rat studies. However, for the lack of toxicity data avian TRVs could not be developed for birds.

7.3.2.4 TNT. 2,4,6-Trinitrotoluene is a manmade, yellow crystalline solid used as a high explosive in military armaments and as a chemical intermediate in the manufacture of dyestuffs and photographic chemicals.

TNT is absorbed through the gastrointestinal tract, skin, and lungs; is distributed primarily to the liver, kidneys, lungs, and fat, and is excreted mainly in the urine and bile (El-hawari et al. 1981). In animals, signs of acute toxicity to TNT include ataxia, tremors, and mild convulsions. Splenic hemosiderosis, leukopenia, thrombocytosis, slight hepatomegaly, and increase in kidney weight occurred in mice fed a dietary level equivalent to 700 mg TNT/kg/day for 28 days (Levine et al.1984b). Oral LD50 values of 660 to 1320 mg/kg have been reported for rats (Dilley et al. 1982).

The primary target organs for TNT toxicity in experimental animals following subchronic and chronic oral exposures are (1) liver (hepatocytomegaly and cirrhosis), (2) blood (hemolytic anemia with secondary alterations in the spleen), and (3) testes (degeneration of the germinal epithelium lining the seminiferous tubules). The LOAEL for hepatotoxicity in dogs was 0.5 mg/kg/day (Levine et al.1990a). Chronic oral toxicity studies on rats have also demonstrated TNT-induced anemia and hepatotoxicity, as well as adverse effects on the kidney (hypertrophy and nephropathy) and sternal bone marrow fibrosis (Furedi et al. 1984a). The reference dose (RfD) for chronic oral exposures, 0.0005 mg/kg/day, is based on a LOAEL of 0.5 mg/kg/day for liver effects in dogs (EPA 1991b).

Laboratory animal studies indicate that many of the occupational epidemiological findings occur across species and from oral as well as inhalation plus dermal exposures. Laboratory studies have shown anemia in both beagle dogs and rats following oral exposures, as well as enlarged livers, and spleens, testicular atrophy and altered semen morphology. Mammalian TRVs were developed from rat studies. However, for the lack of toxicity data avian TRVs could not be developed for birds.

7.3.3 Risk Characterization

Risk characterization is the final step of the WAG ERA process. The risk evaluation determines whether risk is indicated from the contaminant concentrations and the calculated dose for the INEEL functional groups, threatened or endangered species, and species of concern and considers the uncertainty inherent in the assessment. For a WAG ERA, the risk characterization step has two components: a description of the estimation of risk and a summary of the results.

Risk is estimated by comparing the calculated dose to the TRV. If the dose from the contaminant does not exceed its TRV (i.e., if the HQ is less than 1.0 for nonradiological contaminants), adverse effects to ecological receptors from exposure to that contaminant are not expected and no further evaluation of that contaminant is required. Hence, the HQ is an indicator of potential risk. Hazard quotients are calculated using the following equation:

$$HQ = \frac{Dose}{TRV} \quad (6)$$

where

HQ = Hazard quotient (unitless)

$Dose$ = Dose from all media (mg/kg/day or pCi/g/day)

TRV = Toxicity reference value (mg/kg/day or pCi/g/day).

Hazard quotients were derived for all contaminants, functional groups, threatened or endangered species, and species of concern identified for each site of concern. The largest observed HQ across all species within WAG 6 and 10 varies by at least three orders of magnitude. When information is not available to derive a TRV, then an HQ cannot be developed for that particular contaminant and functional group or species combination.

An HQ greater than the threshold value of 1 indicates that exposure to a given contaminant, at the concentrations and for the duration and frequencies of exposure estimated in the exposure assessment, may cause adverse health effects in exposed populations. However, the level of concern associated with exposure may not increase linearly as the HQ values exceed the threshold value. Therefore, the HQs cannot be used to represent a probability or a percentage because an HQ of 10 does not necessarily indicate that adverse effects are 10 times more likely to occur than an HQ of 1. It is only possible to infer that the greater the HQ, the greater the concern about potential adverse effects to ecological receptors.

In general, the significance of an HQ exceeding 1 depends on the perceived "value" (i.e., ecological, social, or political) of the receptor (or species represented by that receptor), the nature of the endpoint measured, and the degree of uncertainty associated with the process as a whole. Therefore, the decision to take no further action, order corrective action, or perform additional assessment must be determined on a site-, chemical-, and species-specific basis. With the exception of threatened or endangered species (EPA 1992b), the unit of concern in ERA is usually the population as opposed to the individual. Therefore, exceeding conservative screening criteria does not necessarily mean that significant adverse effects to populations of receptors are likely.

Seventeen sites with HQs in excess of 10 were identified in the WAG 6 and 10 ERA. As shown in Table 5, an additional screening was performed in which contaminants were eliminated from further evaluation for either of two reasons: (1) the exposure point concentration did not exceed the INEEL background concentration, or (2) the HQ was less than 10. The INEEL-wide ecological risk assessment conducted under the OU 10-04 comprehensive investigation considered the OU 10-04 sites eliminated in the additional screening: BORAX-01, BORAX-09, CPP-66, LCCDA-01, LCCDA-02, OMRE-01, CFA-633 Naval Firing Site and Downrange Area, UXO East of TRA, Burn-Ring South of Experimental Field Station, Rail Car Explosion Area, and Craters East of INTEC. Information from the INEEL-wide monitoring will be considered in the 5-year remedy reviews for WAGs 6 and 10. If indicated, additional remediation to protect ecological receptors from contamination at these sites will be considered.

Six sites, NODA, NOAA, Fire Station II Zone and Range Fire Burn Area, Experimental Field Station, Land Mine Fuze Burn Area, and STF-02, were retained for evaluation of remedial alternatives in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001) to address ecological HQs in excess of 10. Because these sites are small, it is less expensive to remediate than it is to characterize further. All six of these sites also exceed the human health risk thresholds.

UXO does not typically pose a risk to ecological receptors. Encounters ecological receptors may have with UXO are typically brief, and detonation does not occur from casual contact. It is unlikely that an animal could strike an UXO with enough force for detonation. Additionally, the loss of individual members of animal populations does not represent an unacceptable ecological risk.

Principal sources of uncertainty apply to the use of data not specifically collected for ERA and the development of the exposure assessment. Uncertainties inherent in the exposure assessment are associated with estimation of receptor ingestion rates, selection of acceptable HQs, estimation of site usage, and estimation of risk assessment parameters (e.g., plant uptake factors and bioaccumulation factors). Additional uncertainties are associated with the depiction of site characteristics, the determination of the nature and extent of contamination, and the derivation of TRVs. A large area of uncertainty is the inability to evaluate risk to many receptors because of the lack of appropriate toxicity data for many chemicals. This is especially a problem for certain receptors such as reptiles. In addition, because of the conservative nature of assumptions made to compensate for the lack of site-specific uptake and

Table 5. Results of OU 10-04 ecological contaminant screening against concentrations equivalent to a hazard quotient of 10.

Site	Contaminant	Maximum Concentration (mg/kg)	95% UCL (mg/kg)	INEEL Background (mg/kg)	Maximum Hazard Quotient	Comment	Considered for WAG 6 & 10 Remediation?
BORAX-01	Cadmium	6.90E+00	7.11E+00	2.20E+00	8.00E+02[a]	—	no
	Cobalt	1.52E+01	3.13E+01	1.10E+01	8.00E+00	Below background	no
	Mercury	7.00E-01	—	5.00E-02	2.00E+00	HQ < 10	no
BORAX-09	Manganese	4.97E+02	3.99E+02	4.90E+02	1.00E+01	Below background	no
	Mercury	1.20E+00	2.55E+00	5.00E-02	6.00E+00	HQ < 10	no
CPP-66	Boron	5.11E+01	9.03E+01	NA	1.00E+02[b]	—	no
	Copper	2.31E+01	2.33E+01	2.20E+01	8.00E+00	HQ < 10	no
	Strontium	1.63E+02	1.68E+02	NA	1.00E+01	HQ = 10	no
LCCDA-01	Barium	3.84E+02	3.23E+02	3.00E+02	5.00E+00	HQ < 10	no
	Cobalt	1.17E+01	1.07E+01	1.10E+01	4.00E+00	Below background	no
	Copper	2.40E+01	2.42E+01	2.20E+01	1.00E+00	HQ < 10	no
	Manganese	6.83E+02	6.36E+02	4.90E+02	1.00E+01	HQ = 10	no
LCCDA-02	Copper	2.70E+01	—	2.20E+01	1.00E+00	Below background	no
	Manganese	5.45E+02	—	4.90E+02	6.00E+00	Below background	no
OMRE-01	Chrysene	2.55E+03	—	NA	2.00E+02[c]	—	no
CFA-633	2,4,6-Trinitrotoluene	3.07E+02	6.43E+00	NA	2.00E+00	HQ < 10	no
	HMX	2.55E+01	4.18E+04	NA	4.00E+00	HQ < 10	no
	RDX	5.00E+01	6.30E+00	NA	7.00E+01[d]	—	no
NODA	1,3-Dinitrobenzene	6.00E+00	2.77E-01	NA	2.00E+00	HQ < 10	no
	Barium	4.56E+02	2.21E+02	3.00E+02	9.00E+01	Below background	no
	Cadmium	9.20E+00	2.01E+00	2.20E+00	5.00E+02	Below background	no
	Chromium	6.76E+01	3.02E+01	3.30E+01	5.00E+00	Below background	no
	Cobalt	1.71E+01	8.85E+00	1.10E+01	7.00E+01	Within the range of regional background	no
	Copper	4.86E+02	9.55E+01	2.20E+01	3.00E+01[e]	—	no
	Lead	1.79E+03	3.63E+01	1.70E+01	5.00E+00	HQ < 10	no
	Manganese	1.29E+03	3.50E+02	4.90E+02	2.00E+01	Within the range of regional background	no
	Mercury	1.90E+00	3.03E-01	5.00E-02	8.00E+00	HQ < 10	no
	Nitrate	1.10E+02	8.09E+01	NA	3.00E+00	HQ < 10	no
	Pentachlorophenol	1.00E+00	1.81E+00	NA	3.00E+00	HQ < 10	no
	RDX	**3.28E+02**	**4.88E+02**	**NA**	**4.00E+03**	**—**	**YES**
	Strontium	8.18E+01	6.44E+01	NA	4.00E+00	HQ < 10	no
	TPH-Diesel	1.20E+03	1.46E+04	NA	8.00E+01[f]	—	no
	Vanadium	6.07E+01	2.66E+01	4.50E+01	1.00E+01	Below background	no
	Zinc	3.62E+02	1.66E+02	1.50E+02	1.00E+01	HQ = 10	no
NOAA	**1,3-Dinitrobenzene**	**2.70E+01**	**2.26E+04**	**NA**	**2.00E+02**	**—**	**YES**
	1,3,5-Trinitrobenzene	7.70E+01	1.74E+11	NA	2.00E+00	HQ < 10	no
	2,4,6-Trinitrotoluene	**1.70E+04**	**8.64E+02**	**NA**	**5.00E+02**	**—**	**YES**
	Nitrate	4.10E+02	4.39E+02	NA	5.00E+00	HQ < 10	no
	Nitrite	1.15E+02	2.99E+02	NA	2.00E+00	HQ < 10	no
	RDX	**5.30E+01**	**1.17E+00**	**NA**	**2.00E+01**	**—**	**YES**

Table 5. (continued).

Site	Contaminant	Maximum Concentration (mg/kg)	95% UCL (mg/kg)	INEEL Background (mg/kg)	Maximum Hazard Quotient	Comment	Considered for WAG 6 & 10 Remediation?
Fire Station II Zone & Range Fire Burn	**2,4,6-Trinitrotoluene**	**1.30E+02**	**1.38E+03**	**NA**	**4.00E+01**	**—**	**YES**
	Copper	2.47E+01	2.42E+01	2.20E+01	3.00E+00	HQ < 10	no
	Nitrate	3.40E+02	4.49E+02	NA	5.00E+00	HQ < 10	no
	RDX	**3.70E+00**	**1.25E+06**	**NA**	**4.00E+01**	**—**	**YES**
	TPH-Diesel	1.20E+02	4.02E+03	NA	8.00E+00	HQ < 10	no
Experimental Field Station	**1,3-Dinitrobenzene**	**1.40E+01**	**1.75E+02**	**NA**	**8.00E+01**	**—**	**YES**
	1,3,5-Trinitrobenzene	8.00E+01	1.91E+03	NA	2.00E+00	HQ < 10	no
	2,4,6-Trinitotoluene	**1.10E+03**	**4.72E+05**	**NA**	**3.00E+02**	**—**	**YES**
	4-Amino-2,6-Dinitrotoluene	1.40E+01	2.60E+02	NA	2.00E+00	HQ < 10	no
	Nitrate	5.30E+02	4.06E+02	NA	4.00E+00	HQ < 10	no
	Nitrite	9.20E+01	8.14E+01	NA	1.00E+00	HQ < 10	no
UXO East of TRA	2,4,6-Trinitrotoluene	4.60E+00	2.42E+01	NA	1.00E+00	HQ < 10	no
	Nitrate	2.10E+02	2.30E+02	NA	3.00E+00	HQ < 10	no
	Nitrite	7.50E+01	6.27E+01	NA	1.00E+00	HQ < 10	no
Burn Ring South	Chromium	3.75E+01	3.89E+01	3.30E+01	7.00E+01	HQ < 10	no
	Cobalt	1.12E+01	1.11E+01	1.10E+01	5.00E+00	Within the range of background	no
	Copper	3.71E+01	3.98E+01	2.20E+01	3.00E+00	HQ < 10	no
	Nitrate	3.10E+02	3.86E+02	NA	1.00E+00	HQ < 10	no
	Zinc	2.71E+03	20.6E+08	1.50E+02	8.00E+01[g]	—	no
Rail Car Explosion	Nitrate	3.70E+02	3.46E+02	NA	5.00E+00	HQ < 10	no
	Nitrite	1.10E+02	1.16E+02	NA	2.00E+00	HQ < 10	no
	Thallium	6.90E-01	5.38E-01	4.30E-01	3.00E+00	HQ < 10	no
Land Mine Fuze Burn	**1,3-Dinitrobenzene**	**1.30E+03**	**—**	**NA**	**4.00E+03**	**—**	**YES**
	2,4-Dinitrotoluene	1.30E+03	—	NA	2.00E+02[h]	—	no
	2,4,6-Trinitrotoluene	**6.90E+04**	**1.74E+14**	**NA**	**1.00E+04**	**—**	**YES**
	Lead	1.73E+01	1.63E+01	1.70E+01	2.00E+00	Below background	no
	Nitrate	1.60E+03	3.99E+04	NA	5.00E+00	HQ < 10	no
	Selenium	2.2E+00	1.65E+00	2.20E-01	2.00E+00	HQ < 10	no
	TPH-Diesel	1.51E+02	8.29E+02	NA	5.00E+00	HQ < 10	no
	Zinc	4.46E+02	1.32E+03	1.50E+02	1.00E+01	HQ = 10	no
Craters east of ICPP	Nitrate	2.60E+02	2.65E+02	NA	4.00E+00	HQ < 10	no
	Selenium	1.20E+00	9.15E-01	2.20E-01	2.00E+00	HQ < 10	no
STF-02	Antimony	1.49E+01	1.82E+01	4.80E+00	4.00E+00	HQ < 10	no
	Copper	1.85E+02	5.42E+01	2.20E+01	1.00E+01	HQ = 10	no
	Lead	**2.44E+04**	**1.54E+05**	**1.70E+01**	**2.00E+03**	**—**	**YES**
	Manganese	5.30E+02	4.74E+02	4.90E+02	2.00E+01	Below background	no
	Zinc	4.22E+02	1.09E+02	1.50E+02	8.00E+00	Below background	no

Table 5. (continued).

Site	Contaminant	Maximum Concentration (mg/kg)	95% UCL (mg/kg)	INEEL Background (mg/kg)	Maximum Hazard Quotient	Comment	Considered for WAG 6 & 10 Remediation?

Sites BORAX-01, BORAX-09, CPP-66, LCCDA-01, LCCDA-02, OMRE-01, and the following ordnance areas (CFA-633, UXO east of TRA, Burn Ring South, Rail Car Explosion, and Craters east of ICPP) were evaluated in the INEEL-wide ecological risk assessment.

a. This COPC is found at a depth that would not pose a significant risk to the species of concern.

b. Boron was eliminated as a COPC because the only receptor with HQs greater than 10 was plants. This is a limited area and should not adversely affect the populations of plants in this area.

c. Chrysene was eliminated as a COPC because the two maximum chrysene samples, used to determine the EPCs, were associated with degraded asphalt giving an unrealistically elevated concentration for this compound (see discussion in Section 2.2 of Appendix J in the OU 10-04 Comprehensive RI/FS [DOE-ID 2001]). No significant risk is expected to occur from this COPC.

d. The risk evaluation indicates that the CFA-633 Naval Firing Site and Downrange Area have some potential for risk to ecological receptors from RDX. However, during sampling it was discovered that detected amounts of RDX were localized in smaller soil clusters, but that it is unlikely to present a widespread exposure hazard. The modeling weighted averages would have overestimated the risks for RDX. CFA-633 is highly disturbed area and does not provide desirable habitat. RDX is the only COPC at this site presenting any potential for risk. This contaminant is unlikely to pose an unacceptable risk to ecological receptors and should not be considered a risk driver at this site. These COPCs will no longer be evaluated in this ERA. However, because there is some potential for risk from exposure to RDX this COPC was further evaluated in the Site-wide ERA.

e. Four sample results for copper were removed from the data set before the exposure point concentrations (EPCs) were calculated. These samples were removed because they were representative of “hot spots.” These four sample results have concentrations ranging from 24,000 to 772 mg/kg. Several other sample results showed levels above background, but they were significantly less in concentration. Therefore, risk from exposure to copper contamination at NODA Area 2 is not considered hazardous to ecological receptors. These COPCs will no longer be retained or evaluated in the FS. However, because there is some potential for risk from exposure to copper this COPC was further evaluated in the Site-wide ERA.

f. Only two ecological receptors show risk from TPH-diesel with HQs above 10 (the deer mouse and the pygmy rabbit). TPH-diesel is the only COPC, at this site, presenting any potential for risk. TPH-diesel was not further evaluated at this site (Section 12 of the OU 10-04 Comprehensive RI/FS [DOE-ID 2001]). However, because there is still some potential for risk, this COPC was retained and evaluated in the Site-wide ERA.

g. Only two ecological receptors show risk from zinc with HQs above 10, these include plants and the pygmy rabbit. Zinc is the only COPC, at this site, presenting any potential for risk. Zinc is found naturally in the environment and is present in all foods (ATSDR 1988). Zinc is likely to be strongly sorbed to soil, and relatively little land disposed zinc is expected to be in a soluble form (DOE-ID 1999). This contaminant is unlikely to pose an unacceptable risk to ecological receptors and should not be considered a risk driver at this site. Zinc will no longer be evaluated in this ERA. However, because there is still some potential for risk, this COPC was retained and evaluated in the Site-wide ERA.

h. 2,4-Dinitrotoluene (2,4 DNT) was eliminated as a risk driver at the Land Mine Fuze Burn Area because of uncertainty associated with the lab analysis. The exposure point concentration used in the ERA was based on a sample result that was considered a nondetect by the lab and by validation efforts. The high, non-detected concentrations were left in this site’s data set because of the uncertainties associated with the maximum detection limit. These uncertainties limit the ability for determining risk to ecological receptors. The Land Mine Fuze Burn Area is currently being evaluated for remediation for 2,4,6-TNT contamination, and presumably this COPC will be removed as well. Post-remedial sampling will include analyzing for 1,3 DNB to determine if any residual contamination is left behind. This COPC was retained for the Site-wide ERA.

bioaccumulation factors, ecologically based screening levels for some chemicals are lower than their sample quantitation and detection limits. In the OU 10-04 analysis, this occurs for metals and a few organics. All of these uncertainties likely influence risk estimates. The major sources and effects of uncertainties in the ERA are reviewed in Table 6.

Table 6. Source and effects of uncertainties in the ecological risk assessment.

Uncertainty Factor	Effect of Uncertainty (level of magnitude)	Comments
Ingestion rates (soil, water, and food)	May overestimate or underestimate risk (moderate).	Ingestion estimates used for terrestrial receptors are based on data in the scientific literature. Food ingestion rates are calculated by using allometric equations available in the literature (Nagy 1987). Soil ingestion values are generally taken from Beyer, Connor, and Gerould (1994).
Acceptable hazard quotients	May overestimate or underestimate risk (high).	The magnitude of the hazard quotient indicates the level of concern for a functional group or species based on perceived importance.
Concentration factors and plant uptake factors	May overestimate or underestimate risk, and the magnitude of error cannot be quantified (high).	Few bioaccumulation factors or plant uptake factors are available in the literature because they must be both contaminant- and receptor-specific. In the absence of more specific information, values for these parameters are obtained from Baes et al. (1984) for metals and elements, and from Travis and Arms (1988) for organics.
Toxicity reference values (TRVs)	May overestimate (high) or underestimate (moderate) risk.	To compensate for potential uncertainties in the exposure assessment, various adjustment factors are incorporated to extrapolate toxicity from the test organism to other species.
Conservative TRVs may be below background concentrations	May overestimate (high) risk.	Because of compensation for potential uncertainties, the calculation of TRVs (see above comment) may result in risk being shown at INEEL background concentrations and give an erroneous indication of risk to certain receptors.
Lack of appropriate toxicity data to derive TRVs	Results in the inability to evaluate risk for many receptors and chemicals.	Those receptor groups and chemicals that could not be evaluated are data gaps in the assessment.
Use of functional grouping	May overestimate (moderate) risk.	Functional groups were designed as an assessment tool to ensure that the ERA address all species potentially present at a facility. A hypothetical species is developed using input values that represent the greatest exposure of the combined functional group members.
Site use factor	May overestimate (high) or underestimate (low) risk.	The site use factor is a percentage of the site of concern area compared to the home range of the receptor species. When the home range is not known for a species, a default value of 1.0 is used. This can result in an overestimate of the risk at small sites.

7.3.4 Transition to the INEEL-wide Ecological Risk Assessment

The third phase of the ERA process was the INEEL-wide ERA. The INEEL-wide ERA integrated the individual WAG ERAs to evaluate risk to Sitewide ecological resources (Section 17, DOE-ID 2001). The INEEL-wide ERA approach and results are summarized in Sections 7.5 and the long-term ecological monitoring that will be implemented under this ROD is discussed in Section 11.

The WAGs 6 and 10 sites that were retained for further evaluation in the INEEL-wide ERA included: BORAX-01, BORAX-09, CPP-66, LCCDA-01, LCCDA-02, OMRE-01, CFA-633 Naval Firing Site and Downrange Area, UXO East of TRA, Burn-Ring South of Experimental Field Station, Rail Car Explosion Area, and Craters East of INTEC (see Table 5).

7.4 Baseline Risk Assessment Summary

Unexpectedly high risks were estimated in the OU 10-04 baseline risk assessment for Ra-226 at a few sites. Further investigation revealed that reported Ra-226 concentrations were artificially high. In most cases, gamma-ray spectroscopy was the analytical method used to quantify Ra-226 concentrations. However, this method does not provide sufficient resolution to discriminate the 186-keV gamma-rays emitted by Ra-226 and U-235, both of which are naturally occurring radionuclides. Therefore, a correction factor was developed (Giles 1998a). For those sites at which the corrected Ra-226 concentrations were at or below background values, Ra-226 was eliminated as a contaminant of potential concern in soil after the baseline risks were estimated (DOE-ID 2001). The sites that were affected by the correction factor were LCCDA-01, LCCDA-02, and OMRE-01. The appropriate background values for Ra-226 are 1.2 pCi/g for analytical methods that avoid U-235 interference and 2.1 pCi/g for results that include interference from U-235 (Giles 1998b).

Risk estimates for the future residential scenario and ecological risks were used to identify sites for remediation. After the modifications to the baseline risk assessment for Ra-226, nine sites were identified for evaluation of remedial alternatives in the feasibility study: NPG (including 22 smaller ordnance sites), Arco High Altitude Bombing Range, and Twin Buttes Bombing Range for human health risks; and NODA, NOAA, Fire Station II Zone and Range Fire Burn Area, Experimental Field Station, Land Mine Fuze Burn Area, and STF-02 for both human health and ecological risks.

For remediation purposes these nine sites were grouped according to contaminated media. Three sites presented risk from explosive materials or UXO and are called the Ordnance Areas. The Ordnance Areas include the NPG, Arco High Altitude Bombing Range (ORD-01), and Twin Buttes Bombing Range (ORD-09). The site codes used to identify the ordnance areas are not presented in the FFA/CO. They were assigned to 29 individual ordnance areas identified prior to 1999 and are presented in the OU 10-04 Work Plan (DOE-ID 1999a). Many of these ordnance areas are located within the NPG. These areas include:

ORD-03: CFA-633 Naval Firing Site and Downrange Area

ORD-04: CFA Gravel Pit

ORD-05: CFA Sanitary Landfill Area

ORD-06: Naval Ordnance Disposal Area

ORD-07: Explosive Storage Bunkers- North of INTEC

ORD-08: National Oceanic & Atmospheric Administration

ORD-10: Fire Station II Zone & Range Fire Burn Area

ORD-11: Anaconda Power Line

ORD-12: Old Military Structure

ORD-13: Mass Detonation Area

ORD-14: Dairy Farm Revetments

ORD-15: Experimental Field Station

ORD-16: UXO East of TRA

ORD-17: Burn Ring South of Experimental Field Station

ORD-18: Igloo-Type Structures Northwest of Experimental Field Station

ORD-19: Rail Car Explosion Area

ORD-20: UXO East of ARVFS

ORD-22: Projectiles Found Near Mile Markers 17 and 19

ORD-24: Land Mine Fuze Burn Area

ORD-25: Ordnance & Dry Explosives East of the Big Lost River (same as the Rail Car Explosion Area)

ORD-26: Zone East of the Big Lost River ORD-27: Dirt Mounds Near the Experimental Field Station NOAA, and NRF

ORD-28: Craters East of INTEC

The second group of sites requiring remediation consists of six soil contamination sites. Five of which has TNT and/or RDX soil contamination and are called the TNT/RDX Contaminated Soil Sites. The sixth site, STF-02Gun Range, contains lead-contaminated soil. Human health risks associated with lead contamination were not calculated because approved reference doses are not available. However, the concentrations detected at STF-02 exceed the EPA 400 mg/kg screening level (EPA 1994b). The risk assessment results, for all nine sites, are described below:

- The NPG presents unacceptable risk to human health from unintentional detonation of UXO.
- The Arco High Altitude Bombing Range presents unacceptable risk to human health from unintentional detonation of UXO.
- The Twin Buttes Bombing Range presents unacceptable risk to human health from unintentional detonation of UXO.
- The NODA presents unacceptable human health and ecological risks from exposure to RDX.
- The NOAA site presents unacceptable human health risks from TNT and ecological risks from 1,3 DNB, RDX, and TNT in the surface soil.
- The Fire Station II Zone and Range Fire Burn Area presents unacceptable human health risks from TNT and potential risk to ecological receptors from exposure to RDX and TNT in the soil.
- The Experimental Field Station presents unacceptable human health risks from TNT and potential risk to ecological receptors from exposure to 1,3 DNB and TNT in the soil.
- The Land Mine Fuze Burn Area presents unacceptable human health and ecological risks from exposure to TNT.
- STF-02 Gun Range presents unacceptable human health and ecological risks from exposure to lead.

Table 7 summarizes the risk assessment results for these nine sites.

Table 7. Individual sites and contaminants of concern addressed by the selected remedy for OU 10-04.

Site	Contaminant of Concern	Exposure Pathway	Risk	Hazard Quotient
Future Residential Exposure Scenario				
Naval Proving Ground	UXO	NA[a]	NA[a]	NA[a]
Arco High Altitude Bombing Range	UXO	NA[a]	NA[a]	NA[a]
NODA (soil)	RDX	Ingestion of groundwater	1E-02 (1 in 100)	146
	RDX	Ingestion of homegrown produce	2E-03 (2 in 1,000)	10
NOAA (soil)	TNT	Ingestion of soil	5E-05 (1 in 100,000)	7
	TNT	Ingestion of groundwater	4E-05 (1 in 100,000)	6
	TNT	Ingestion of homegrown produce	1E-03 (1 in 1,000)	200
	TNT	Dermal absorption from soil	4E-04 (4 in 10,000)	NA
Twin Buttes Bombing Range	UXO	NA[a]	NA[a]	NA[a]
Fire Station II Zone & Range Fire Burn (soil)	TNT	Ingestion of homegrown produce	6E-05[b] (6 in 600,000)	9
	TNT	Dermal absorption from soil	5E-05[b] (5 in 100,000)	NA
Experimental Field Station (soil)	TNT	Ingestion of soil	3E-06[c] (3 in 1,000,000)	NA
	TNT	Ingestion of homegrown produce	6E-05[c] (6 in 100,000)	9
	TNT	Dermal absorption from soil	2E-05[c] (2 in 100,000)	NA
Land Mine Fuze Burn (soil)	TNT	Ingestion of soil	2E-04 (2 in 10,000)	31
	TNT	Ingestion of groundwater	5E-05 (5 in 100,000)	8
	TNT	Ingestion of homegrown produce	4E-03 (4 in 1,000)	651
	TNT	Dermal absorption from soil	2E-03 (2 in 1,000)	1
STF-02 (soil)	Lead	Ingestion of soil	NA[d]	NA[d]
Current Occupational Exposure Scenario				
Naval Proving Ground	UXO	NA[a]	NA[a]	NA[a]
Arco High Altitude Bombing Range	UXO	NA[a]	NA[a]	NA[a]
NOAA (soil)	TNT	Ingestion of soil	2E-05 (2 in 100,000)	4
	TNT	Dermal absorption from soil	2E-04 (2 in 10,000)	NA
Twin Buttes Bombing Range	UXO	NA[a]	NA[a]	NA[a]
Experimental Field Station (soil)	TNT	Ingestion of soil	6E-06 (6 in 1,000,000)	1
Land Mine Fuze Burn (soil)	TNT	Ingestion of soil	4E-04 (4 in 10,000)	70
	TNT	Dermal absorption from soil	3E-03 (3 in 1,000)	2
STF-02 (soil)	Lead	Ingestion of soil	NA[d]	NA[d]

Table 7. (continued).

Site	Contaminant of Concern	Exposure Pathway	Risk	Hazard Quotient
		Future Occupational Exposure Scenario		
Naval Proving Ground	UXO	NA[a]	NA[a]	NA[a]
Arco High Altitude Bombing Range	UXO	NA[a]	NA[a]	NA[a]
NOAA (soil)	TNT	Ingestion of soil	2E-05 (2 in 100,000)	4
	TNT	Dermal absorption from soil	2E-04 (2 in 10,000)	NA
Twin Buttes Bombing Range	UXO	NA[a]	NA[a]	NA[a]
Experimental Field Station (soil)	TNT	Ingestion of soil	6E-06 (6 in 1,000,000)	1
Land Mine Fuze Burn (soil)	TNT	Ingestion of soil	4E-04 (4 in 10,000)	70
	TNT	Dermal absorption from soil	3E-03 (3 in 1,000)	2
STF-02 (soil)	Lead	Ingestion of soil	NA[d]	NA[d]
		Ecological Exposure Scenario		
NODA (soil)	RDX	Ecological exposure	NA	≤ 1 to ≤ 4,000
NOAA (soil)	1,3 DNB	Ecological exposure	NA	≤ 1 to ≤ 200
	RDX	Ecological exposure	NA	≤ 1 to ≤ 20
	TNT	Ecological exposure	NA	≤ 1 to ≤ 500
Fire Station II Zone & Range Fire Burn (soil)	RDX	Ecological exposure	NA	≤ 1 to ≤ 40
	TNT	Ecological exposure	NA	≤ 1 to ≤ 40
Experimental Field Station (soil)	1,3 DNB	Ecological exposure	NA	≤ 1 to ≤ 80
	TNT	Ecological exposure	NA	≤ 1 to ≤ 300
Land Mine Fuze Burn (soil)	TNT	Ecological exposure	NA	≤ 1 to ≤ 10,000
STF-02 (soil)	Lead	Ecological exposure	NA	≤ 1 to ≤ 2,000

a. Human health risks cannot be calculated for unexploded ordnance in the same way that they are for chemical contamination. Instead, the need for cleanup is based on an assessment of physical danger. Unexploded ordnance poses a physical risk to human safety through the possibility of it exploding when handled or contacted, especially by machinery. Though unexploded ordnance encounters are relatively common, there has never been an accidental detonation at the INEEL caused by casual human contact (see OU 10-04 Comprehensive RI/FS Section 4.1.2 [DOE-ID 2001]).

b. The cumulative risk for TNT in Fire Station II Zone and Range Fire Burn Area is 1E-04. Therefore, TNT was identified as a contaminant of concern.

c. The cumulative risk for TNT in Experimental Field Station is 9E-05. Therefore, TNT was identified as a contaminant of concern.

d. Risks and hazard quotients were not calculated for lead for human health. Concentrations in excess of the EPA screening level of 400 mg/kg (EPA 1994b) will be remediated.

The response action selected in this Record of Decision is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment. Such a release, or threat of release, may present an imminent and substantial endangerment to public health, welfare, or the environment.

7.5 INEEL-wide Ecological Risk Assessment Summary

The OU 10-04 INEEL-wide ecological risk assessment (ERA) was the third phase of the INEEL ERA approach. The phased approach at the INEEL evaluated the results of all WAG ERAs and other identified supporting information as inputs to the OU 10-04 ERA.

The primary purpose of the OU 10-04 ERA was to assess risk to ecological receptors at the INEEL from contamination released to the environment. This contamination is largely a result of activities performed in support of DOE and other missions, as discussed in previous RI/FS documents and this ROD. The goals of the OU 10-04 ERA are as follows:

- To evaluate and assess the sampling data collected to date including:
  - Sampling performed in 1997 and 2000 to support the OU 10-04 ERA
  - Sampling performed for the WAG-specific ERAs. Specifically, to more clearly identify sites and receptors of concern and refine the COPC list on a Site-wide basis.
- To define new assessment areas surrounding the WAGs, and to quantitatively compare the percentage of the assessment areas to species/habitat associations on the INEEL.
- To evaluate supporting information and studies previously performed on the INEEL, which qualitatively support the risk characterization.

The results of the OU 10-04 ecological assessment summarized the risk to ecological receptors Site wide. Ultimately, the risk results will be used to focus on long-term monitoring and stewardship issues.

The OU 10-04 ERA has been a multiyear effort that has included sampling and other supporting information in the form of compilations and analyses of existing data. Section 17 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001) and associated appendices H1-H12 provide detail on this effort. Similar to the individual site ERAs, the Site-wide ERA also follows the three major steps of the ERA process: problem formulation, analysis, and risk characterization (EPA 1992).

7.5.1 Problem Formulation

The activities performed in the problem formulation were highly interactive and interrelated. The problem formulation integrates available information supporting the ERA, develops the assessment endpoints and conceptual site model, and offers an analysis plan (EPA 1998). The problem formulation was a process for generating and evaluating hypotheses to determine if and why ecological effects have occurred based on site-related activities (EPA 1998).

For OU 10-04, much information was compiled, evaluated, and analyzed. The results of this effort are presented in Appendixes H-1 through H-12 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). The problem formulation analysis section summarizes the final efforts performed to support the risk assessment for the OU 10-04 ERA.

Selection of management goals, assessment endpoints, and measures for the INEEL OU 10-04 ERA constituted an important step of the problem formulation. Two elements are required to define an assessment endpoint: (1) the valued ecological entity (e.g. a species, a functional group, an ecosystem function or characteristic, a specific habitat, or a unique place) and (2), the characteristic about the entity that is important to protect and potentially at risk (e.g., reproductive viability) (EPA 1996).

The assessment endpoints for the OU 10-04 ERA can be summarized as follows:

- *De minimis* risk (defined below) to INEEL plant communities as forage base for herbivores and upper trophic level receptors
- *De minimis* risk to soil fauna communities that support plant communities and upper trophic level receptors
- *De minimis* risk to INEEL terrestrial wildlife communities, terrestrial threatened or endangered species and species of concern
- *De minimis* risk to INEEL aquatic wildlife communities, aquatic threatened or endangered species and species of concern
- *De minimis* risk to INEEL game species populations
- *De minimis* risk to the INEEL prey base.

These assessment endpoints represent components of scientific management decision points (SMDPs) (b) and (c) (EPA 1996) and reflect the general consensus of the risk assessment team. By adopting an approach similar to that presented by Suter et al. (1995), expressing endpoints in relation to *de minimis* risk offers a method for categorizing ecological risk in terms of remediation strategies. Such an approach is expected to be useful to risk managers.

De minimis ecological risk is defined as risk corresponding to the following:

- Less than 20% reduction in the abundance or production of an endpoint population within suitable habitat within a unit area.
- Loss of less than 20% of the species in an endpoint community in a unit area.
- Loss of less than 20% of the area of an endpoint community in a unit area. The term "unit area" refers to a discrete area that is at risk and may be subject to a regulatory or remedial action.

Loss of more than 20% may also be *de minimis* if the community has negligible ecological value (e.g., a baseball field) or if the loss is brief because the community is adapted to physical disturbances (e.g., the plant communities of stream gravel bars) (Suter 1995).

Due to the large size of the INEEL, the risk assessment team decided that an evaluation of the assessment areas would best represent the "measures" against which the endpoints could be assessed. Based on the WAG ERA results, attempts to measure abundance, habitat, or species loss on a landscape scale were not warranted or feasible.

The INEEL is characterized by having large inter-facility (WAG) areas that have had limited disturbance in comparison to other areas of site activities. This lack of physical or other disturbance (e.g., grazing) occurring in the areas between the WAGs has resulted in areas of the INEEL becoming an ecological treasure (Anderson 1999). Therefore, due to the impracticality and costs associated with assessing species or community abundance or production on such a large scale, it was determined that loss of 20% of habitat important to the selected species of concern would be equivalent to the *de minimis* risk definition. This assessment (or measure) is based on the refined assessment areas compared to the total INEEL habitat.

The *de minimis* risk concept has its roots in the practice of law. In law practice, the concept is applied to situations in which the item is small or irrelevant in the context of the case. The *de minimis* risk concept as applied at the INEEL is intended to identify those ecological risks that are important, and remove those that are small in the context of the INEEL. Based on the preceding discussion, endpoint populations including species of concern, game populations and prey base species are specifically protected under this approach. Protecting these endpoint species is also protective of other nonendpoint species and populations. A 20% change in individuals of a population or species within an exposure unit community is considered the limit of detection, based on variability of the numbers of each. Note that the *de minimis* approach as applied at the INEEL also considers the habitat quality of the affected sites. Most of the WAG sites are disturbed, of limited ecological habitat value, and likely support only species tolerant of human disturbance. Thus, additional species extinction within the WAG boundaries is not expected. In addition, the overall footprint of the WAGs' facility areas is minimal compared to that of the total INEEL (less than 2%).

7.5.2 Analysis

The *Guidelines for Ecological Risk Assessment* (EPA 1998) states that the analysis phase is a process to examine the primary components of risk, exposure, and effects and their relationships among each other and ecosystem characteristics. The EPA (1998) also states that the nature of the stressor influences the types of analyses conducted, and the results may range from quantitative to qualitative. As discussed in the problem formulation, the OU 10-04 ERA focuses on evaluating the contamination at the WAG sites, migration of that contamination from the WAGs, and the spatial contribution to risk. It is also critical to identify receptors and contaminants of concern at the INEEL-wide level for both assessment of risk and for future monitoring. For the OU 10-04 ERA, analysis comprised two evaluations: (1) a geographic information systems (GIS) analysis performed using interpretive maps to support the spatial evaluation (presented in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001), and (2) assessment of the WAG ERA receptors using the results of the WAG ERAs to identify species and contaminants of concern. The analysis is discussed in detail in Section 17.3 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001).

7.5.2.1 Delineation of Contaminant Spatial Extent. The extent of contamination spread from the WAGs onto the areas outside the WAG fences has been a major component of this assessment. As discussed in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001), the sizes of the WAG assessment areas were reduced based on both the air modeling (Appendix H5) and ecological sampling (Appendix H3). Original isopleths estimating the contaminated areas were compared to the sampling data, which reduced the WAG facilities' boundaries (either inside the fences or as designated by the CERCLA site mapping). Using vegetation maps and knowledge from site visits, the reduced WAG areas were assigned a vegetative class (e.g., sagebrush-steppe, grassland). Vegetation classes were assigned based on the assumption that historical vegetation communities would be present where the WAGs currently have disturbed communities.

Since detailed habitat models and data are not currently available for most species, vegetation class was used as a surrogate for general habitat features. The INEEL vegetation map (Kramber et al. 1992) was, therefore, used as the base dataset for OU 10-04 GIS analyses. A description of INEEL vegetation communities, including a vegetation map, can be found in Anderson et al. (1996).

The amount of habitat potentially adversely affected was determined by overlaying the delineation of contaminant spatial extent map onto the INEEL vegetation map and evaluating the habitat composition inside the contaminant isopleths. The results of the evaluation indicate that the overall percentage of the INEEL ecological habitats impacted by the WAG contamination is less than 2% (not including roads). The ordnance sites, assessed as part of OU 10-04, were evaluated separately due to the possible wide spread presence of these sites. The primary contaminants in the ordnance areas were TNT, RDX, and their degradation products. The overall percentage of INEEL ecological habitats impacted by known areas of TNT and RDX contamination is approximately 3%.

7.5.2.2 Analysis of Species Distribution Data at the INEEL. Distribution data sets were overlaid on the INEEL vegetation map to draw habitat associations for individual species (including mule deer, burrowing owl, ferruginous hawk, Loggerhead shrike, elk, and pygmy rabbit) and the distribution data were evaluated in relation to vegetation and contaminant isopleths to determine which receptors/resources occur in or are proximate to the areas of contamination. The results of this analysis are summarized here and detailed in Appendix H8 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). This type of observation is used to further characterize the site for future monitoring.

7.5.2.3 WAG ERA Receptor Evaluation. The results of the WAG ERAs were incorporated to develop a preliminary list of receptors for the Sitewide evaluation. All INEEL species and trophic linkages were represented in the ERAs by 36 functional groups and 14 T/E and other species of concern that were assessed individually. A summary of the WAG ERA methodology and receptors can be found in the OU 10-04 Workplan (DOE-ID 1999).

Along with expert judgment, two processes were applied to identify receptors that were evaluated in the OU 10-04 ERA: (1) Functional groups or individual species for which WAG-specific HQs exceeded 10 for any COPC at more than one WAG were retained (refer to Appendix H2) and (2) The number of COPCs for which HQs for those receptors exceeded 10 was summarized as a general indicator of spatial distribution of potential risk for functional groups and species.

The final list of WAG ERA sites and associated COPCs carried forward to the OU 10-04 ERA are discussed in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). The functional groups or individual receptors evaluated at the WAG level were evaluated in order to focus the OU 10-04 ERA on those COPCs likely to pose a risk, and those receptors most likely to be affected, Site-wide.

7.5.2.4 Analysis of the 1997 OU 10-04 ERA Sampling. Abiotic and biotic data collected in 1997 were evaluated and are discussed in detail in Appendix H3. One of the goals of the 1997 sampling event was to verify the food web modeling used for the WAG ERAs. This was accomplished by comparing a limited number of bioaccumulation factors (BAFs) calculated from Site-specific biota and co-located soil data to literature BAFs. The acronym PUF has also been used in context of the WAG ERAs to identify soil-to-plant uptake factors. The results of this evaluation indicate that for the analytes where comparisons could be made, the use of literature BAFs was sufficiently conservative, and risks associated with the dietary ingestion pathways were generally overestimated.

7.5.3 Risk Characterization

Risk characterization is the final phase of the ERA process (EPA 1998). The risk characterization clarifies the relationships between stressors, effects, and ecological entities, and uses the results of the analysis to develop an estimate of the risk. There are generally three main components of the risk characterization phase of an ERA including (1) risk estimation, (2) risk description, and (3) an uncertainty analysis.

Since the OU 10-04 ERA had a large amount of information compiled, a line of evidence approach was used to support the risk conclusions. The conclusions and recommendations section (Section 17 in the Comprehensive RI/FS [DOE-ID 2001]) summarizes the results of these efforts and discusses their implications at the OU 10-04 level. Section 17 of the Comprehensive RI/FS (DOE-ID 2001) is centered on focusing the results on assessing whether remediation efforts were warranted, but also to support the Sitewide long-term ecological monitoring and stewardship efforts that will be implemented under this ROD at the INEEL.

7.5.3.1 Risk Estimation. The risk estimation determines the likelihood of adverse effects by integrating the analysis results with the assessment endpoints (i.e., ecological receptors). The risk estimation discusses the results of the WAG ERA summaries, the spatial analysis, and the OU 10-04 ERA sampling data. The OU 10-04 ERA sampling data were also evaluated, and a sensitivity study on the Site-specific and literature uptake factors was performed to evaluate the food web modeling used in the ERA. This information is discussed in the following sections as it supported the risk assessment.

7.5.3.1.1 WAG ERA Results—Tables 17-14 through 17-24 (Section 17.3.2) in the Comprehensive RI/FS (DOE-ID 2001) present the receptors, by functional group, with hazard quotients in excess of 10 by WAG for nonradionuclides selected as OU 10-04 ERA COPCs. The nonradionuclide COPCs results at the individual WAGs and the receptors of concern potentially affected by these COPCs are similarly summarized. Radionuclides have not been of great concern for ecological receptors in the WAG ERAs and could not be evaluated using the same approach. However, they were retained as OU 10-04 COPCs due to a common presence across the INEEL.

The WAG ERA assessment developed a picture as to which functional groups and receptors were or could be potentially affected the most by the COPCs, and at which locations effects may or may not have occurred. This information allows for selecting the key receptors for long-term monitoring studies. The results of this assessment are presented in Section 17.4.1.1 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). In summary, the results of the WAG ERA indicate that multiple COPCs remain to many functional groups.

7.5.3.1.2 OU 10-04 ERA Sampling and Risk Analysis Results—The sampling and risk results for the 1997 OU 10-04 ERA sampling indicate that there is negligible potential for the spread of metals or radionuclide contamination from WAG 3 (WAG 3 was used as a worst case scenario) to the off-Site reference area. On-Site and off-Site risks were similar, and both sets of risk results were similar to or less than risks calculated for the INEEL soil background data. Uncertainty remains pertaining to the Waste Calcining facility since organics may be of concern and were not included in the 1997 sampling. Sampling and risk results for the BORAX area indicate little or no migration of radionuclides from under the engineered barrier at BORAX-02 buried reactor site.

A comparison of Site-specific uptake factors to literature values is presented in Section 17.3.3 (Table 17-25) and in Appendix H3 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). The results indicate that the use of literature values for the food web modeling is conservative and likely to overestimate potential dietary ingestion risks for several metals.

7.5.3.1.3 Spatial Analysis—The spatial analysis is presented in the analysis phase. The amount of habitat potentially adversely affected was determined by overlaying the delineation of contaminant spatial extent map onto the INEEL vegetation map and evaluating the habitat composition inside the contamination isopleths.

The results of the evaluation were discussed by WAG ERA assessment areas and by the TNT/RDX contaminated soil. The TNT/RDX contaminated soil sites were evaluated separately due to the larger area of impact and the different contaminants. These soil sites are typically less disturbed, and, therefore, provide better habitat in the area (that is, most of the WAG areas are disturbed by facility activities). The total INEEL is approximately 230,617 ha (569,865 acres), with the WAG assessment areas impacting approximately 4,317 ha (10,667 acres) or 1.87% of this total. The TNT/RDX contaminated soil sites include approximately 5,977 ha (14,769 acres) or 3% of this total. These two areas are approximately 5% of the total INEEL. The majority of the WAG and TNT/RDX contaminated soil sites are on sagebrush-steppe both on and off lava. The percentage of total area (WAG assessment areas and TNT/RDX contaminated soil sites) was compared to the selected endpoint as discussed in Appendix H6 to evaluate risk to ecological populations at the facility.

Based on the *de minimis* risk definition, risk corresponds to (1) less than 20% reduction in the abundance or production of an endpoint population within suitable habitat within a unit area, (2) loss of less than 20% of the species in an endpoint community in a unit area, or (3) loss of less than 20% of the area of an endpoint community in a unit area. Here the term "unit area" refers to a discrete area that is at risk and may be subject to a regulatory or remedial action.

The sagebrush steppe is a broad category encompassing many diverse ecological communities. Communities are defined as "populations of many species that interact," and for this assessment it was acceptable to consider the INEEL sagebrush steppe as a broad community that can be evaluated on a larger scale.

The modeled area potentially affected by the contaminants identified from the ERA sampling at the INEEL, is, therefore, less than 5% of the total area. This is significantly less than the 20% loss of area in the endpoint community accepted by the definition of *de minimis* risk (Appendix H6).

7.5.3.2 Risk Description. After risks have been estimated, risk assessors need to integrate and interpret the available information into conclusions about risks to the assessment endpoints. EPA guidance (EPA 1998) suggests that the risk characterization include evaluation of multiple lines of evidence (also referred to as a weight of evidence evaluation). Development of lines of evidence provides both a process and framework for reaching conclusions regarding confidence in the risk estimates (EPA 1998). The process includes evaluation of all available and pertinent information, even if qualitative in nature. Such sources of supporting information are used in conjunction with the quantitative risk assessment results to reach summary level conclusions and recommendations for the risk managers.

The results of the spatial estimation indicate that *de minimis* risk is produced due to contamination impact on the INEEL endpoint community. The extent of contamination is modeled to be present at significantly less than the 20% loss of total area in the endpoint community (sagebrush steppe), and it was concluded that WAG activities at the facilities have minimal impact on the ecological communities present at the INEEL. This conclusion is further supported by the information summarized in the lines of evidence table (see Table 8). The far right column provides a ranking of the overall value rating from low to high and whether the results support (+) or do not support (-) the overall risk conclusions.

The Breeding Bird Survey (BBS) and the long-term vegetation transect studies are two of the strongest supports for this conclusion. Bird populations from the state of Idaho and the nation as a whole from the past 20 years were analyzed in a similar timeframe as surveys conducted at the INEEL from 1985 to 1999. Breeding bird populations on the INEEL for the seven target species have remained constant, except for an increase in the number of mourning doves. However, this study did not assess plots near the facilities against the plots in less impacted areas at the INEEL.

The long-term vegetation transects (plots) were first established in 1950, when the area was in a severe drought. Since then, perennial grasses have increased in the plots. However, this may be seen as a step in the natural recovery from drought and overgrazing. Since the 1950s, the species richness on the plots has changed very little; however, the plant species heterogeneity has increased. Study plots outside the INEEL have produced similar results. Increases in shrub cover, perennial grasses, mean species richness, and heterogeneity have all been observed, as well as similar relative vascular plant cover. The major difference in the vegetation transects (plots) was the percentage of cover of annuals versus perennials.

An evaluation of ecologically sensitive areas identified several areas as having significant value for supporting sensitive and/or unique on-Site plant and wildlife species and communities (Reynolds 1993). The first of these areas is the area along the Big Lost River and Birch Creek. Riparian and wetland communities support a great variety of species. Buffer areas that define a reasonable area to protect these habitats have been identified (Reynolds 1993).

Table 8. Lines-of-evidence evaluation for the OU 10-04 ERA.

Item	Strengths	Weaknesses	Results	Overall Lines-of-Evidence Rating for the OU 10-04 Site-wide ERA (+/-)[a]
Ecologically Sensitive Areas overlay map (Section 17.2.4.2 [DOE-ID 2001])	Identifies areas of special concern to ecological receptors.	Characterization has significant uncertainty; much of the characterization was extrapolated.	None of the WAG facilities are directly within the buffer for protected areas. However, several of the WAGs either border or fall within sensitive biological resource areas.	Medium (+)
ERA sampling (1997) at INTEC (Appendix H3 [DOE-ID 2001])	Multi-media, radionuclides and inorganics, on-Site and off-Site, identified possible spread of contamination from WAG area, used to evaluate food web modeling assumptions.	Small sample size, no organic analyses, problem with detection limits for some analytes, not representative of the INEEL, sampling, did not include organics.	Risks for on-Site locations were less than or equal to background or the reference area; no apparent biotic uptake or movement of contamination off-Site occurring.	Low value for Site-wide characterization (+) Medium value for modeling verification (++)
ERA sampling (BORAX 2000) (Appendices C and H3 [DOE-ID 2001])	Multi-media, radionuclides and inorganics.	No off-Site data; comparison of data to earlier reference area and background data sets.	Risks for on-Site locations were less than or equal to background or the reference area; no apparent biotic uptake or movement of contamination off-Site occurring.	Low value (+)
Breeding Bird Surveys (Appendices H10 & 11 [DOE-ID 2001])	Multi year (1960s to present), nation-wide, strong and consistent methodology.	Not done every year from 1999 to present; inadequate route coverage for western U.S. limits comparisons; weather conditions can be a limiting factor during survey dates, near facility routes not compared to off facility routes.	More birds and more bird species seen/heard in 1999 than previous years back to 1985; some bird species experienced declines but these reflect state declines as well.	High value (+)

Table 8. (continued).

Item	Strengths	Weaknesses	Results	Overall Lines-of-Evidence Rating for the OU 10-04 Site-wide ERA (+/-)[a]
Long-term Vegetation Transects (Appendix H12 [DOE-ID 2001])	From 1950 to1995 with 9 samplings; core and noncore transects; consistent methodology applied.	Results prone to variance with drought and fire; study cannot be used strictly to assess grazing effects, not located in known areas of sensitive habitat.	Little evidence of directional changes other than increase in rabbitbrush and cheatgrass; results would indicate that current conditions reflect earlier heavy grazing prior to establishment of the INEEL.	High value (+)
RESL Radiological data (Appendix H4 [DOE-ID 2001])	Numerous studies; many different biota tissues sampled from around 1978 through the 80s.	Radionuclides only; may not be adequately conservative for TRA; no co-located soil data collected; data collected for research not usable for risk assessment purposes; lacks sufficient documentation on many studies; studies not directed at risk characterization, studies performed during 70s and 80s with significant remediation efforts occurring since that time.	Indicates significant radionuclides present in biota in the past; however, of limited value since conclusive results can not be obtained from different studies over many years by different researchers.	Low value (-)
Warm Waste Ponds Air Dispersion Modeling (Appendix H5 [DOE-ID 2001])	Worst case scenario for conservatism, EPA-approved methodology; supported further delineation and reduction in size of the assessment areas.	Limited inorganic data – only chromium evaluated along with Cs-137, Co-60, and Sr-90.	Off-Site radiological and inorganic contamination due to wind dispersion is unlikely; supported reduction of the WAG areas for assessment of *de minimis* risk.	Medium value (+)

Table 8. (continued).

Item	Strengths	Weaknesses	Results	Overall Lines-of-Evidence Rating for the OU 10-04 Site-wide ERA (+/-)[a]
WAG Biological Surveys (1997-99) (Appendix H7 [DOE-ID 2001])	The surveys were performed by the Environmental Science and Research Foundation and findings for WAGs 1, 2, 3, 4, 5, 6, 7, 9, and 10 have been documented in a draft report included in Appendix H7.	WAG 8 not included; qualitative, not quantitative; limited effort and does not provide a thorough T/E survey; will need to be updated to support CERCLA 5-year reviews and long-term stewardship issues.	Identified habitat present at WAGs; was used primarily for supporting the WAG ERAs; is presented here since it documents the final.	Medium value (+/-)
WAG ERA Summaries (Appendices H1 & H2 [DOE-ID 2001])	Allows rollup to INEEL-wide ERA, identifies receptors at greatest risk from WAG contaminants and the COPCs contributing to these risks.	Problems with some of the ERA results and other methodology inconsistencies; WAG 7 not assessed; characterization at WAGs may be adequate, but this information is difficult at this level to evaluate.	Identified receptors and COPCs for long-term monitoring and risk characterization.	High (-)

a. + Indicates positively supports the overall risk conclusions, - indicates that results do not support the overall risk conclusions.

Four TNT/RDX contaminated soil sites that were evaluated in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001): NODA, NOAA, Land Mine Fuze Burn Area, and the Fire Station border the Big Lost River or are within the buffering area of the Big Lost River. RDX and TNT chunks, fuzes (primers), frag (metal fragments), and projectiles were found in these areas. Shrapnel and frag are common to all of the sites, and are found on both sides of the river and in the river itself, which was dry during the walkdowns. Pronghorn, mule deer, elk, raptors, and small mammals were all observed in these areas during the summer of 2000. No sage grouse leks were observed in the ordnance areas stated above. Much of the area that served as a firing range in the 1950s was not surveyed in the field walkdowns in the summer of 2000. A significant portion of the buffer areas, sage grouse leks, pronghorn wintering area, and sensitive biological resource areas fall within the footprint of the firing area.

None of the WAG facilities are directly within the buffer for protected areas. However, several of the WAGs either border or fall within sensitive biological resource areas (e.g., WAG 1) because the facilities are so close to these sensitive biological resources areas and much of the firing area has not been surveyed.

The WAG Biological Surveys identified habitat for sensitive species at the WAG sites. Although limited in scope, the effort supported the WAGs during their RI/FS process and can be used to help focus future monitoring at those WAGs that have superior habitat characteristics. These surveys identified some areas on the WAGs that have significant habitat for sensitive species. The results neither support nor negate the risk conclusions. However, this was not a formal threatened or endangered (T/E) survey, and did not include species of concern recently identified, such as the sage grouse.

Some of the Radiological and Environmental Sciences Laboratory (RESL) data collected during various studies from the 1970s to 1980s was summarized. These RESL studies focused on radionuclides, collected for research, and were not generally useful for risk assessment purposes, and did not support transport from soil to biota calculations (no co-located soils). It is apparent that many of the sites that contributed significant risk in the studies have since been remediated. This information, therefore, is of limited value.

Results from the individual WAG ERAs were used extensively in the assessment to identify the receptors and contaminants of concern Site-wide. From the air dispersion modeling and the ERA sampling at INTEC, it was concluded that contamination is limited to small areas within the WAG boundaries. These areas represent limited ecological habitat relative to the INEEL as a whole. On the other hand, the results showed that there were low to significantly high unacceptable risks to several ecological receptors at the WAGs due primarily to metals and explosives.

The 1997 and 2000 ecological sampling activities provided a degree of certainty to the risk conclusions. The limitations of these results were due primarily to the low number of on-Site samples collected, which were located in one small area (CPP plume) relative to the large expanse of the INEEL. To a lesser degree was the lack of organic analytical results. The BAFs (and PUFs), which were calculated for several metals from the 1997 biota and co-located soil data, provide a relatively strong degree of confidence that the use of the literature-derived uptake factors were appropriately conservative. As a result, it is likely that potential risks associated with the dietary ingestion pathway are protective of ecological receptors. The 1997 results also support the premise that WAG contamination has not spread off the INEEL and the reduction of the assessment areas. The reduction in assessment areas is also supported by the Warm Waste Pond Air Dispersion Modeling.

7.5.4 Uncertainty Analysis

The ERA uncertainty analysis identifies, and to the extent possible, quantifies the uncertainty in problem formulation, analysis, and risk characterization (EPA 1992). The uncertainties from each of these phases of the process are carried through as part of the total uncertainty of the risk assessment. The product of the uncertainty analysis is an evaluation of the impact of the uncertainties on the overall assessment and, when feasible, a description of the ways in which uncertainty could be reduced. The basic categories include the following:

- Uncertainty in the CSM, TRVs, and exposure parameters
- Assessment area/habitat assessment uncertainty
- Uncertainty in the summary of WAG ERAs
- Uncertainty in the ERA sampling and analysis
- Uncertainty associated with the other lines of evidence (i.e., supporting information).

Uncertainty in the ERA process may be addressed both qualitatively and quantitatively. There are two general approaches to tracking uncertainty quantitatively. The first is to develop point estimates for each exposure parameter and toxicity value, and to obtain a point estimate for the HQ and HI. By using different sets of exposure parameters (i.e., average [or central tendency] or conservative [reasonable maximum exposure (RME)]) and toxicity values (i.e., NOAEL and LOAEL), the bounds of uncertainty of the risk estimates can be defined. The second approach is to perform a distributional analysis so that a distribution of the risks can be obtained.

For the WAG ERAs and the OU 10-04 ERA, risk estimates were obtained using a modified RME exposure scenario. The maximum or 95% UCL, whichever was lower, and mean ingestion rates and body weights (BW) were typically used. This approach was meant to be conservative. With the exception of the ecological remediation goal evaluation for lead (Appendix K, DOE-ID 2001), a distributional analysis (such as a Monte Carlo analysis) was deemed unnecessary for the WAG 6 and 10 site ERAs at the INEEL due to the low risks observed. As a result, the uncertainties in the ERA process will be discussed qualitatively.

The number and types of samples taken in support of the ERA were frequently restricted. It was often not possible to obtain as many samples as the DQOs suggest. As a result, extrapolations were made based on fewer samples and analytes, a process that can introduce considerable uncertainty. It is also possible, due to the limited number of samples and analytes, to entirely miss the contamination. Uncertainty also arises in the selection of various sampling depths. Often, the selection relies heavily on visual observation and professional judgment. The actual collection depths may vary from those planned due to obstructions, cobble, or lack of adequate soil materials.

7.5.4.1 Overall Uncertainty and Assumptions. Although there are many sources of uncertainty attributed to the ERA process, only the major issues have been included in this discussion. The risk assessment results indicate that contamination is not widespread and that the majority of INEEL receptors were adequately evaluated. Although extensive monitoring of radionuclides has occurred off the facilities by Environmental Monitoring, RESL, and the off-Site surveillance program, organics and metals are not well characterized. These contaminants may have a greater impact on ecological receptors than the radionuclides.

Several assumptions were associated with the INEEL-wide ERA. It assumed that contamination and associated effects from past activities at the WAGs were mostly confined within the WAG fence lines based on evidence from ERA sampling and air modeling. It also assumed that recent CERCLA cleanup activities have removed, will remove, and/or will stabilize most of the contamination within the WAG sites that will eliminate the possible exposures that have been detected by past radiological biotic studies. It was also assumed that no sensitive species were present at the site and that a population model would be adequate for the assessment.

An ecological risk assessment usually requires consideration of many more factors than does a human health risk assessment. For example, more than 200 species of plants and animals can be found on the INEEL, either part, or all, of the year. These species interact in numerous and complex ways, such as predation, plant eating, and scavenging, which must be taken into account. As well, the ecological risk assessment must take into account wide variations in ranges including migration patterns, and must account for the tendency for many contaminants to accumulate as they move up the food chain. Finally, habitat requirement, life cycle, or tolerance to the range of contaminants released, the EPA is subject to a number of areas of uncertainty. These uncertainties were identified by the Agencies in 1997 through 1999 as part of the INEEL-wide ERA planning process. Uncertainty issues relevant to the INEEL-wide ERA are presented in Section 17 and Appendix F of the Comprehensive RI/FS (DOE-ID 2001).

7.5.5 Other INEEL Specific Issues

The INEEL is considered an ecological treasure (Anderson 1999). A special benefit of the site being set aside for government use was the protection of what is arguably the largest expanse of protected sagebrush-steppe habitat anywhere in the United States. Approximately 40% of the INEEL has not been grazed for the past 45 years. Recognizing the importance of this undisturbed area as an ecological field laboratory, the area was also designated as a National Environmental Research Park (NERP) in 1975. This is one of only two such parks in the United States that allows comparative ecological studies in sagebrush-steppe ecosystems (DOE-ID 1997).

July 17, 1999, the Sagebrush-Steppe Ecosystem Reserve was created at the INEEL. This reserve will conserve 74,000 acres of unique habitat on the northwest portion of the INEEL. The INEEL contains some of the last sagebrush-steppe ecosystem in the United States. This action recognized that the INEEL has been a largely protected and secure facility for 50 years and that portions are valuable for maintaining this endangered ecosystem.

The U.S. Geological Survey (USGS) evaluated endangered ecosystems of the United States (Noss et al. 1995). In this study both the ungrazed sagebrush-steppe in the Intermountain West, and the Basin big sagebrush (*Artemisia tridentata*) in the Snake River Plain of Idaho are listed as ecosystems that are critically endangered (>98% decline).

Several wildlife species are found only or primarily in sagebrush habitats throughout their range. About 100 bird, 70 mammal, and 23 amphibian and reptile species in the Great Basin rely to some degree on sagebrush habitat for shelter and food. Some are sagebrush obligates—sagebrush lizard, pygmy rabbit, pronghorn, sage sparrow, brewer's sparrow, sage grouse, loggerhead shrike, and sagebrush vole, which cannot survive without plenty of high-quality sagebrush and its associated perennial grasses and forbs. Other species depend on sagebrush for a significant portion of their diet. For example, pronghorn depend on sagebrush for nearly 90 percent of their diet (Lipske 2000).

A 1999 report prepared by the Western Working Group of the International Bird Conservation Coalition Partners in Flight warns that more than 50 percent of shrubland and grassland bird species in the Intermountain West show downward population trends. Sage grouse numbers have dipped more than 33 percent in the last 15 years, according to BLM studies. As these species come increasingly to the attention of the concerned public, it will be critical to have the information to support the decisions made for the assessment.

Other current risks to the sagebrush steppe include invasion of both exotic weeds and juniper, subdivision of private lands, improper livestock grazing, and impediments to management practices caused by litigation. The major current risk to maintaining productivity of these communities is the invasion of exotic species across the entire ecoregion and juniper encroachment where native juniper woodlands occur in conjunction with the sagebrush-steppe. In some cases, exotic species may invade undisturbed communities (without grazing or fire), and in other cases, improper livestock grazing and wild or prescribed fire provide disturbances that open communities to invasion. Exotic weed invasion is not clearly understood at this time and management practices are not adequate to prevent such invasion.

7.5.6 Conclusions and Recommendations

Investigations determined that more than 100 contaminated sites at different individual WAGs on the INEEL pose risk to ecological receptors. These 100 sites were evaluated in the INEEL-wide ERA. Of those 100 sites, 68 had hazard quotients greater than 10 and required further evaluation. At 28 of the 68 sites, remediation is in progress or has been completed. An additional six sites (the five TNT/RDX Contamination Sites and the STF-02 Gun Range, described in this ROD) were evaluated in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). Naval Reactors Facility (NRF) (WAG 8) sites were included only qualitatively in the INEEL-wide ERA because of the different risk assessment methodology used at NRF. Also, because investigations are not complete for the Radioactive Waste Management Complex (RWMC) (WAG 7) and the Idaho Nuclear Technology and Engineering Center (INTEC) Tank Farm (OU 3-14), information from these areas could not be included in the INEEL-wide ERA.

The following conclusions were drawn as a result of the INEEL-wide ERA concerning the risk to ecological receptors from release sites at the INEEL:

- The contamination from past activities at the WAGs is fairly confined to the WAGs, based on evidence from ERA sampling and air modeling.
- Recent CERCLA cleanup activities have removed or will remove and/or stabilize most of contamination within the WAG sites.
- Impact is limited to a small percentage of overall area (i.e., of total INEEL area) that has been adversely affected by these activities.
- The presence of large areas of undisturbed vegetation has benefited the receptors at the Site, primarily the result of reduced grazing.

The evaluation of the assessment area to habitat area was used as a measure for the assessment endpoints. From this analysis, it is evident that less than 20% of the habitats present on the INEEL are lost to facility activities. Therefore, the overall results indicate that there is *de minimis* risk to the INEEL plant communities, terrestrial wildlife communities, species of concern, soil fauna, game species, and prey base. Multiple lines of evidence, as presented in Table 8, support the results of this analysis.

The assessment used a population level approach for the evaluation of the receptors at the INEEL, with the assumption that much of our modeling and other characterization has been adequate for evaluating this large facility area. The policy has been to pass the WAG ERA results to the OU 10-04 ERA with the understanding that for populations at the INEEL, in the larger perspective, the risk is minimal. The WAG ERA results indicated that potential risk at the individual WAGs may remain but is not a risk to the population.

The population level assessment would be invalidated if a species on the INEEL obtained federal T/E listing (e.g., the sage grouse is currently under consideration).

The results of the WAG ERAs identified that COPCs contributing to risk and the receptors at greatest exposure is presented in Section 17.4.1 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001).

For WAG 6 and 10 sites, the ERA results identified secondary explosives at many sites represented the greatest risks to ecological receptors. If these items and contaminated soil were left in place, the risks would be due primarily to ingestion of RDX, TNT, and other explosive degradation products. It is uncertain as to whether these materials would be mistakenly ingested as food items by mammalian and avian receptors, but some potential remains for this exposure pathway, especially during preening and grooming activities. Small mammals and ground feeding birds were identified as the most likely receptors to be exposed. Risks associated with accidental detonation of UXO are expected to be minimal.

The WAG ERA summaries were used to identify receptors for evaluation of risk in the OU 10-04 ERA. However, based on the WAG ERAs, some apparent risk to receptors at the sites may be possible and concerns to ecological receptors were identified. However, assessment of the effects to ecological receptors due to low levels (minimal risk) of contaminants over long periods of time is difficult. Loss of habitat off and on-Site from new facilities/activities could potentially impact populations on the Site. Off-Site contamination from surrounding farming activities were also identified as a concern.

8. ORDNANCE AREAS

There are three large ordnance areas identified on the INEEL including the NPG, the Arco High Altitude Bombing Range, and the Twin Buttes Bombing Range (hereafter referred to as the Ordnance Areas). The locations of these areas are shown in Figure 13.

Activities during World War II also included practice aerial bombing at two bombing ranges established by the U.S. Army Air Corps. The Arco High Altitude Bombing Range was located adjacent to the southwest end of the NPG (see Figure 13); the Twin Buttes Bombing Range was located east of the southern end of the NPG, near the present-day Argonne National Laboratory-West (ANL-W) complex.

Most ordnance, UXO, and ordnance-related areas at the INEEL resulted from activities conducted at the Naval Proving Ground in the 1940s. The term *ordnance* refers to military equipment or apparatus. *Explosive ordnance* is any munition, weapon delivery system, or ordnance item that contains explosives, propellants, or chemical agents. UXO refers to these same items after being (1) armed or otherwise prepared for action; (2) launched, placed, fired, or released in a way that they cause hazards; or (3) unexploded either through malfunction or design (DOE-ID 1998). Areas containing ordnance must be remediated to mitigate risk to human health from unexploded ordnance and, as discussed in Section 9, explosive residues or explosive contaminated soil. Unexploded ordnance poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.

Between 1942 and 1950, approximately 1,650 minor (3- to 5-in.) and major (16-in.) guns were tested at the NPG (see Figure 13). Most of the projectiles were nonexplosive. However, experimental and test work was also performed using live explosives, primarily in mass detonations. During these mass detonation tests, hundreds of thousands of pounds of explosives in land mines, smokeless powder, and bombs were placed in explosives storage bunkers or open areas and detonated to determine the effects to collocated bunkers and facilities. Stacks of ammunition were shot with high explosive projectiles to test their susceptibility to enemy fire. As a result of the NPG activities, many projectiles (explosive and inert), explosive materials, pieces of explosives, UXO, NPG structures, and debris remain. At locations where these materials remain from explosive testing activities, UXO is visibly obvious and some areas have undergone some limited remediation, such as at the Naval Ordnance Disposal Area (NODA). In other locations, where UXO remains from firing activities, projectiles have become imbedded in the ground (such as in large portions of the Naval Firing Range); therefore, UXO is not nearly as visibly obvious since debris from explosion does not exist.

In 1950, the 69,808.58 ha (172,494.65 acres) that composed the NPG were transferred from the Navy to the Atomic Energy Commission (AEC) for use as a nuclear reactor testing site. The AEC also acquired, through public land withdrawals, lands surrounding the NPG, including the two former bombing ranges.

In 1968, the Naval Ordnance Test Facility was established at the south end of the former NPG. The U.S. Navy used this facility after the NPG had been transferred to the AEC. The Naval Ordnance Test Facility was a temporary facility used to test 16-in. gun barrels, which fired inert projectiles at the Big Southern Butte.

Between about 1980 and 1985, the NODA Site, which had been used in the late 1940s as a disposal site, was used to treat hazardous waste by open burning under Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Act (HWMA) regulations. As discussed in Section 2.4.2.4, the Hazardous Waste Permitting Bureau (HWPB) of the IDEQ terminated the Interim Status for the NODA, EPA ID No. ID 4890008952, with the understanding that the CERCLA program would perform the final evaluation of the site in accordance with the FFA/CO and would include any requisite ARAR and HWMA reviews prior to issuance of the final Record of Decision.

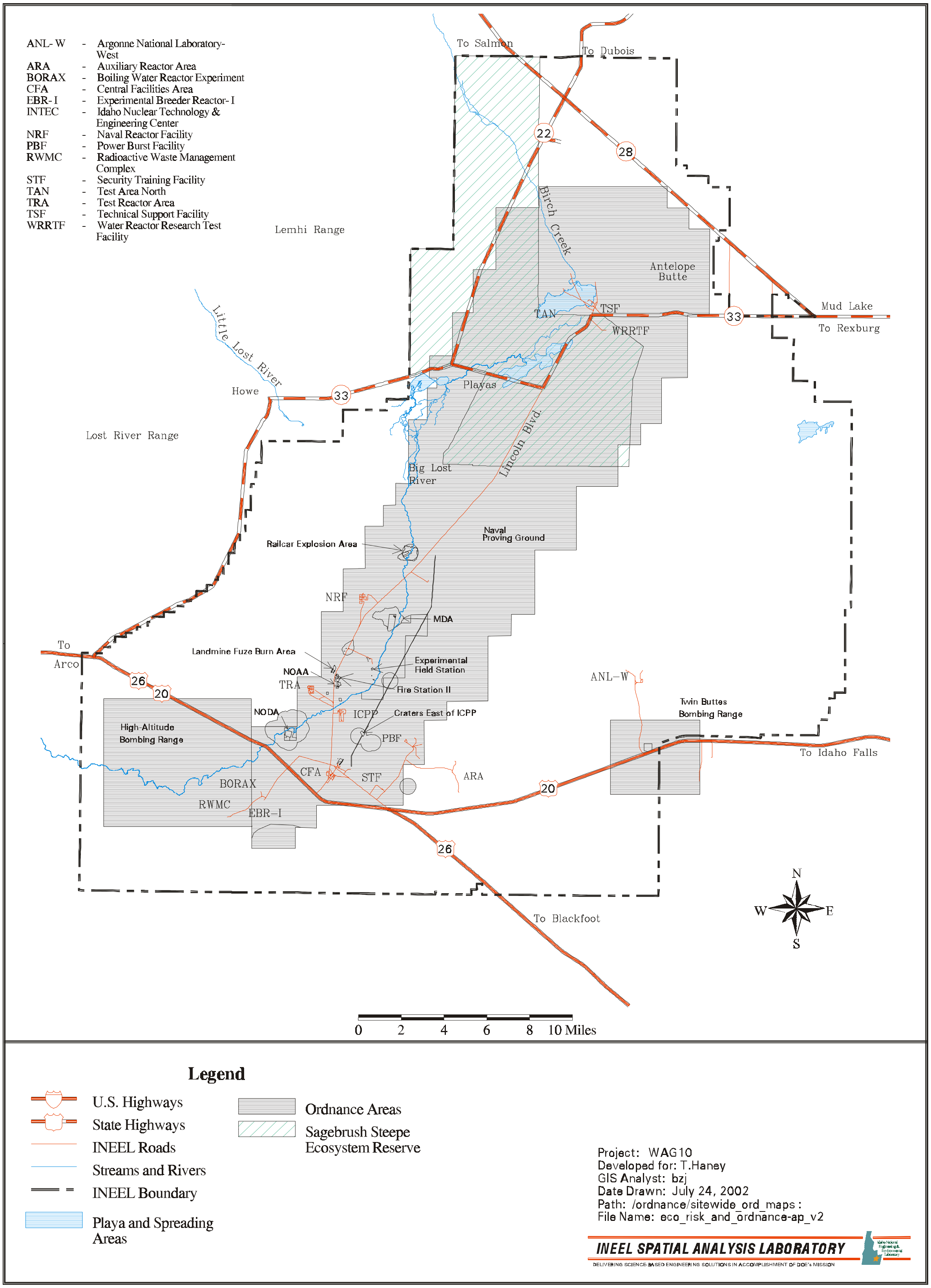

Figure 13. Locations of WAG 10 Ordnance Areas at the INEEL.

8.1 Investigations of the Ordnance Areas

UXO was cleared and field-assessed at several sites during each field season from 1993 through 1997. The term "clearance" when used in discussion of UXO is defined as "the removal of UXO from the surface or subsurface to a pre-established depth" (EPA 2001). However, the use of the term "clearance" or "cleared" in regards to UXO may not mean unrestricted land use. The ground surveys used to detect and "clear" UXO cannot be claimed to be 100% effective because of the multiple uncertainties in the detection methods. There remains risk for additional UXO to be located at six sites where it is known "live" ordnance was used even though past removal actions have been implemented. These sites include NODA , NOAA, MDA, Experimental Field Station, Rail Car Explosion Area, and the Land Mine Fuze Burn Area. Also, UXO buried below the surface soil may become exposed to the ground surface through erosion or frost heave, which would lead to an underestimation of risk.

The Preliminary Scoping Track 2 Summary Report for OU 10-03 Ordnance (DOE-ID 1998) summarizes the history of investigations and remedial actions performed prior to January 1997 for the 29 identified ordnance sites at the INEEL. The removal action that occurred in 1997 is documented in the *Summary Report for the 1997 Non-Time Critical Removal Action* (Sherwood 1999a). In 1999, soil samples were collected from several sites per the *Field Sampling Plan for Operable Unit 10-04 Explosive Compounds* (Sherwood 1999b). In 2000, a UXO walk-down was conducted at several sites to better define the extent of UXO fragments at NODA (Smith 2000). Figures 14 through 16 present photos of types of previously discovered UXO at the INEEL.

Twenty-nine individual ordnance sites were listed in Table 12-1 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). Since the time of the development of this table, seven more sites have been identified on the INEEL as shown in Figure 2. Section 12 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001) summarizes information on each of these sites.

8.1.1 Naval Proving Ground (Naval Gun Range)

The NPG, also known as the Naval Gun Range, as shown in Figure 13, covered 69,808.58 ha (172,494.65 acres) and was used extensively for ordnance testing research. In 1942, the U.S. Navy had acquired the acreage to test fire 3- to 16-in. diameter Naval ship guns reconditioned at the Naval Ordnance Plant in Pocatello, Idaho. Between 1942 and 1950, approximately 1,650 minor (3- to 5-in.) and major (16-in.) guns were tested at the NPG.

When a projectile is fired from a big gun, a rotating band on the projectile, normally made of copper, engages the lands and grooves in the gun barrel. Although a small number of live and armed projectiles were fired from the big guns at close range into stacks of bombs, all the projectiles found to date with lands and groove gouges in the rotating bands have been target projectiles that do not contain main explosive charges. Unfortunately for cleanup, the rotating bands are not always visible and live bombs from the different tests described below exist in the same locations as the target projectiles. Additionally, there have been instances at the Jefferson Proving Ground where live projectiles have been inadvertently included in lots of inert munitions, which could increase the uncertainty of the extent of live projectiles that could be in the NPG.

Additional work at the NPG that resulted in 29 smaller ordnance sites located within the NPG area, included experimental and test work, primarily in mass detonations. During the mass detonation tests, hundreds of thousands of pounds of explosives in landmines, smokeless powder, and bombs were placed in explosives storage bunkers, railcars, or open sites and detonated to determine the effects on collocated bunkers and facilities. Numerous smaller detonation tests were similar in purpose, but much less explosive was used. These 29 sites were evaluated in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001) and six were determined to have a high probability for and/or the confirmed presence of UXO.

Figure 14. The top photograph shows a stack of five projectiles found along Power Line Road. They consist of two 5-in. and three 2-in. projectiles assumed to be non-explosive. Evidence of firing is shown near the end of the projectile by the rifling pattern in the rotating band. The bottom photograph shows a collection of projectiles being prepared for demolition using a flex-linear shaped charge at the MDA.

Figure 15. The top photograph is a picture of three depth charges located in the Rail Car Explosion Area. The bottom photograph is an example of a land mine fuze at the Land Mine Fuze Burn Area.

Figure 16. The top picture shows an aerial photograph of the MDA with its many craters. The bottom photograph shows a partially buried UXO located within the NPG.

These six sites include the Railcar Explosion Area, NODA,NOAA, the MDA, the Experimental Field Station, and the Land Mine Fuze Burn Area. Although UXO has been previously detected and cleared from these sites, clearance is not complete and the extent of potential UXO outside these areas has not been determined. The following paragraphs present a brief history of these ordnance sites.

8.1.1.1 Experimental Field Station. This site is located within the NPG gunnery range approximately 9.7 km (6 mi) downrange and northeast of the CFA-633 NPG firing site, and approximately 0.4 km (0.25 mi) west of the Big Lost River channel (see Figure 13). The site encompasses 556.5 ha (1,375 acres) and includes multiple craters where a variety of explosive tests were conducted. The site contains UXO, pieces of explosives, structural debris, and soil contamination (DOE-ID 1999c).

In 1996, the field team encountered remnants of World War I and World War II vintage bombs and two areas of widespread heavy concentrations of explosive-contaminated soils. One area was approximately 0.8 ha (2 acres) in size. The second area was approximately 0.3 ha (0.8 acres). The assessment included a visual examination for signs of craters, detonation tests, surface UXO, pieces of explosives, and soil staining. The area was searched for UXO using 10-m (33-ft) sweeps. When the team encountered areas of TNT contamination, the region was examined in great detail and mapped. Several large craters are located in this area. The craters appear to have resulted from ordnance destruction or ordnance testing and no ordnance has ever been found in these craters.

Approximately 2.4 km (1.5 mi) away, the nose section of a World War I vintage bomb containing TNT and an empty tail section of a World War I vintage bomb were found during the assessment and transported during the 1996 removal action to the MDA for disposal by detonation (DOE-ID 1998).

8.1.1.2 National Oceanic and Atmospheric Association (NOAA) . The NOAA site is located just east of Lincoln Boulevard, approximately midway between Mile Markers 4 and 5. It is thought the site was used for a variety of explosive tests or cleanup detonations, or both. The area contains a number of small craters, low-ordered bomb casings and detonators, and some widely scattered pieces of explosives. The NOAA site has been and is currently used by NOAA and other government agencies for a variety of atmospheric, geodetic, and weather-related monitoring and research work (DOE-ID 1997).

During the 1993 interim action, a surface clearance and a geophysical search were conducted to a depth of 0.61 m (2 ft) on a large 1.7 ha (4.13 acre) area and a small 0.88 ha (2.17 acre) area. No UXO was found below the surface.

During the 1996 field assessment, the major objectives of the field team was to determine whether ordnance or soil contamination existed outside the previously identified area, to establish the site boundary, to reestimate the volume of contaminated soil, and to look for any indications that detonation pits existed in the area. The field crews searched the area on foot at approximately 10-m (33-ft) intervals and located scattered TNT, ranging from small flakes to baseball-size chunks. The boundary was established and the large area of contamination mapped (see Figure 13). Several craters were located on the south side of the site that appear to be sites of ordnance destruction. Several partial 100-lb bombs were found southeast of the NOAA site, which indicates that the bombs had been intentionally low-ordered. A low-order detonation is the result of a low-order procedure, intended to detonate an explosive item without causing the item to totally consume itself. A low-order procedure is performed in an area that could not withstand a high-order detonation, which would have totally consumed the item (DOE-ID 1997).

8.1.1.3 Land Mine Fuze Burn Area. The site was used by NPG personnel for disposal of land mine pressure plates, aerial bomb packaging materials, and as an area to dispose of land mine fuzes by burning (DOE-ID 1998). The location of this site is approximately 0.8 km (0.5 mi) west of Lincoln Boulevard and 0.8 km (0.5 mi) north of the Fire Station II training area as shown in Figure 13. The site is estimated to encompass 19.7 ha (48.7 acres) (DOE-ID 1998).

During the 1996 field assessment, the perimeter was established, and the area for the removal action was defined (DOE-ID 1998). The subsurface was characterized using geophysics as part of a technology demonstration project in June of 1996. Approximately 0.6 ha (1.5 acres) were surveyed to a depth of 0.61 m (2 ft), and the area was mapped (DOE-ID 1998).

During the 1996 removal action, 8.1 ha (20 acres) were surface cleared, characterized using geophysics, and mapped. A subsurface clearance was not performed based on the removal action subcontractor's evaluation of the data. However, during the INEEL quality check of the results in the subsurface at this site, several inert items were found and excavated (DOE-ID 1998). Figure 14 presents photographs showing the types of UXO previously found within this area.

8.1.1.4 Mass Detonation Area (MDA). The MDA is located 1.6 km (1 mi) east of Mile Marker 8 on Lincoln Boulevard, north of the INTEC and approximately 3.2 km (2 mi) east of the NRF, as illustrated in Figure 13. The site encompasses 322 ha (796 acres) and has been used for a number of small- to large-scale sympathetic and mass detonation tests, with test shots ranging up to 226,800 kg (500,000 lb) of explosives. A sympathetic detonation test is a test to find out if a charge explodes when another charge is detonated next to it. The MDA site includes numerous blast craters varying in dimensions from a few feet to several tens of feet and is littered with large quantities of UXO, pieces of explosives, and structural debris scattered during past testing and recent ordnance detonation for disposal activities (DOE-ID 1998).

Prior to demolition operations during the 1993 interim action and the 1994, 1995, and 1996 removal actions, the demolition pit of the MDA was searched for UXO, and several were found. In addition, demolition area signs were placed every year, and the postholes were surveyed prior to placement of the sign posts (DOE-ID 1998). Figure 16 presents an aerial photo showing the MDA large detonation craters and storage bunker.

8.1.1.5 Rail Car Explosion Area. The site is approximately 3.2 km (2 mi) due west of Mile Marker 13 on Lincoln Boulevard and adjacent to the Big Lost River channel, approximately 4.8 km (3 mi) northeast of NRF, as shown in Figure 13. It encompasses 195 ha (483 acres) and contains the debris scattered from a sympathetic detonation test involving five railroad cars, each loaded with 13,608 kg (30,000 lb) of explosive ordnance for a total of 68,040 kg (150,000 lb). The crater is located near the west bank of the Big Lost River, and pieces of ordnance and explosives (mostly RDX) are located along both sides of the Big Lost River (DOE-ID 1998).

During the 1996 field assessment, the entire area was walked at 50-m (164-ft) intervals. The boundary of the mapped area was established at the last piece of fragmentation located.

During the 1996 removal action, an 8.1 ha (20 acre) test strip extending south from the detonation pit was cleared of surface ordnance and fragmentation (although UXO has been previously detected and cleared from this site, clearance cannot be considered complete). One live 12.7 cm (5 in.) projectile was found approximately 15 cm (6 in.) below the surface in the 8.1-ha (20-acre) area. About 1,928 kg (4,250 lb) of scrap metal and 11 kg (25 lb) of bulk explosive, mostly RDX, were removed. Two live, 12.7 cm (5 in.) projectiles were removed from the dry riverbed of the Big Lost River. All three projectiles and the bulk explosives were removed to the MDA and disposed of by detonation during the 1996 removal action. Three inert sea mines (depth charges) were located on the east side of the Big Lost River bed at the Rail Car Explosion Area (see Figure 15). The 8.1-ha (20-acre) strip was then mapped, and some of the anomalies (metal fragments) were excavated (DOE-ID 1998).

8.1.1.6 Naval Ordnance Disposal Area (NODA). The NODA site is located approximately 1.6 km (1 mi) northeast of U.S. Highway 20/26 between Mile Markers 266 and 267 and about 3.2 km (2 mi) equidistant from the TRA, INTEC, and CFA facilities at the INEEL, as shown in Figure 13. The NODA is estimated to encompass 55.8 ha (138 acres) (DOE-ID 1998). The U.S. Navy used NODA as an ordnance and nonradioactive hazardous material disposal area during the 1940s. Following the establishment of the National Reactor Testing Station (now the INEEL), the NODA came under the control of the AEC (now DOE). From about 1967 to 1985, approximately 3,175 kg (7,000 lb) of reactive materials were treated (burned) at the NODA. Between 1967 and 1985, the NODA was also used as a storage area for hazardous waste generated at the INEEL. Until 1982, solvents, corrosives, ignitables, heavy metal contaminated solutions, formaldehyde, polychlorinated biphenyl materials, waste laboratory chemicals, and reactives were also stored at this site. By October 1985, all these materials had been removed for off-Site disposal as hazardous waste or treated on-Site by open burning, as allowed by RCRA regulations (DOE-ID 1998).

In 1985, NODA was added to the RCRA, Part A, permit application as a thermal treatment unit. The last treatment of hazardous waste occurred in 1988 (except for one emergency action/detonation in 1990). In June 1990, a Memorandum of Understanding (MOU) was developed between the Environmental Programs (EP) and Waste Reduction Operations Complex (WROC) under which EP agreed to fund and manage all activities necessary to formally close the NODA, including soil sampling and analysis, removal of contaminated soil, emergency removal of ordnance, maintenance of access signs and barricades, and preparation and submittal of all required documentation. In 1997, the Interim Status for the NODA was terminated by the IDEQ with the agreement that the CERCLA program shall perform the final evaluation of the site in accordance with the FFA/CO.

During the 1994 removal action, 11.7 ha (28.92 acres) were cleared of ordnance and pieces of explosives to a depth of 1.2 m (4 ft). An additional 1.6 ha (3.89 acres) were cleared to a depth of 1.2 m (4 ft) from Lincoln Boulevard to the NODA to accommodate an access road. Because of the lack of information pertaining to tests performed in the pits at the NODA site, none of the pits were addressed during the 1994 removal action. The removal action was continued during the summer of 1995, when an additional 9.1 ha (22.56 acres) were cleared to a depth of 0.61 m (2 ft). The depth was reduced to 0.61 m (2 ft) from 1.2 m (4 ft) based on the results of the 1994 removal action. At that time, five pits were remediated. Two pits were remediated with a remote excavator; two pits were remediated with a backhoe; and one pit was hand excavated. The pits were excavated until the geophysical surveys determined there were no additional anomalies (DOE-ID 1998). Although UXO has been previously detected and cleared from this area during the 2000 walk-down, additional 5 in. shells and other fragments were located (Smith 2000).

8.1.2 Arco High Altitude Bombing Range

The Arco High Altitude Bombing range was used during World War II by the Army for aerial bombing practice. As shown in Figure 13, this site is located approximately 9.7 km (6 mi) north and east, inside the southwest corner of the current INEEL boundary, and lies just southwest of Mile Marker 262 on U.S. Highway 20/26, which traverses the south end of the INEEL. The extent of the bombing range, shown in Figure 13, is taken from U.S. Army Air Corp documentation (DOE-ID 1998). This area is over 10,700 ha (26,400 acres) and is significantly larger than the area designated by U.S. Navy maps.

It is reported that the primary ordnance at this site had been M38A2 practice bombs. These practice bombs were 100 lb, sand-filled and air-dropped by B24 Liberator bombing aircraft flying out of the Army Air Corps base at Pocatello (DOE-ID 1998). M38A2 practice bombs included black powder spotting charges and simple, high-reliability, impact-activated initiators (DOE-ID 1998).

The entire site as defined by the Navy, as well as adjacent areas within the Air Corps delineation, was searched on foot by field crews in 1996 (DOE-ID 1998). The visual assessment observed no signs of craters, detonation tests, surface UXO, pieces of explosives, or soil contamination (DOE-ID 1998). The practice bombs, along with initiators, were characterized in detail during the 1996 field assessment.

8.1.3 Twin Butte Bombing Range

The Twin Butte bombing range was used by B-17 bombers, flying practice missions out of the Army Air Corps base at Pocatello beginning in 1942 and continued throughout World War II (DOE-ID 1998). As shown in Figure 13, this area is located near ANL-W on the southeastern boundary of the INEEL and is approximately 3,760 ha (9,291 acre) in area. The range straddles U.S. Highway 20, which was not in existence during the time that the range was in use.

The site was cleared to a maximum depth of 1.2 m (4 ft) in a 36 ha (90 acre) section during the 1994 removal action. Two detonation pits were encountered; however, no UXO, bulk explosives, or contaminated soil was observed in this area (DOE-ID 1998). Items recovered during the removal action included 1,409 expended practice bombs, one sand-filled practice bomb with the black powder spotting charge still installed, two live fuzes, and some partial bomb pieces (see ordnance inventory Appendix K [DOE-ID 1998]). Although UXO has been previously detected and cleared from this area, clearance cannot be considered complete for unrestricted land use.

During the 1996 field assessment, several empty and crushed practice bombs and an arming vane from a M100 bomb fuze were found (DOE-ID 1998). Several expended flare cases and one unexploded M26 flare bomb were also found. Two craters containing bomb fragments were located and investigated. These craters were the result of a high-order detonation and it cannot be determined whether the bombs were deliberately or inadvertently dropped from the air or brought to the location for disposal by detonation (DOE-ID 1998).

8.2 Nature and Extent of Contamination

A detailed summary of the previous investigations and remediation activities at the 29 ordnance sites, which are within the three ordnance areas (discussed by DOE-ID [1998] and shown in Figure 2) is presented in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). No evidence of UXO or soil contamination had been identified in previous investigations for 14 of the 29 sites. However, in some cases, these investigations were limited to only surface searches. Subsurface investigations using geophysical techniques were conducted at some sites, but these were typically limited in aerial extent and to depths of 0.6 m (2 ft) or 1.2 m (4 ft). Therefore, the possibility of subsurface UXO still existing in some areas cannot be eliminated.

Five of the sites within the NPG have confirmed UXO, as follows:

- Naval Ordnance Disposal Area (NODA)—This area was a demolition area for a large variety of ordnance items. An 8-in. projectile, Mk 25 Mod 1, was the largest ordnance item found during the two removal actions. The large number of items removed during two previous actions indicate the potential for fuzes, projectiles, and grenades continue to be present (DOE-ID 1998).

- Mass Detonation Area (MDA)—Heavy ordnance or explosive contamination at this site is not visually evident, despite the extensive explosive testing that occurred there. Historical documentation indicates a potential for land mines, bombs, bulk high explosive, and bulk smokeless powder to be present in this area (DOE-ID 1998).

- Experimental Field Station—This area has UXO, pieces of explosives, and structural debris scattered across a wide area. During the site inspections, 500-lb bomb casings and foreign bomb casings were found. It is very likely that live ordnance items are present in this area (DOE-ID 1998).

- Rail Car Explosion Area—A mix of Amatol-loaded bombs and TNT-loaded Navy mines were used in the rail car detonation. The scattered white explosives (RDX) found at the site most likely originated from two small craters near the rail car crater. Large fragments of 5- and 8-in. projectiles with the explosive still in them can be found in and near both of the small craters. Historical documents indicate potential for bombs and Navy mines to be present in this area (DOE-ID 1998).

- Land Mine Fuze Burn Area—The fuzes found to date are M1A1, M1A2, and M4 land mine fuzes, a number of which still had intact detonators. These fuzes require 500-lb pressure on the pressure plate to function the fuze, but they may be functioned by a weight of 10 lb dropped from a height of 24 in. (DOE-ID 1998). Although a removal action was performed here in 1996 and 1997, additional land mine fuzes are likely to be present.

In summary, multiple types of ordnance and explosives have been recovered from the ordnance areas, which are the Arco High-Altitude Bombing Range, the Twin Buttes Bombing Range, and the NPG. To date, approximately 2,360 live items (UXO) have been removed and detonated (DOE-ID 1998). Because subsurface investigations were not conducted for all ordnance areas, and/or were limited in aerial extent and depth, there is significant uncertainty regarding whether UXO hazards remain at some OU 10-04 areas.

UXO is likely to be present at, and beyond, the NODA, the MDA, the Experiment Field Station, the Railcar Explosion Area, and the Land Mine Fuze Burn Area; currently, more UXO items are found intermittently both at known and at previously unidentified sites. As shown in Figure 2, seven more new ordnance locations were detected during the 2000 walk-down.

8.3 Summary of Site Risks

8.3.1 Human Health Risk Assessment

All sites that potentially contain UXO present some degree of risk. For human contact with OXO, risk may be evaluated in terms of three main components or events: (1) UXO encounter, (2) UXO detonation, and (3) consequences of UXO detonation.

A UXO encounter considers the likelihood that a person will come across UXO and will influence the UXO through some level of force, energy, motion, or other means. A UXO detonation is the likelihood that a UXO will detonate once an encounter has occurred. Consequences of UXO detonation encompass a wide range of possible outcomes or results, including bodily injury or death, health risks associated with exposure to chemical agents, and environmental degradation caused by the actual explosion and dispersal of chemicals to air, soil, surface water, and groundwater. Though UXO encounters occur, casual human contact has never caused a detonation at the INEEL.

The interim guidance recently developed for assessing UXO risk under the U.S. Department of Defense (DoD) Range Rule (DoD 2000) was reviewed for applicability to INEEL UXO areas. This rule identified a process for evaluating responses to risks from military munitions, unexploded ordnance and associated materials on closed, transferred, and transferring (CTT) ranges previously or currently owned by, leased to, or used by the United States. The interim guidance was not used at the INEEL because a number of controversies arose that resulted in the proposed Range Rule being withdrawn on November 14, 2000. Previous investigations had also indicated that insufficient data existed on OU 10-04 UXO areas to perform a risk assessment using the DoD guidance. Therefore, no quantitative risk assessments were performed for confirmed UXO areas.

8.3.2 Ecological Risk Assessment

UXO does not typically pose a risk to ecological receptors. Encounters ecological receptors may have with UXO are typically brief and detonation does not occur from casual contact. It is unlikely that an animal could strike a UXO with enough force to cause a detonation. As with human contact, no known accidental detonations have been caused at the INEEL by contact with ecological receptors.

8.4 Remediation Objectives for the Ordnance Areas

Remedial Action Objectives (RAO) for the ordnance areas were developed in accordance with the *National Oil and Hazardous Substances Contingency Plan* (NCP) (40 CFR 300) and EPA guidance (EPA 1988) and through the consensus of DOE-ID, EPA, and IDEQ participants. The RAOs are based on the results of both the human health risk assessments (HHRAs) and ecological risk assessments (ERAs) and are specific to the COCs and exposure pathways developed for OU 10-04.

The RAOs specified for protecting human health are expressed both in terms of risk and exposure pathways, because protection can be achieved through reducing contaminant levels as well as through restricting or eliminating exposure pathways. UXO does not have a typical exposure pathway where the overall intent of the human health RAOs is to limit the cumulative carcinogenic human health risk to less than or equal to 1E-04, and noncarcinogenic exposure to less than or equal to an HQ of 1. Therefore, the UXO at the ordnance areas was excluded from quantitative analysis in the baseline risk assessment (BRA). However, the potential UXO at these areas presents an unacceptable risk of acute physical injury from fire or explosion resulting from accidental or unintentional detonation. Therefore, an RAO pertaining to the explosive safety aspect of ordnance to eliminate or reduce the potential for exposure to explosive ordnance was developed. The RAO developed for the ordnance areas to protect human health is as follows:

- Prevent any inadvertent contact with potential UXO by onsite workers and members of the public.

8.5 Description of Alternatives for the Ordnance Areas

Three remedial alternatives were developed to address the ordnance areas: no action, limited action, and detection with removal and disposal of detected ordnance as shown in Figure 13. The major combinations of technology process options associated with each alternative are presented in Table 9. Each of the three remedial alternatives is discussed below.

8.5.1 Alternative 1, No Action

Formulation of a no action alternative is required by the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP) (40 CFR 300.430[e][6]) and guidance for conducting feasibility studies under CERCLA (EPA 1988). The no action alternative serves as the baseline for evaluating other remedial action alternatives. The alternative includes environmental monitoring, but does not include any actions to reduce potential exposure pathways, such as fencing, deed restrictions, or administrative controls (EPA 1988).

8.5.2 Alternative 2, Limited Action and Institutional Controls

The limited action alternative represents the continuation of current management practices at WAG 10 ordnance areas including site access restrictions, inspection, and monitoring. Remedial actions under this alternative focus on restricting access (i.e., fencing, deed restrictions, administrative controls). The effectiveness of the limited action would be evaluated by DOE-ID, EPA, and IDEQ during subsequent 5-year reviews. Additional monitoring would be initiated if determined necessary.

Table 9. Detailed analysis summary for the Ordnance Areas.

Criteria	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Detection, Removal, and Institutional Controls
Overall protection of human health and the environment			
Human health protection	No reduction in risk	Reduces risk by restricting access	Reduces risk by removing detected UXO and restricting access
Environmental protection	Not applicable	Not applicable	Not applicable
Compliance with ARARs			
Action-specific			
Military Munitions Rule – 40 Code of Federal Regulation 266, Subpart M	Not applicable	Would meet ARAR	Would meet ARAR
Idaho Fugitive Dust Emissions – IDAPA 58.01.01.650-.651	Not applicable	Would meet ARAR	Would meet ARAR
Rules and Standards for Hazardous Waste in Idaho– IDAPA 58.01.05.010.006, .008, and .011	Not applicable	Would meet ARAR	Would meet ARAR
Hazardous Waste Determination – 40 Code of Federal Regulation 262.11	Not applicable	Would meet ARAR	Would meet ARAR
Rules and Standards for Hazardous Waste in Idaho – IDAPA 58.01.05.009	Not applicable	Would meet ARAR	Would meet ARAR
Location-specific			
Native American Graves Protection and Repatriation Act —25 USC 32	Would meet ARAR	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary
National Historic Preservation Act—36 Code of Federal Regulation 800	Would meet ARAR	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary

Table 9. (continued).

Criteria	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Detection, Removal, and Institutional Controls
TBCs			
Real Property Contaminated with Munitions, Explosives, or Chemical Agents – DoD Standard 6055.9, Chapter 12	Would not meet TBC	Would meet TBC	Would meet TBC
Long-term effectiveness and permanence			
Magnitude of residual risk	No change from existing risk	Risk is controlled only through access restriction	Risk is reduced through UXO detection and removal, and continued access restrictions
Adequacy and reliability of controls	No control and, therefore, no reliability	Assumed to be adequate for the period of institutional control	Assumed to be adequate for the period of institutional control
Reduction of toxicity, mobility, or volume through treatment			
Treatment process used	No treatment process will be performed	No treatment process will be performed	Detection and detonation
Amount destroyed or treated	There will be no waste destruction or treatment	There will be no waste destruction or treatment	Amount of remaining UXO is not known
Reduction of toxicity, mobility, or volume	There will be no reduction of toxicity, mobility, or volume	There will be no reduction of toxicity, mobility or volume	Amount of UXO to be recovered and destroyed is not known
Irreversible treatment			Not reversible, but detonation of UXO will permanently eliminate risk
Type and quantity of residuals remaining after treatment	No treatment will be performed	No treatment will be performed	Inert metal – quantity is not known at this time
Statutory preference for treatment	Does not meet preference for treatment	Does not meet preference for treatment	Meets preference
Short-term effectiveness			
Community protection	Increase of potential risks to the public	Reduces potential risks to the public	Reduces potential risks to the public
Worker protection	Increase of risks to workers	Workers protected by engineering and administrative controls	Workers protected by engineering and administrative controls
Environmental impacts	No change from existing conditions	No change from existing conditions	Limited to disturbances from excavation of UXO
Time until action is complete	No action will be taken	Approximately 12 months	Approximately 36 to 48 months

Table 9. (continued).

Criteria	Alternative 1 No Action	Alternative 2 Limited Action	Alternative 3 Detection, Removal, and Institutional Controls
Implementability			
Ability to construct and operate	No construction or operation	Easy, involves installation of fencing and signs	Moderately difficult; involves use of specialized detection technology over very large areas; removal and detonation of detected UXO can be hazardous
Ease of implementing additional action if necessary	May require repeat of feasibility study and record of decision process	Moderately difficult, would involve detection and removal of UXO using specialized technology; removal and detonation of UXO can be hazardous	Moderately difficult, would involve detection and removal of UXO using specialized technology; removal and detonation of UXO can be hazardous.
Ability to monitor effectiveness	Monitoring of conditions is readily implemented	Monitoring of conditions is readily implemented	Moderate since UXO detection methods are rarely 100% effective
Ability to obtain approvals and coordinate with regulatory agencies	No approvals required	No difficulties identified	No difficulties identified
Availability of services and capacity	None required	All necessary services are available on-Site	UXO detection capability is available commercially; UXO removal and detonation services are available on-Site as well as commercially
Availability of equipment, specialists, and materials	None required	Equipment, specialists and materials for implementing site access restrictions and deed restrictions are available on-Site	Equipment, specialists, and materials for UXO detection are available commercially; equipment, specialists and materials for UXO removal and detonation are available on-Site as well as commercially
Availability of technology	None required	None required	Available commercially
Cost (net present worth, 5% discount rate)			
Capitol Cost	$ 0.2 million	$ 0.7 million	$ 12.0 million
Operations and Maintenance Cost	$ 2.2 million	$ 4.2 million	$ 4.0 million
Total Cost	$ 2.4 million	$ 4.9 million	$ 16.0 million

8.5.3 Alternative 3, UXO Detection with Removal, and Institutional Controls

Implementation of this alternative would involve detection of, and disposal operations on UXO. Disposal will consist of detonation at the MDA or in-place, if it is determined transport of the UXO to the MDA is unsafe. Detonation of UXO will be performed in a manner that does not threaten human health or the environment, and meets the minimum distance to the property of others, as specified in RCRA Open Burning; Waste Explosives regulation. Actions under this alternative would include performing geophysical surveys to detect UXO in select areas where known ordnance testing occurred with live ordnance, including, but not limited to, the Rail Car Explosion Area, NODA, NOAA, Experimental Field Station, Land Mine Fuze Burn Area, and the Mass Detonation Area. Although some UXO has previously been detected and cleared from these areas, it is likely that some UXO remains. UXO may also be found adjacent to the areas previously cleared because of the limited actions taken and limitations associated with the detection technologies used. New detection technologies are evolving rapidly, which will be evaluated for the use at the INEEL as they are developed and demonstrated.

The boundaries of the firing fan and bombing ranges from World War II activities are based primarily on historic data from World War II era documents, which is supported by ground observations. Significant uncertainty exists with respect to the extent of these areas and surveys are required to define these boundaries and the ordnance density and depth within the boundaries. Survey technologies will be evaluated and demonstrated for effectiveness before utilized for extensive UXO detection over the bombing and firing ranges. Locations of probable ordnance detections found during the surveys will be logged. Locations will be confirmed and ordnance cleared, as necessary, to support current and reasonable expected future land use.

The need for additional surveys or removal actions would be assessed during the remedy review and the statutory 5-year reviews. INEEL-wide access restrictions, such as institutional controls, will be necessary as long as an unacceptable risk remains.

8.5.4 Comparison of Elements and Distinguishing Features of Each Alternative

The relative performance of each alternative is described in Table 9.

8.6 Comparative Analysis of Alternatives for the Ordnance Areas

The comparative analysis of the remedial action alternatives is a measurement of the relative performance of alternatives against each evaluation criterion. The comparison identifies the relative advantages and disadvantages associated with each alternative. The alternatives were evaluated using the nine evaluation criteria as specified by CERCLA (40 CFR 300.43[f][5][i]). The purpose of this comparison is to identify the relative advantages and disadvantages associated with each alternative. The comparative analyses of alternatives for the nine criteria are summarized below.

8.6.1 Overall Protection of Human Health and the Environment

For the ordnance areas, Alternative 3 (UXO detection, removal, and institutional controls) would provide effective long-term protection of human health and the environment. UXO detected from survey efforts would be identified, removed, and detonated. Long-term institutional controls would be maintained to restrict access or activities. Alternative 2 would be protective by limiting access and exposure to UXO.

8.6.2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Comparison of compliance with ARARs is summarized in Table 9 for the ordnance areas. The ARARs for Alternative 1 (no action) would not be met for the ordnance areas. Alternatives 2 and 3 for the UXO areas would meet ARARs.

8.6.3 Long-Term Effectiveness and Permanence

Alternative 1 (no action) would provide the least long-term effectiveness and permanence for the ordnance areas.

For the ordnance areas, Alternative 3 (UXO detection, removal, and institutional controls) would provide the highest degree of long-term effectiveness and permanence. Visual and geophysical surveys would be performed to detect UXO. Detected UXO would be removed and detonated as appropriate. However, because undetected UXO could remain in place, institutional controls will be required and remedy reviews and statutory 5-year reviews would continue during the institutional control period. Alternative 2 (institutional controls) would be somewhat less effective and permanent because direct exposure to UXO would still be a risk at the sites and risk reduction would rely primarily on access restrictions.

8.6.4 Reduction of Toxicity, Mobility, or Volume through Treatment

For the ordnance areas, Alternative 3 offers treatment of UXO by detonation in place or at the MDA. This alternative would reduce mobility concerns and reduce the potential volume of UXO present at the INEEL. Alternatives 1 and 2 do not provide any reduction in toxicity, mobility, or volume through treatment.

8.6.5 Short-Term Effectiveness

For the ordnance areas, the no action alternative is rated lowest in short-term effectiveness; without access restrictions and administrative controls on-Site workers could encounter UXO and suffer physical injury from inadvertent detonation. Worker risk is always a consideration of UXO clearance (Alternative 3) and is based on the amount and type of intrusive work involved and the potential for an explosion to occur. Though many precautions are taken to protect site workers, the density and type of UXO at the INEEL has not been completely determined and thus, Alternative 3 has higher short-term risk. Alternative 2 is considered the most effective in the short-term because administrative controls will limit human exposure to UXO and workers would not be exposed to the hazards associated with removal and detonation of UXO.

8.6.6 Implementability

Alternatives 1, 2, and 3 are all implementable. Alternative 1 (no action) would be the most implementable for the ordnance areas, since no change in existing conditions would be required.

The implementability of Alternative 2 is also high, many of the access restrictions are currently in place, and other administrative controls are easy to implement and maintain. Alternative 3 is more difficult to implement because specialized UXO detection capability is required to survey the vast land areas included in the ordnance areas, and methods currently available may not be completely effective at detecting all UXO under conditions at the INEEL.

8.6.7 Cost

Alternative 3 (UXO detection, removal, and institutional controls) is the most costly, at $16 million, because extensive effort is required to detect and remove UXO over such large land areas. The cost estimate is based on the use and operation of a helicopter mounted array of magnetometers to detect potential UXO and standard military practices to detonate UXO and recover metal fragments. The cost for Alternative 2 (limited action), which only includes efforts to implement and maintain institutional controls, is $4.9 million, and the cost for Alternative 1 (no action) is $2.4 million. Detailed cost estimates are included in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001, Appendix I).

8.6.8 State Acceptance

The IDEQ has been involved in the development and review of the OU 10-04 RI/FS report (DOE-ID 2001), the Proposed Plan (DOE-ID 2002), and this ROD. All comments received from IDEQ on these documents have been resolved and the documents revised accordingly. In addition, IDEQ has participated in public meetings where public comments and concerns have been received and responses offered. The IDEQ concurs with the selected remedial alternative for the ordnance areas contained in this ROD and is a signatory to the ROD with DOE and EPA.

8.6.9 Community Acceptance

Community participation in the remedy selection process and Proposed Plan reviews included participation in the public meetings held February 7 and 12, 2002 (see Section 3). The 30-day public comment period was extended an additional 30-days from January 28, 2002, through March 29, 2002. The Responsiveness Summary, presented as Part 3 of this ROD, includes verbal and written comments received from the public and the DOE responses to these comments. Representatives of the EPA and IDEQ assisted in the development of the responses.

All comments received on the Proposed Plan were considered during the development of this ROD. Public concerns generally centered on the cost to perform geophysical surveys over all ordnance areas. Consequently, a phased approach to UXO detection and removal will be developed during the remedial design phase to reduce costs.

8.7 Selected Remedy for the Ordnance Areas

Activities at the ordnance areas that may have left UXO behind include aerial bombing practice, naval artillery testing, detonation research, explosives storage bunker testing, and ordnance disposal. Any UXO remaining in these areas can pose a physical risk to human safety if an explosion is triggered from handling or contact, especially by machinery. Alternative 3, UXO detection, removal, and institutional controls, was the selected remedy for the three ordnance sites to mitigate potential human health risk from inadvertent contact to UXO.

The remediation of the ordnance areas will include the following activities:

- Implement institutional controls consistent with land-use. The specific goals of the institutional controls are to control human activity at sites with suspected UXO contamination and prevent harm from unintentional detonation of UXO. Institutional controls can include access restrictions, excavation restrictions, and restrictive covenants, and other restrictions such as signage and educational programs. Institutional controls will be maintained until the UXO hazard is removed or reduced to levels acceptable for current and anticipated future land use.
- Perform visual and geophysical surveys for the presence of UXO. If aerial UXO detection methods are to be used, a demonstration shall be performed first over a specially designed test area and over a known high-impact area of ordnance testing to confirm effectiveness under INEEL site-specific conditions.
- Investigate potential UXO targets during the survey.
- Identify and define the boundaries of the firing and bombing impact areas and the weapons testing and ammunition detonation areas.
- Determine the ordnance density, explosive characteristics of the UXO, and ordnance accessibility.
- Determine the relative risks of land use based on the type, amount, and accessibility of UXO and determine the extent of UXO removal required to meet desired land use objectives.

- Perform surface clearance, surface geophysical investigations, and intrusive UXO removal with disposal by detonation at the MDA or in-place detonation. Address waste generated during detonation activities using current disposal practices.

- Dispose of other recovered non-ordnance items, such as shrapnel, at an approved landfill on the INEEL or sent off of the INEEL for recycling. If secondary explosive contamination, such as TNT or RDX is discovered, perform remediation as described for the TNT/RDX contaminated soil sites.

- Backfill excavated areas deeper than 1 ft, contour to match the surrounding terrain, and vegetate.

Geophysical surveys will be conducted over the ordnance areas shown on Figure 13 to identify potential UXO. Anomalies detected from the surveys would be noted and further investigated to determine whether intrusive investigation is necessary to remove suspect items. Any items removed that could be UXO will be detonated at the MDA, unless it was determined to be too hazardous to transport, in which case the UXO would be detonated at the location it was detected. Detonation of UXO will be performed in a manner that does not threaten human health or the environment, and meets the minimum distance to property of others as specified in the RCRA Open Burning: Waste Explosives regulation. Sampling will be performed to determine if products of incomplete combustion are present after detonation events at the MDA (or other areas where UXO is detonated). Although detectable levels are not expected, remediation of soil contamination of the MDA will be performed at post-remediation if residual risk exceeds 1E-04. Therefore, the MDA will be investigated for remediation after remediation of the UXO sites and the TNT/RDX sites is complete. Other non-UXO items recovered, such as shrapnel, would be disposed at an appropriate landfill at the INEEL, such as the CFA landfill, or sent off the INEEL for recycling, if permitted by DOE policy.

Geophysical investigations for buried munitions are seldom 100% effective. In many cases, a munition is buried too deep, is too small to be detected, or is constructed of a material difficult to detect. Later, through frost heave, erosion, or construction, the item can reach the surface. Also, because the total amount of munitions buried at a site is almost never known, complete recovery cannot be documented. Therefore, periodic surveys may be required and institutional controls established and maintained. For purposes of cost estimation, it was assumed that a helicopter boom-mounted magnetic detection system would be used to perform a survey over the NPG, the Arco High-Altitude Bombing Range, and the Twin Buttes Bombing Range, which also encompasses the weapons testing and ammunition detonation areas, and that hand-held detectors would be used in confirming the location of UXO identified from the aerial survey. The purpose of the survey is to define the boundaries of the bombing and firing ranges and the weapons testing and ammunition detonation areas and determine ordnance location and density within these boundaries.

Institutional controls will be maintained at the ordnance areas until the UXO hazard is removed or reduced to acceptable levels. Controls are required to restrain human activity at areas with suspected UXO contamination and prevent harm from unintentional detonation of UXO. In April 1999, the EPA Region 10 developed a policy for institutional controls. During the OU 10-04 remedial design/remedial action (RD/RA) phase for the ordnance areas, an operation and maintenance (O&M) plan will be developed that will contain the institutional controls for the ordnance areas that will follow the guidelines in the policy. This plan will establish uniform requirements of the institutional control remedy components for all INEEL ordnance areas and specify the monitoring and maintenance requirements.

Access to the INEEL is currently restricted for purposes of security and public safety. Site-wide access restrictions would limit accessibility until at least 2095 based on the Comprehensive Facility and Land Use Plan for ordnance areas within the INEEL boundary. Installation of additional fences or relocation of the existing fences may also be necessary. Other access control measures may include warning signs, assessing trespassing fines, and establishing training requirements for persons allowed access. Land-use restrictions will be specified if government control of the INEEL is not maintained throughout the institutional control period.

8.7.1 Cost

The estimated cost for Alternative 3, UXO detection, removal, and institutional controls, is $16 million. Cost estimates are based on the use and operation of a helicopter-mounted array of magnetometers and hand-held detectors to detect potential UXO over all INEEL ordnance areas, which is approximately 84,252 ha. (208,192 acres), and standard military practices to detonate UXO and recover metal fragments. Cost allowances are included to account for waste characterization, packaging, and continuing institutional controls. The elements of the cost estimate are summarized in Table 10 and details of the cost estimate are provided in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001, Appendix I). By implementing the remedy in phases, and postponing geophysical surveys over all ordnance areas until more effective and less costly methods are developed and demonstrated, the cost for this alternative can be reduced.

Table 10. Cost estimate summary for OU 10-04 Ordnance Areas selected remedy.

Description	Cost (Net Present Value)	Totals
Capital Costs		**8,990,000**
Remedial Design	**468,000**	
Remedial design/remedial statement of work	76,000	
Remedial design work plan	10,000	
Environmental, safety and health plan	95,000	
Sampling and analysis plan	102,000	
Quality assurance project plan	23,000	
Site operation and maintenance plan	34,000	
Draft final design/report preparation	23,000	
Remedial action work plan	59,000	
Plans and specifications	23,000	
Miscellaneous environmental documents	23,000	
Remediation Support	**146,000**	
Quality assurance	22,000	
Project office operations	124,000	
Remediation/Technical Support Activities	**42,000**	
Engineering and technical support	42,000	
Remedial Action	**8,290,000**	
Mobilization & prep. work	12,000	
Site work	8,249,000	
Site restoration	0	
Demobilization	12,000	
Other	17,000	
Removal Action	**44,000**	
Summary report	44,000	
Operations Cost		**3,197,000**
Cleanup Tech. Admin. Activities Program Management	**1,471,000**	
Project and baseline management/report	1,471,000	
Post ROD Ops and Maintenance	**1,500,000**	
Caretaker maintenance	1,500,000	
Monitoring	**226,000**	
Field sampling plan	0	
Sampling	0	
5-year reviews	226,000	
General and Administrative (G&A)		**171,000**
Subtotal Costs		**12,358,000**
Plus 30% Contingency		**3,707,000**
TOTAL PROJECT COST IN NET PRESENT VALUE		**16,065,000**

NOTE: Net present value is the cumulative worth of all costs, as of the beginning of the first year of activities, accounting for inflation of future costs. Net present values are estimated assuming variable annual inflation factors for the first 10 years, in accordance with DOE Order 430.1, followed by a constant 5% annual inflation rate. A constant 5% discount rate is assumed.

8.7.2 Estimated Outcomes of the Selected Remedy

For on-Site workers and members of the public, risk of potential contact with UXO will be reduced through detection and removal of UXO and restricting access and activities within the suspect UXO areas. However, geophysical investigations for buried munitions are seldom 100% effective and because the total amount of munitions buried at a site is almost never known, complete recovery cannot always be documented. Therefore, institutional controls will be implemented and maintained and periodic surveys may be required. The specific goals of the institutional controls will be to control human activity at sites with suspected UXO contamination and prevent harm from unintentional detonation of UXO.

Access to the INEEL is currently restricted for purposes of security and public safety. Site-wide access restrictions would limit accessibility until at least 2095 based on the Comprehensive Facility and Land Use Plan for ordnance areas within the INEEL boundary. Installation of additional fences or relocation of the existing fences may also be necessary. Other access control measures can include warning signs, assessing trespassing fines, and establishing training requirements for persons allowed access. Land-use restrictions will be specified if government control of the INEEL is not maintained throughout the institutional control period.

8.8 Statutory Determinations for the Ordnance Areas

8.8.1 Overall Protection of Human Health and the Environment

Alternative 3, the UXO detection, removal, and institutional controls, provides effective, long-term protection of human health and the environment. The removal of UXO from OU 10-04 ordnance areas will minimize potential long-term human health and environmental concerns associated with exposure to UXO. Detonation of ordnance will effectively destroy the material and reduce risk. Institutional controls will be maintained to limit access and future activity at the sites because there is the potential for buried, undetected UXO to reach the surface from frost heaves and erosion, thereby posing an unacceptable risk.

Short-term protection of human health is less effective, because workers would be exposed to safety hazards during UXO clearance. However, all potential risks during implementation could be controlled through administrative and engineering controls.

8.8.2 Compliance with ARARs and TBCs

The ARARs and TBCs for the selected remedy UXO survey, removal, and detonation, are presented in Table 11. Removal and detonation of UXO complies with the Military Munitions Rule and the Open Burning; Wastes Explosives provisions of RCRA. Since the MDA is in a remote location, miles from INEEL facilities and neighboring property, detonation of UXO at the MDA can be performed in a manner that will not threaten human health or the environment. Any waste generated from detonation of UXO will be subjected to a hazardous waste determination, and any waste determined to be RCRA regulated will be treated, if required, and disposed in an approved facility on or off the INEEL. The DoD Standard 6055.9, Chapter 12 "Real Property Contaminated with Ammunition, Explosives, or Chemical Agents," would be met by implementing and enforcing applicable provisions of the standard. All areas affected by WAGs 6 and 10 remedial activities would be evaluated for cultural resource concerns before disturbance. Activities in sensitive areas will be modified, as required, to meet ARARs. Therefore, the selected remedy will comply with ARARs and TBCs.

Table 11. ARARs and TBCs for the selected alternative—survey and removal—for OU 10-04 Ordnance Areas.

Category	Citation	Reason	Relevancy[a]
Action-specific ARARs			
Rules for the Control of Air Pollution in Idaho	Fugitive Dust IDAPA 58.01.01.650 and .651	Requires control of dust during excavation for recovery of UXO and other potential ordnance items.	A
Resource Conservation and Recovery Act – Standards Applicable to Generators of Hazardous Waste	Hazardous Waste Determination IDAPA 58.01.05.006 (40 CFR 262.11)	A RCRA hazardous waste determination is required for recovered UXO and other potential ordnance items, and any secondary waste generated during remediation, which is to be treated or disposed of on or off the INEEL.	A
Resource Conservation and Recovery Act – Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Units	General Facility Standards for Owners and Operators of Remediation Waste Management Sites IDAPA 58.01.05.008 (40 CFR 264.1[j][1-13])	General RCRA performance standards must be met during remediation.	A
	Equipment Decontamination IDAPA 58.01.05.008 (40 CFR 264.114)	All equipment used during remediation that contact hazardous waste must be decontaminated in accordance with RCRA requirements.	A
	Use and Management of Containers IDAPA 58.01.05.008 (40 CFR 264.171-177)	Hazardous waste generated during remediation that is managed in containers must meet RCRA requirements.	A
	Open Burning, Waste Explosives IDAPA 58.01.05.008 (40 CFR 265.382)	Detonation of UXO and other explosive ordnance items must be performed in a manner that does not threaten human health or the environment.	A
Resource Conservation and Recovery Act – Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities	Military Munitions Rule 40 CFR 266.205 and 206	Recovered UXO and other ordnance items that are identified as hazardous waste under RCRA must meet RCRA requirements for storage, if required during remediation on an interim basis, and transport. Any emergency response conducted during remediation involving munitions or explosives will be exempt from RCRA waste generator and transporter requirements.	A

Table 11. (continued).

Category	Citation	Reason	Relevancy[a]
Location Specific ARARs			
National Historic Preservation Act	Historic properties owned or controlled by Federal agencies 16 USC 470 h-2 Identifying Historic Properties 36 CFR 800.4 Assessing Effects 36 CFR 800.5	In accordance with federal requirements, the site must be surveyed for cultural and archeological resources before construction and appropriate actions must be taken to protect any sensitive resources.	A
Native American Graves Protection and Repatriation Act	Custody 25 USC 3002 (43 CFR 10.6) Repatriation 25 USC 3005 (43 CFR 10.10)	In accordance with federal requirements, the site must be surveyed for cultural and archeological resources before construction and appropriate actions must be taken to protect any sensitive resources.	A
TBC			
Real Property Contaminated with Munitions, Explosives, or Chemical Agents	DoD Standard 6-55.9, Chapter 12	Establishes requirements for disposition of real property known or suspected to be contaminated with ammunition, explosives, or chemical agents.	

a. A = Applicable; RA = Relevant and Appropriate

8.8.3 Cost Effectiveness

The selected remedy is considered cost-effective with respect to the level of protection of human health and the environment. The removal and treatment of UXO through destruction will provide for permanent effectiveness for current workers and future residents. Cost will be reduced through implementation of a phased approach to UXO remediation that will be developed during remedial design. When compared to other potential remedial actions, the selected remedy provides the best balance between cost and effectiveness in protecting human health and the environment.

8.8.4 Use of Permanent Solutions and Alternative Treatment Technologies

The selected remedy Alternative 3, the UXO survey, removal, detonation, and institutional controls, represent the maximum extent to which permanent solutions and treatment technologies can be used in a practical manner at the INEEL. Of those alternatives that are protective of human health and the environment and comply with ARARs/TBCs, DOE, EPA, and IDEQ have determined that the selected remedy provides the best balance of tradeoffs in terms of the nine CERCLA criteria.

8.8.5 Preference for Treatment as a Principal Element

The selected remedy uses permanent solutions through removal and disposal of UXO, a principal threat waste, through treatment by detonation. This satisfies the statutory preference for treatment as a principal element of the remedy.

8.8.6 Five-Year Reviews

The effectiveness of the institutional controls and the need for surveys or removal actions will be evaluated as part of the 5-year review process to assure that final remedial actions for UXO on the INEEL remain protective.

9. TNT/RDX CONTAMINATED SITES

Remedial action is required for five sites contaminated with TNT and RDX: TNT at the Fire Station II Zone and Range Fire Burn Area, the Experimental Field Station, Land Mine Fuze Burn Area, and NOAA soil sites, and RDX at the NODA Area 2 soil site. These five sites are also located within the ordnance areas (discussed in section 8) and are subjected to the selected remedial action for those areas as well. Figure 17 shows the location of the five TNT/RDX contaminated sites within the NPG. Although risks for the five contaminated soil sites were analyzed individually, they were considered collectively for the analysis of remedial alternatives. Therefore, Sections 9.1 through 9.5 each addresses a single site, including a summary of the site investigations, nature and extent of contamination, and baseline risk estimates. Ingestion of homegrown produce, dermal absorption of soil, and ingestion of groundwater are the only human health exposure routes with unacceptable estimated risk for the TNT/RDX contaminated soil sites. Subsequent sections present the analysis of alternatives for the entire group. Remedial action objectives, remedial alternatives, and the selected remedy are presented. More detailed information about the contaminated soil sites can be found in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001). Figure 18 presents photographs of soil contaminated with TNT and RDX fragments present in the TNT/RDX contaminated areas.

9.1 Site: Fire Station II Zone and Range Fire Burn Area

The Fire Station II Zone and Range Fire Burn Area will be remediated to address the risk to human and ecological receptors posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below.

The Fire Station II Zone and Range Fire Burn Area is located adjacent to the Fire Station II training site for the INEEL Fire Department (see Figure 17). It is located just east of Lincoln Boulevard at Mile Marker 5 and includes an area of contamination approximately 13 ha (33 acres) in size. Earlier NPG activities at the site included some low-order bomb detonations that scattered UXO and pieces of explosives over several areas of the site. In the early 1970s, the entire 800-acre area was engulfed by a range fire that reportedly burned some UXO. More detailed information about the Fire Station II Zone and Range Fire Burn Area can be found in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001).

9.1.1 Site Investigation

A 4-ha (10-acre) area was cleared to a depth of 0.61 m (2 ft) of UXO and pieces of explosives during the 1993 interim action, and only a few areas of explosive contaminated soils were found. A total of 20 samples were collected and analyzed from the area. The results ranged from 0.0 to 2,141 ppm for TNT and 0.0 to 4.7 ppm for RDX. Areas above the TNT action levels were excavated by hand until the verification sample results met the cleanup levels of 44 ppm.

During the 1996 field assessment, the entire site was assessed, including the area outside the 4-ha (10-acre) site that was cleared of ordnance during the 1993 interim action. The assessment included a visual examination for signs of craters, detonation tests, surface UXO, pieces of explosives, and soil contamination. The boundary of soil contamination was extended and mapped. The burn area was covered during the sweep of the downrange area. The area outside of the 4-ha (10-acre) site was walked at 10-m (33-ft) intervals. The area searched extended out to the last identified piece of TNT, which became the tentative outer boundary of the site. From this piece, the search moved laterally, until another piece of TNT could be located. The search then again extended out to confirm that no other pieces could be found and then retracted to the last peripheral piece, which was flagged as the boundary. This search process was repeated until the entire boundary was established. In addition to the Fire Station II Area, the Range Fire Burn Area also was assessed. The search team fanned out in approximately 10-m (33-ft) intervals from the Fire Station II training area and walked east and northeast toward the Experimental Field Station (DOE-ID 1998).

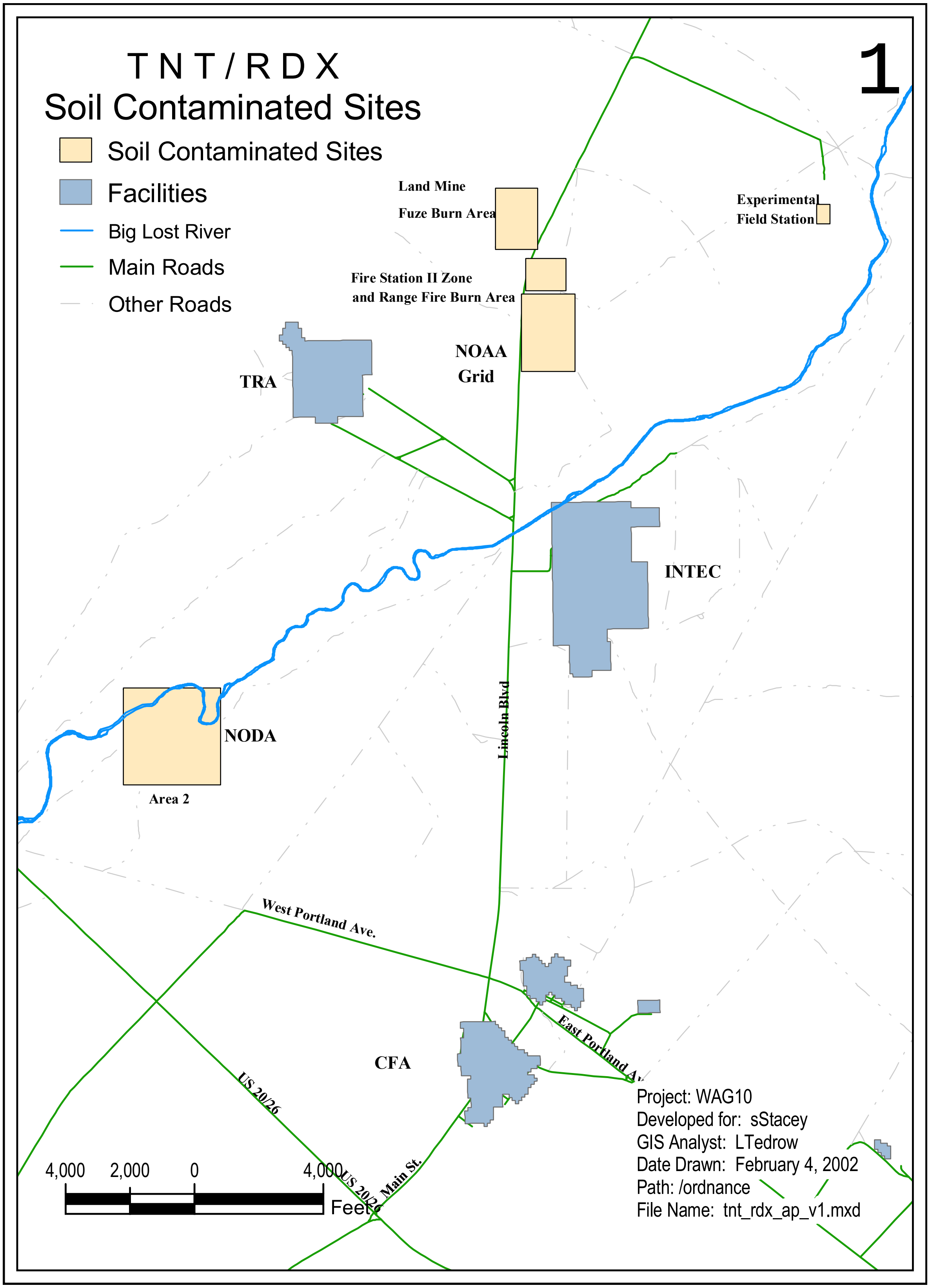

Figure 17. Location of the NODA, NOAA Experimental Field Station, Land Mine Fuze Burn Area and Fire Station II Zone and Range Fire Burn Area.

Figure 18. The top photograph shows a large metal fragment remaining from a bomb and chunks of TNT. The bottom photograph shows chunks of RDX.

In 1999, surface soil samples were collected as described in the *Field Sampling Plan (FSP) for Operable Unit (OU) 10-04 Explosive Compounds* (DOE-ID 1999c). The results of this sampling effort were evaluated in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001), and presented below in Section 9.1.3.

9.1.2 Nature and Extent of Contamination

The location of the Fire Station II Zone and Range Fire Burn Area is shown in Figure 17. In 1999 soil samples were taken from this area. Contaminants were detected between 0 to 0.61 m (0 to 2 ft) below the ground surface; however, the highest detected concentrations were mainly located in the top 15 cm (0.5 ft) of the surface soil. The maximum detected RDX concentration was 3.7 mg/kg. For TNT, the maximum detected concentration was 130 mg/kg. The volume of contaminated soil that must be remediated at this site is an estimated 150 yd^3.

Some of the unexploded ordnance was removed during the 1993 and 1997 removal activities. However, there is still some potential for UXO to remain in the area.

9.1.3 Summary of Site Risks

The 1999 samples yielded concentrations of benzo(a)pyrene, phenanthrene, and TNT in excess of contaminant screening levels for human health, and concentrations of 4-amino-2,6-dinitrotoluene, copper, HMX, lead, nitrate, nitrite, RDX, selenium, TPH-diesel, trichlorofluoromethane, and xylene above screening levels for the ecological risk assessment. There still remains a potential for UXO to be located within the site presenting a risk to human health. The results of the human health and ecological risk assessments are given below.

The Fire Station II Zone and Range Fire Burn Area was divided into four separate areas for the human health and ecological risk assessments (more detailed information about these four areas can be found in Section 12 of the OU 10-04 RI/FS [DOE-ID 2001]). In the human health assessment the inhalation and groundwater pathways were evaluated cumulatively across all four areas, whereas all other pathways were evaluated separately for each area. Area 4 posed the greatest risk in the human health risk assessment while areas 1 and 2 showed the greatest risk for ecological receptors. Therefore, the four areas were grouped in the remediation evaluation.

9.1.3.1 Human Health Risk Assessment Summary. TNT is identified as a COC based on human health risk estimates. The exposure pathways of concern are ingestion of homegrown produce and dermal absorption. Contribution of all other contaminants to total risk and hazard index is insignificant. A summary of the information about the human health COC in soil at the Fire Station II Zone and Range Fire Burn Area is given in Table 12.

Table 12. Soil concentrations for the human health contaminant of concern at the Fire Station II Zone and Range Fire Burn Area.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
TNT	0.20	130	24/37	NA	130	Maximum

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

The total risk for all pathways for the current occupational scenario is less than 1E-04, and the noncarcinogenic hazard index for the current occupational scenario is less than 1.0.

The total estimated risk for all pathways for the 100-year future residential scenario is 1E-04 (1 in 10,000) from TNT. The noncarcinogenic hazard index of 12 for the future residential scenario is from TNT.

The total estimated risk for all pathways for the 100-year future occupational scenario is less than 1E-04, and the noncarcinogenic hazard index for the future occupational scenario is less than 1.0.

9.1.3.2 Ecological Risk Assessment Summary. RDX and TNT were identified as COCs at the Fire Station II Zone and Range Fire Burn Area for ecological receptors. A summary of the information about the ecological COCs in soil at the Fire Station II Zone and Range Fire Burn Area is given in Table 13.

The HQs for exposure to RDX in the surface and subsurface soil at the Fire Station II Zone and Range Fire Burn Area (Area 2) ranged from 2 for the mule deer to a maximum of 40 for the pygmy rabbit. The deer mouse also has HQs exceeding 1.0.

The HQs for exposure to TNT in the surface and subsurface soil range from 9 for the deer mouse to a maximum of 20 for the pygmy rabbit. The pygmy rabbit is classified as a species of special concern by the State of Idaho.

Table 13. Soil concentrations for the ecological contaminants of concern at the Fire Station II Zone and Range Fire Burn Area.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
RDX	0.23	3.7	7/37	NA	3.7	Maximum
TNT	0.20	130	24/37	NA	130	Maximum

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

9.2 Site: Experimental Field Station

The Experimental Field Station will be remediated to address the risk to human and ecological receptors posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below.

This site is located within the Naval Proving Ground gunnery range approximately 9.7 km (6 mi) downrange and northeast of the CFA-633 Naval Proving Ground firing site, and approximately 0.4 km (0.25 mi) west of the Big Lost River channel (see Figure 17). The contaminated area of the site is an estimated 2 ha (5 acres) (DOE-ID 2001). This site includes multiple craters within which a variety of explosive tests were conducted. The site is known to contain UXO, pieces of explosives, structural debris, and soil contamination (DOE-ID 1999c). More detailed information about the Experimental Field Station can be found in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001).

9.2.1 Site Investigation

The 1996 field team encountered remnants of World War I and World War II vintage bombs and two areas of widespread heavy concentrations of explosive contaminated soils. One area was approximately 0.8 ha (2 acres) in size. The second area was approximately 0.3 ha (0.8 acres) (see map in

[DOE-ID 1998] Appendix H). The assessment included a visual examination for signs of craters, detonation tests, surface UXO, pieces of explosives, and soil contamination. The area was searched for UXO using 10-m (33-ft) sweeps. When the team encountered areas of TNT contamination, the region was examined in great detail, and the area was mapped. Several large craters were located in this area, however, no ordnance was found in any of the craters. The craters appear to have resulted from ordnance destruction or ordnance testing. Approximately 2.4 km (1.5 mi) away, the nose section of a World War I vintage bomb with TNT and an empty tail section of a World War I vintage bomb were found during the assessment and transported during the 1996 removal action to the MDA for disposal using detonation.

In 1999, surface soil samples were collected as described in the *Field Sampling Plan (FSP) for Operable Unit (OU) 10-04 Explosive Compounds* (DOE-ID 1999c). Nineteen samples were collected and analyzed from the TNT-contaminated soil areas (DOE-ID 1999a). The results of this sampling effort were evaluated in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001), and presented below in Section 9.2.3.

9.2.2 Nature and Extent of Contamination

The location of the Experimental Field Station is shown in Figure 17. In 1999, soil samples were taken at the Experimental Field Station. Contaminants were detected between 0 to 0.61 m (0 to 2 ft) below the ground surface; however, the highest detected concentrations were mainly located in the top 15 cm (0.5 ft) of the surface soil. The maximum detected 1,3 DNB concentration was 14 mg/kg. For TNT, the maximum detected concentration was 1,100 mg/kg. The volume of contaminated soil that must be remediated at this site is an estimated 10 yd^3. There is still some potential for UXO to remain at the Experimental Field Station.

9.2.3 Summary of Site Risks

The 1999 samples yielded concentrations of 4-amino 2,6 dinitrotoluene and TNT in excess of contaminant screening levels for human health, and concentrations of 1,3,5-trinitrobenzene, 1,3 DNB 4-amino-2,6-dinitrotoluene, nitrate, nitrite, and TNT above screening levels for the ecological risk assessment. There remains a potential for UXO to be located within the site presenting a risk to human health. The results of the human health and ecological risk assessments are given below.

The Experimental Field Station was divided into two separate areas for the human health and ecological risk assessments (more detailed information about both of these areas can be found in Section 12 of the OU 10-04 RI/FS). In the human health assessment the inhalation and groundwater pathways were evaluated cumulatively across both areas, whereas all other pathways were evaluated separately for each area. Area 1 posed the greatest risk in the human health and ecological receptors risk assessment. These areas were grouped in the remediation evaluation.

9.2.3.1 Human Health Risk Assessment Summary. TNT was identified as a COC based on human health risk estimates. The exposure pathway of concern is ingestion of homegrown produce. A summary of the information about the human health COC in soil at the Experimental Field Station is given in Table 14.

Table 14. Soil concentrations for the human health contaminant of concern at the Experimental Field Station.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
TNT	0.28	1,100	10/19	NA	1,100	Maximum

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

The total risk for all pathways for the current occupational scenario is less than 1E-04. The noncarcinogenic hazard index for the current occupational scenario is equal to 1.0 from TNT.

The total estimated risk for all pathways for the 100-year future residential scenario is slightly less than 1E-04, and the noncarcinogenic hazard index of 10 for the future residential scenario is primarily from TNT.

The total estimated risk for all pathways for the 100-year future occupational scenario is less than 1E-04. The noncarcinogenic hazard index for the future occupational scenario is equal to 1.0 from TNT.

9.2.3.2 Ecological Risk Assessment Summary. 1,3 DNB and TNT were identified as COCs at the Experimental Field Station for ecological receptors. A summary of the information about the ecological COCs in soil at the Experimental Field Station is given in Table 15.

The HQs for exposure to 1,3 DNB in the surface and subsurface soil at the Experimental Field Station (Area 1) ranged from 30 for the deer mouse to a maximum of 80 for the pygmy rabbit.

The HQs for exposure to TNT in the surface and subsurface soil range from 200 for the deer mouse to a maximum of 300 for the pygmy rabbit. The pygmy rabbit is classified as a species of special concern by the State of Idaho.

Table 15. Soil concentrations for the ecological contaminants of concern at the Experimental Field Station.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
1,3 DNB	0.22[b]	14	1/19	NA	14	Maximum
TNT	0.28	1,100	10/19	NA	1,100	Maximum

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.
b. Although the minimum concentration was less than the detection limit, this value was used in determining the exposure point concentration for this site.

9.3 Site: Land Mine Fuze Burn Area

The Land Mine Fuze Burn Area will be remediated to address the risk to human and ecological receptors posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below.

The site is 0.8 km (0.5 mi) west of Lincoln Boulevard and approximately 0.8 km (0.5 mi) north of the Fire Station II training area (Mile Marker 5) (see Figure 17). The site consists of approximately five separate ordnance disposal locations in a 8.1-ha (20-acre) area between a meander of a former channel of the Big Lost River and an old abandoned irrigation canal that was hand dug in the early 1900s. The contaminated area of the site is an estimated 12 ha (30 acres) (DOE-ID 2001). The site was used by NPG personnel for disposal of land mine pressure plates and aerial bomb packaging materials and as an area to dispose of land mine fuses by burning (DOE-ID 1998). More detailed information about the Land Mine Fuze Burn Area can be found in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001).

9.3.1 Site Investigation

During the 1996 field assessment, the perimeter of the site was established, and the area for the 1996 removal action was defined. The subsurface was characterized using geophysical methods during a Technology Demonstration Project in June 1996. Approximately 0.6 ha (1.5 acres) were surveyed to a depth of 0.61 m (2 ft), and the area was mapped (DOE-ID 1998).

During the 1996 removal action, 8.1 ha (20 acres) were surface cleared, characterized using geophysical methods, and mapped. A subsurface clearance was not performed based on the removal action subcontractor's evaluation of the data. However, during the INEEL quality check of the results of the action in the subsurface at this site, several inert items were found and excavated (DOE-ID 1998).

In 1999, surface soil samples were collected as described in the *Field Sampling Plan (FSP) for Operable Unit (OU) 10-04 Explosive Compounds* (DOE-ID 1999c). The results of this sampling effort were evaluated in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001), and presented below in Section 9.3.3.

9.3.2 Nature and Extent of Contamination

The location of the Land Mine Fuze Burn Area is shown in Figure 17. In 1999, surface soil samples were collected at the Land Mine Fuze Burn Area. Contaminants were detected between 0 to 0.61 m (0 to 2 ft) below the ground surface; however, the highest detected concentrations were mainly located in the top 15 cm (0.5 ft) of the surface soil. The maximum detected TNT concentration was 79,000 mg/kg. The volume of contaminated soil that must be remediated at this site is an estimated 240 yd^3. Some UXO was removed from this site during the 1996 and 1997 removal activities. However, there is still some potential for UXO to remain in the area.

9.3.3 Summary of Site Risks

The 1999 samples yielded concentrations of TNT in excess of contaminant screening levels for human health, and concentrations of 2,4-DNT, 2,6-DNT, lead, nitrate, selenium, TNT, TPH-diesel, and zinc above screening levels for the ecological risk assessment. There still remains a potential for UXO to be located within the site also presenting potential risk to human health. The results of the human health and ecological risk assessments are given below.

The Land Mine Fuze Burn Area was divided into separate areas (areas 2 and 3) for the human health and ecological risk assessments (more detailed information about these areas can be found in Section 12 of the OU 10-04 RI/FS). In the human health assessment the inhalation and groundwater pathways were evaluated cumulatively across both areas, whereas all other pathways were evaluated separately for each area. Area 3 posed the greatest risk in both the human health and ecological risk assessments. These areas were grouped for the remediation evaluation.

9.3.3.1 Human Health Risk Assessment Summary. TNT was identified as a COC based on the human health risk estimates. The exposure pathways of concern are ingestion of soil, groundwater, and homegrown produce. A summary of the information about the human health COC in soil at the Land Mine Fuze Burn Area is given in Table 16.

Table 16. Soil concentrations for the human health contaminant of concern at the Land Mine Fuze Burn Area.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
TNT	0.26	79,000	7/13	NA	69,000[b]	Maximum

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

b. The soil sample containing the maximum detection for TNT was a duplicate sample, the average of the two maximum detects (79,000 and 59,000 mg/kg) was 69,000 mg/kg.

The total risk for all pathways for the current occupational scenario is 4E-03 from TNT. The noncarcinogenic hazard index for the current occupational scenario is 70 from exposure to TNT.

The total estimated risk for all pathways for the 100-year future residential scenario is 6E-03 from TNT. The noncarcinogenic hazard index of 700 for the future residential scenario is from TNT.

The total estimated risk for all pathways for the 100-year future occupational scenario is 4E-03 from TNT. The noncarcinogenic hazard index for the future occupational scenario is 70 from exposure to TNT.

9.3.3.2 Ecological Risk Assessment Summary. TNT was identified as a COC at the Land Mine Fuze Burn Area for ecological receptors. A summary of the information about the ecological COCs in soil at the Land Mine Fuze Burn Area is given in Table 17.

The HQs for exposure to TNT in the surface and subsurface soil range from 900 for the deer mouse to a maximum of 10,000 for the pygmy rabbit. The pygmy rabbit is classified as a species of special concern by the State of Idaho.

Table 17. Soil concentrations for the ecological contaminant of concern at the Land Mine Fuze Burn Area.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
TNT	0.26	79,000	7/13	NA	69,000[b]	Maximum

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

b. The soil sample containing the maximum detection for TNT was a duplicate sample, the average of the two maximum detects (79,000 and 59,000 mg/kg) was 69,000 mg/kg.

9.4 Site: National Oceanic and Atmospheric Administration (NOAA)

The NOAA site will be remediated to address the risk to human and ecological receptors posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below.

The NOAA site is located just east of Lincoln Boulevard, approximately midway between Mile Markers 4 and 5 (see Figure 17). The contaminated area of the site is an estimated 25 ha (63 acres) (DOE-ID 2001). The site was used for a variety of explosive tests or cleanup detonations or both following such tests. The area contains a number of small craters, low-ordered bomb casings and detonators, and some widely scattered pieces of explosives. The NOAA site has been and is currently used by NOAA and other governmental agencies for a variety of atmospheric, geodetic, and weather-related monitoring and research work (DOE-ID 1998). More detailed information about the NOAA site can be found in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001).

9.4.1 Site Investigation

During the 1993 interim action, a surface clearance and a geophysical survey were performed to a depth of 0.61 m (2 ft) on a large site consisting of 1.7 ha (4.13 acres) and a small site consisting of 0.88 ha (2.17 acres). No UXO was found below the surface. Pieces of TNT remain at the surface of this site (DOE-ID 1998).

During the 1996 field assessment, the major objectives of the field team were to determine whether ordnance or soil contamination existed outside of the previously identified area, to establish the boundary, to reestimate the volume of contaminated soil, and to look for any indications that detonation pits existed in the area. This area was searched on foot by field crews at approximately 10-m (33-ft) intervals. Scattered TNT was located, ranging from small flakes to baseball-size chunks. The area of contamination covers a large area of the site. Several craters were located on the south side of the site. It appears that they were sites of ordnance destruction. Several partial 100-lb bombs were found southeast of the NOAA site, which indicates they had been intentionally *low-ordered*. A low-order detonation is the result of a low-order procedure, intended to detonate an explosive item without causing the item to totally consume itself. A low-order procedure is performed in an area that could not withstand a high-order detonation, which would have totally consumed the item (DOE-ID 1998).

In 1999, surface soil samples were collected as described in the *Field Sampling Plan (FSP) for Operable Unit (OU) 10-04 Explosive Compounds* (DOE-ID 1999c). The results of this sampling effort were evaluated in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001), and presented below in Section 9.4.3.

9.4.2 Nature and Extent of Contamination

The location of NOAA is shown in Figure 17. In 1999, the soil was sampled at NOAA. Contaminants were detected between 0 to 0.61 m (0 to 2 ft) below the ground surface; however, the highest detected concentrations were mainly located in the top 15 cm (0.5 ft) of the surface soil. The maximum detected 1,3 DNB concentration was 27 mg/kg. For RDX, the maximum detected concentration was 53 mg/kg. The maximum detected TNT concentration was 17,014 mg/kg. The volume of contaminated soil that must be remediated at this site is an estimated 370 yd^3.

Unexploded ordnance was removed during the 1993 and 1997 removal activities. However, there is still potential for some UXO to remain in the area.

9.4.3 Summary of Site Risks

The 1999 samples yielded concentrations of RDX and TNT in excess of contaminant screening levels for human health, and concentrations of 1,3 DNB, 1,3,5-trinitrobenzene, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, nitrate, nitrite, RDX, and TNT above screening levels for the ecological risk assessment. There still remains a potential for UXO to be located within the site presenting a risk to human health. The results of the human health and ecological risk assessments are given below.

NOAA was divided into five separate areas (areas 2, 2a, 3, 5, and 6) for the human health and ecological risk assessments (more detailed information about these five areas can be found in Section 12 of the OU 10-04 RI/FS). In the human health assessment the inhalation and groundwater pathways were evaluated cumulatively across all five areas, whereas all other pathways were evaluated separately for each area. All five areas pose risk in the human health risk assessment and areas 2a, 3, 5, and 6 showed the greatest risk for ecological receptors. These areas were grouped in the remediation evaluation.

9.4.3.1 Human Health Risk Assessment Summary. TNT was identified as a COC based on human health risk estimates. The exposure pathways of concern are ingestion of soil, groundwater, and homegrown produce. A summary of the information about the human health COC in soil at NOAA is given in Table 18. RDX is only a COC for ecological receptors as discussed in the next section.

Table 18. Soil concentrations for the human health contaminant of concern at NOAA.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
TNT	0.20	17,014	455/489	NA	1,900	UCL

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

The total risk for all pathways for the current occupational scenario is less than 1E-04, and the noncarcinogenic hazard index for the current occupational scenario is less than 1.0.

The total estimated risk for all pathways for the 100-year future residential scenario is 4E-04 (4 in 10,000) from TNT. The noncarcinogenic hazard index of 40 for the future residential scenario is from TNT.

The total estimated risk for all pathways for the 100-year future occupational scenario is less than 1E-04, and the noncarcinogenic hazard index for the future occupational scenario is less than 1.0.

9.4.3.2 Ecological Risk Assessment Summary. 1,3 DNB, RDX, and TNT were identified as COCs for NOAA for ecological receptors. A summary of the information about the ecological COCs in soil at NOAA is given in Table 19.

The HQs for exposure to 1,3 DNB in the surface and subsurface soil at NOAA (Area 6) ranged from 1 for the mule deer to a maximum of 200 for the pygmy rabbit. The deer mouse also has HQs exceeding 1.0.

The HQs for exposure to RDX in the surface and subsurface soil at NOAA (Area 3) ranged from 1 for the mule deer to a maximum of 20 for the pygmy rabbit. The deer mouse also has HQs exceeding 1.0.

The HQs for exposure to TNT in the surface and subsurface soil (Area 5) range from 4 for the mule deer to a maximum of 500 for the pygmy rabbit. The deer mouse also has HQs exceeding 1.0. The pygmy rabbit is classified as a species of special concern by the State of Idaho.

Table 19. Soil concentrations for the ecological contaminants of concern at NOAA.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
1,3 DNB	0.22	27	1/26	NA	27	Maximum
RDX	0.22	53	171/459	NA	1.78	UCL
TNT	0.20	17,014	455/489	NA	1,900	UCL

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

9.5 Site: Naval Ordnance Disposal Area (NODA) – Area 2

The NODA site will be remediated to address the risk to human and ecological receptors posed by contaminated soil. Site investigations, the nature and extent of contamination, and a summary of site risks are presented below.

The NODA site is located approximately 1.6 km (1 mi) northeast of U.S. Highway 20/26 between Mile Markers 266 and 267 and about 3.2 km (2 mi) halfway from the TRA, INTEC, and CFA facilities at the INEEL, as shown in Figure 17. NODA is reported to have been used as an ordnance and nonradioactive hazardous material disposal area by the U.S. Navy during the 1940s. Following the establishment of the National Reactor Testing Station (now the INEEL), the NODA came under the control of the AEC (now DOE). From about 1967 to 1985, approximately 3,175 kg (7,000 lb) of reactive materials were treated (burned) at the NODA. Between 1967 and 1985, the NODA was also used as a storage area for hazardous waste generated at the INEEL. Until 1982, solvents, corrosives, ignitables, heavy metal contaminated solutions, formaldehyde, polychlorinated biphenyl materials, waste laboratory chemicals, and reactives were stored at this site. By October 1985, all these materials had been removed for off-Site disposal as hazardous waste or treated on-Site by open burning, as allowed by RCRA regulations (DOE-ID 1998).

In 1985, NODA was added to the RCRA, Part A, permit application as a thermal treatment unit. The last treatment of hazardous waste occurred in 1988 (except for one emergency action/detonation in 1990). In June 1990, a Memorandum of Understanding (MOU) was developed between the Environmental Programs (EP) and Waste Reduction Operations Complex (WROC) under which EP agreed to fund and manage all activities necessary to formally close the NODA, including soil sampling and analysis, removal of contaminated soil, emergency removal of ordnance, maintenance of access signs and barricades, and preparation and submittal of all required documentation. In 1997, the Interim Status of the NODA was terminated by the IDEQ with the agreement that the CERCLA program would perform the final evaluation of the site in accordance with the FFA/CO.

The 1994 removal action defined the cleanup area as 16 ha (40 acres) centered approximately 762 m (2,500 ft) north of the current INEEL security force gun range on Portland Avenue. The area of contamination of the NODA Area 2 site is an estimated 0.8 ha (2 acres) (DOE-ID 2001). More detailed information about the NODA site can be found in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001).

9.5.1 Site Investigation

During the 1994 removal action, 11.7 ha (28.92 acres) were cleared of ordnance and pieces of explosives to a depth of 1.2 m (4 ft). An additional 1.6 ha (3.89 acres) were cleared to a depth of 1.2 m (4 ft) from Lincoln Boulevard to the NODA to accommodate an access road. Because of the lack of information pertaining to tests performed in the pits at the NODA site, none of the pits were addressed during the 1994 removal action. The removal action was continued during the summer of 1995 when an additional 9.1 ha (22.56 acres) were cleared to a depth of 0.61 m (2 ft). The depth was reduced to 0.61 m (2 ft) from 1.2 m (4 ft) based on the results of the 1994 removal action. At this time, five pits were remediated. Two pits were remediated with a remote excavator, two pits were remediated with a backhoe, and one pit was hand excavated. The pits were excavated until the geophysical search revealed that no additional anomalies were identified (DOE-ID 1998).

During the 1996 field assessment, the area outside the site was cleared during the 1994 and 1995 removal actions and was searched on foot by field crews using approximately 10-m (33-ft) spacing beginning at the west boundary. This search was continued outward, until the last piece of fragmentation was found. All four sides of the original removal action site were assessed. Multiple types of UXO were recovered from this site (DOE-ID 1998).

During the 1996 field assessment, seven live 12.7-cm (5-in.) projectiles and one split-open 12.7-cm (5-in.) projectile with a live fuze were found. Scattered TNT and RDX were found on the south side and southeast corner of the area. What appears to have been a munitions burn facility (crumbled concrete box) was found just west of the Big Lost River. No ordnance or ordnance waste was found at this site; however, what appears to have been fuel-stained soil was observed on the berm on which this facility was constructed (DOE-ID 1998). Although UXO has been previously detected and cleared from this site, clearance cannot be considered complete for unrestricted land use.

In 1999, surface soil samples were collected as described in the *Field Sampling Plan (FSP) for Operable Unit (OU) 10-04 Explosive Compounds* (DOE-ID 1999c). The results of this sampling effort were evaluated in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001), and presented below in Section 9.5.3.

9.5.2 Nature and Extent of Contamination

The location of the NODA site is shown in Figure 17. The 1999 sampling event sampled the surface soils at NODA. Contaminants were detected between 0 to 0.61 m (0 to 2 ft) below the ground surface; however, the highest detected concentrations were mainly located in the top 15 cm (0.5 ft) of the surface soil. The maximum detected RDX concentration was 328 mg/kg. Based on the sampling results, only two acres of the 138-acre site pose a risk to human health and ecological receptors. Unexploded ordnance removal activities were conducted in 1994, 1995 and 1997 at the site. However, there is still some potential for UXO to remain in the area.

9.5.3 Summary of Site Risks

The 1999 samples yielded concentrations of 2-pentanone, 4-chloro-3-methylphenol, antimony, benzo(a)pyrene, benzo(g,h,i)perylene, copper, lead, methapyrilene, phenanthrene, RDX, thallium, TNT, and TPH-diesel in excess of contaminant screening levels for human health. Of these contaminants, 2-pentanone, 4-chloro-3-methylphenol, lead, and methapyrilene could not be evaluated for hazardous effects or carcinogenic risks because slope factors and reference doses are not available. Concentrations of 1,3 DNB, 1,3,5-trinitrobenzene, 2-amino-4,6-dinitrotoluene, 2-hexanone, 2-methylnaphthalene, 2-pentanone, 4-amino-2,6-dinitrotoluene, 4-methyl-2-pentanone, 4-nitrophenol, antimony, barium, bis(ethylhexyl)phthalate, cadmium, chlorobenzene, chromium, chrysene, cobalt, copper, HMX, lead, manganese, methapyrilene, mercury, nickel, nitrate, nitrite, pentachlorophenol, picric acid, RDX, selenium, silver, strontium, tetryl, TNT, TPH-diesel, vanadium, and zinc were above screening levels for the ecological risk assessment. Of these contaminants, 2-hexanone, 2-pentanone, 4-nitrophenal, chlorobenzene, methapyrilene, and picric acid could not be evaluated for ecological risks because available toxicity data are insufficient for developing toxicity reference values. There still remains a potential for UXO to be located within the site presenting a risk to human health. The results of the human health and ecological risk assessments are given below.

The NODA area was divided into three separate areas (areas 2, 3, and 4) for the human health and ecological risk assessments (more detailed information about these three areas can be found in Section 12 of the OU 10-04 RI/FS [DOE-ID 2001]). In the human health assessment the inhalation and groundwater pathways were evaluated cumulatively across all three areas, whereas all other pathways were evaluated separately for each area. Areas 2 and 4 posed the greatest risk in the human health risk assessment and areas 2 and 4 showed the greatest risk for ecological receptors. These areas were grouped in the remediation evaluation.

9.5.3.1 Human Health Risk Assessment Summary. RDX was identified as a COC based on human health risk estimates. The exposure pathways of concern are ingestion of groundwater and homegrown produce. Contribution of all other contaminants to total risk and hazard index is insignificant. A summary of the information about the human health COC in soil at the NODA site is given in Table 20.

Table 20. Soil concentrations for the human health contaminant of concern at the NODA site.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
RDX	0.22	328	24/64	NA	328	Maximum

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

The total risk for all pathways for the current occupational scenario is less than 1E-04 and the noncarcinogenic hazard index for the current occupational scenario is less than 1.0.

The total estimated risk for all pathways for the 100-year future residential scenario is 1E-02 from RDX. The noncarcinogenic hazard index of 100 for the future residential scenario is from RDX.

The total estimated risk for all pathways for the 100-year future occupational scenario is less than 1E-04, and the noncarcinogenic hazard index for the future occupational scenario is less than 1.0.

9.5.3.2 Ecological Risk Assessment Summary. RDX was identified as a COC for the NODA site for ecological receptors. A summary of the information about the ecological COC in soil at the NODA site is given in Table 21.

The HQs for exposure to RDX in the surface and subsurface soil at the NODA site (Area 2) ranged from 3 for the Townsend's western big eared bat to a maximum of 4,000 for the pygmy rabbit. The mule deer and the deer mouse also have HQs exceeding 1.0. The pygmy rabbit is classified as a species of special concern by the State of Idaho.

Table 21. Soil concentrations for the ecological contaminants of concern at the NODA site.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)	Exposure Point Concentration (mg/kg)	Statistical Measure[a]
RDX	0.22	328	24/64	NA	328	Maximum

a. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

9.6 Remediation Objectives for the TNT/RDX Contaminated Sites

Remedial Action Objectives for the TNT/RDX contaminated sites were developed in accordance with the *National Oil and Hazardous Substances Contingency Plan* (NCP) (40 CFR 300) and EPA guidance (EPA 1988) and through the consensus of DOE-ID, EPA, and IDEQ participants. The RAOs are based on the results of both the human health risk assessments (HHRAs) and ecological risk assessments (ERAs) and are specific to the COCs and exposure pathways developed for OU 10-04.

The conclusions from the RI/BRA that were used to develop RAOs are summarized below:

- Ingestion of homegrown produce, dermal adsorption of soil, ingestion of soil, and ingestion of groundwater are the only human health exposure routes with unacceptable estimated risks for the TNT/RDX soil sites.
- Risks associated with the air pathway are well below 1E-04 (i.e., 1 in 10,000). Therefore, RAOs for the air pathway are not required. (Note: Appropriate safety measures, as determined by air emissions calculations, will be implemented during remedial actions to ensure that dust emissions do not exceed the limits specified by ARARs.)

The RAOs specified for protecting human health are expressed both in terms of risk and exposure pathways, because protection can be achieved through reducing contaminant levels as well as through restricting or eliminating exposure pathways. The overall intent of the human health RAOs is to limit the cumulative carcinogenic human health risk to less than or equal to 1E-04, and noncarcinogenic exposure to less than or equal to an HQ of 1. The RAOs specified for protecting ecological receptors inhibit adverse effects from contaminated soil on resident populations of flora and fauna.

The RAOs developed to protect human health and ecological receptors are as follows:

- Inhibit dermal exposure to and ingestion of contaminated soils and food crops with a total excess cancer risk level of greater than 1E-04 and noncarcinogenic COCs with HQs greater than 1 for current and future workers and future residents.
- Prevent contamination of groundwater.
- Inhibit ecological receptor exposures to soil contaminated with COCs, primarily concentrations in soils that result in an HQ greater than or equal to 10.0. The RAO excludes naturally occurring elements and compounds that are not attributable to historic releases.
- Inhibit any inadvertent contact with potential UXO by onsite workers and members of the public, since potential UXO exists at these areas.

To meet these objectives, remediation goals were established. The remediation goals for the TNT/RDX contaminated sites and the basis for each goal are provided in Table 22. These goals are at the upper end of the acceptable risk range because of the conservatism used in the risk assessment methods used to develop these values.

Remediation goals can be satisfied by cleaning up to the identified contaminant concentration (see Table 22). Removing the principal threat wastes TNT and RDX will be protective because surface exposure will be reduced or eliminated and reduce the potential groundwater risk. The estimated soil volumes exceeding cleanup goals for the TNT/RDX soil contaminated sites are provided in Table 23. An approximate total of 612 m^3 (800 yd^3) of contaminated soil will be remediated.

Table 22. Remediation goals for the OU 10-04 TNT/RDX contaminated sites.

Site	Contaminant of Concern	Soil Concentration Remediation Goal[a]	Derivation	Reference	Risk Scenario
Naval Ordnance Disposal Area	RDX	4.4 mg/kg	1E-04 Groundwater and ingestion of homegrown produce	EPA, Region 9 human health preliminary remediation goal (2001a); EPA Soil Screening Level Guidance for Ecological Receptors (EPA 2000) recommends 5.8 mg/kg for RDX	Ecological and human health
National Oceanic & Atmospheric Administration	TNT	16 mg/kg	1E-04, Ingestion of homegrown produce and dermal absorption	EPA, Region 9 human health preliminary remediation goal (2001a); the ecological final remediation goal for TNT is 17 mg/kg (as indicated in memo, WAG 10-01-02, written to S. G. Wilkinson)	Ecological and human health
	RDX	4.4 mg/kg	1E-04, Ingestion of homegrown produce	EPA, Region 9 human health preliminary remediation goal (2001a); EPA Soil Screening Level Guidance for Ecological Receptors (EPA 2000) recommends 5.8 mg/kg for RDX	Ecological and human health
	1,3 DNB	6.1 mg/kg	HQ greater than 10 for ecological receptors	EPA, Region 9 human health preliminary remediation goal (2001a); ecological final remediation goal for 1,3 DNB is 15 mg/kg (OU 10-04 RI/FS, Appendix E6, [DOE-ID 2001])	Ecological
Fire Station II Zone & Range Fire Burn Area	TNT	16 mg/kg	1E-04, Ingestion of homegrown produce	EPA, Region 9 human health preliminary remediation goal (2001a); ecological final remediation goal for TNT is 17 mg/kg (as indicated in memo, WAG 10-01-02, written to S. G. Wilkinson)	Ecological and human health
	RDX	4.4 mg/kg	HQ greater than 10 for ecological receptors	EPA, Region 9 human health preliminary remediation goal (2001a); EPA Soil Screening Level Guidance for Ecological Receptors (EPA 2000) recommends 5.8 mg/kg for RDX	Ecological
Experimental Field Station	TNT	16 mg/kg	Hazard Index greater than 1, Ingestion of homegrown produce	EPA, Region 9 human health preliminary remediation goal (2001a); the ecological final remediation goal for TNT is 17 mg/kg (as indicated in memo, WAG 10-01-02, written to S. G. Wilkinson)	Ecological and human health
	1,3 DNB	6.1 mg/kg	HQ greater than 10 for ecological receptors	EPA, Region 9 human health preliminary remediation goal (2001a); ecological final remediation goal for 1,3 DNB is 15 mg/kg (OU 10-04 RI/FS, Appendix E6, [DOE-ID 2001])	Ecological
Land Mine Fuze Burn Area	TNT	16 mg/kg	1E-04, Ingestion of homegrown produce, dermal absorption, and groundwater	EPA, Region 9 human health preliminary remediation goal (2001a); ecological final remediation goal for TNT is 17 mg/kg (as indicated in memo, WAG 10-01-02, written to S. G. Wilkinson)	Ecological and human health

a. The EPA, Region 9 human health preliminary remediation goals were selected as the soil concentration remediation goals for all sites because these values are protective of both human health and ecological receptors. The EPA soil screening level guidance for ecological receptors fell below the Region 9 preliminary remediation goal for all contaminants (see reference column).

Table 23. Areas and volumes of contaminated media for OU 10-04 TNT/RDX soil sites.

Site Name	Area of Site m^2 (yd^2)	Contaminated Soil Volume m^3 (yd^3)
TNT/RDX soil sites		
Experimental Field Station	20,300 (24,300)	76.5 (100)
Fire Station	137,000 (164,000)	76.5 (100)
NOAA	257,200 (307,600)	268 (350)
Land Mine Fuze Burn Area	123,500 (147,700)	153 (200)
NODA Area 2	6,900 (8,300)	38 (50)

The response action selected in this Record of Decision is necessary to protect the public health and welfare and the environment from actual or threatened releases of hazardous substances into the environment. Such a release, or threat of release, may present an imminent and substantial endangerment of public health, welfare, or the environment.

9.7 Description of Alternatives for the TNT/RDX Contaminated Soils

Four remedial alternatives were developed to address TNT/RDX contaminated soils: no action; limited action; removal and disposal; and removal, ex situ treatment, and disposal. Alternative 1 (No Action) and 2 (Limited Action) were not considered for selection because they do not meet the threshold criteria for protection of human health and the environment and compliance with law. However, the No Action Alternative was evaluated in detail to provide a baseline for comparison of the alternatives as required under CERCLA.

An alternative involving removal and treatment of the TNT/TDX fragments and contaminated soil, by composting using a method developed at the INEEL (Alternative 4c), was developed but eliminated from consideration because of high cost, the extensive time required to complete remediation, and significant implementation difficulties. Under Alternative 4c, contaminated soil and TNT/RDX fragments would be excavated together and treated in a special reactor with a solvent, such as acetone, to break down the TNT/RDX fragments such that the material would degrade during subsequent composting. A large volume of acetone, a highly flammable solvent, is required to dissolve the TNT and RDX fragments. Because of safety concerns, a specially designed facility with air emission controls and fire protection would have to be constructed to provide a controlled environment for the composting process and control acetone emissions during treatment. From results of the treatability study (see Section 2.4.2.3), 55 gallons of acetone are required to treat one cubic yard of soil, and it will take approximately 34 days of treatment to achieve the remediation goals. The preliminary design for a full-scale reactor system will allow treatment of soil in 10 yd^3 batches. Because of the safety concerns associated with the use of large amounts of acetone, a larger reactor capacity is not considered feasible. Since only 10 batches could be treated in a year, it would take approximately 8 years to compete remediation. The estimated cost to implement this alternative is $20 million (DOE-ID 2001).

9.7.1 Alternative 1: No Action

Formulation of a no action alternative is required by the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP) (40 CFR 300.430[e][6]) and guidance for conducting feasibility studies under CERCLA (EPA 1988). The no action alternative serves as the baseline for evaluating other remedial action alternatives. The alternative includes environmental monitoring, but does not include any actions to reduce potential exposure pathways, such as fencing, deed restrictions, or administrative controls (EPA 1988).

9.7.2 Alternative 3: Removal, Ex Situ Treatment, and Disposal or Return to Excavations

Removal, treatment of TNT/RDX fragments, and disposal of soil alternatives for WAG 10 TNT/RDX-contaminated sites would be preceded by a visual or geophysical survey for UXO, with subsequent removal of detected UXO, if required, to proceed with soil removal. Otherwise, UXO will be removed during remediation of the UXO areas. Contaminated soil will be excavated by hand, and the fragments of TNT and RDX will be manually segregated from the soil unless safety analysis indicates it is safe to use conventional mechanical soil excavation and screening equipment. The fragments of TNT and RDX will be detonated at the MDA. The soil will be disposed on the INEEL or at an approved facility off the INEEL. Verification sampling will be performed at the removal sites to ensure that all contamination at concentrations exceeding final remediation goals is removed. The concentrations of TNT in soil removed are expected to be less than 10% and hence will not be regulated under RCRA; however, if some soil is found to exceed 10% TNT/RDX, it will be sent to a RCRA permitted facility for thermal treatment and disposal. The excavations exceeding 0.3 m (1 ft) in depth will be backfilled with clean soil or contoured to blend with the existing landscape and revegetated. Institutional controls will be implemented for continued monitoring and to restrict access because buried, undetected TNT/RDX fragments could exist after remediation. Frost heave and erosion could bring these items to the surface in the future and pose an unacceptable risk. Under Alternative 3a, the excavated soils would be disposed on the INEEL, while under Alternative 3b excavated soils would be disposed off the INEEL. These alternatives are discussed in the following subsections.

9.7.2.1 Alternative 3a: Removal, Treatment of TNT/RDX Fragments and Disposal of Soil at the INEEL. Implementation of this alternative requires excavation of all soils with concentrations above final remediation goals, segregation of the TNT and RDX fragments with subsequent detonation at the MDA, and the transport of the soils to an INEEL waste disposal facility such as the proposed INEEL CERCLA Disposal Facility (ICDF) or the CFA landfill.

9.7.2.2 Alternative 3b: Removal, Treatment of TNT/RDX Fragments and Disposal of Soil Off the INEEL. Implementing this alternative will involve excavation of all soils with concentrations above final remediation goals, segregation of the TNT and RDX fragments with subsequent detonation at the MDA, and transport of soils off the INEEL to an approved disposal facility. A probable disposal location would be the Waste Management Northwest landfill in Arlington, Oregon, which receives RCRA waste and industrial nonhazardous waste. This landfill is located approximately 885 km (550 mi) from the INEEL in Gilliam County, Oregon. Compliance with appropriate waste characterization, transportation, and possible treatment requirements are required under this alternative.

9.7.3 Alternative 4: Removal, Ex Situ Treatment, and Disposal or Return to Excavations

Removal, ex situ treatment, and disposal alternatives for WAG 10 TNT/RDX contaminated sites will be preceded by a visual or geophysical survey for UXO, with subsequent removal of detected UXO, if required to proceed with soil excavation. Otherwise, UXO will be removed during remediation of the UXO areas. Contaminated soil and fragments of TNT and RDX would be excavated by hand unless safety analysis indicates it is safe to use conventional mechanical soil excavation and screening equipment. The soil would be incinerated at a permitted facility off the INEEL or treated biologically on the INEEL. Verification sampling will be performed at the removal sites to ensure that all contamination at concentrations exceeding final remediation goals is removed. The excavations exceeding 0.3 m (1 ft) in depth will be backfilled with clean soil following the excavation. Shallow excavations will be recontoured to blend with the existing landscape. Institutional controls will be implemented to restrict access, and monitoring will be performed since buried, undetected UXO and TNT and RDX fragments could exist after remediation. Frost heave and erosion could bring these items to the surface in the future and pose an unacceptable risk.

Under Alternative 4a, the TNT and RDX fragments will be segregated from the soils during excavation and detonated at the MDA. Then the contaminated soils would be incinerated and disposed at a RCRA permitted facility off the INEEL. Under Alternative 4b, the TNT and RDX fragments will be segregated from the soils during excavation and detonated at the MDA, and the contaminated soils will be composted at the INEEL and returned to the excavation sites.

9.7.3.1 Alternative 4a: Removal, Off-Site Incineration and Disposal. Implementing this alternative would involve excavation of all soils with concentrations above final remediation goals, segregation of the TNT and RDX fragments with subsequent detonation at the MDA, and transport of the soils to an approved incineration and disposal facility off the INEEL. A probable incineration and disposal facility off the INEEL would be the Onyx Environmental Services Treatment Complex at Port Arthur, Texas. Compliance with appropriate waste characterization and transportation requirements would be required under this alternative.

9.7.3.2 Alternative 4b: Removal, On-Site Soil Composting, and Return of Soil to the Excavations. Implementing this alternative would involve excavation of all soils with concentrations above final remediation goals, segregation of the TNT and RDX fragments with subsequent detonation at the MDA, and treatment on the INEEL by composting in a temporary portable building at a central location, such as the CFA. The temporary building would be required to control gases released during composting and to ensure optimum conditions for the composting process are maintained. Composting would involve the addition of water and soil amendments, such as manure, sawdust, and potato waste to the contaminated soil. The amended soil would be placed into windrows and turned several times a day with special mixing equipment to ensure the compost receives sufficient oxygen, release trapped heat, water vapor and gases, and break up clumps of soil. Treatment time is expected to be between 15 days and 30 days. Following treatment the soils would be returned to the excavation sites.

9.7.4 Comparison of Elements and Distinguishing Features of Each Alternative

The relative performance of each alternative is described in Table 24.

9.8 Comparative Analysis of Alternatives for the TNT/RDX Contaminated Soils

The alternatives were evaluated using the nine evaluation criteria as specified by CERCLA (40 CFR 300.43[f][5][i]). The purpose of this comparison is to identify the relative advantages and disadvantages associated with each alternative. The comparative analyses of alternatives for the nine criteria are summarized below.

9.8.1 Overall Protection of Human Health and the Environment

The primary measure of this criterion is the ability of an alternative to achieve RAOs for WAG 10 sites. Alternative 1, no action, would not prevent exposures resulting in risks greater than 1E-04 or HIs greater than 1.0 for the TNT/RDX soil sites. For the TNT/RDX contaminated soil sites, Alternatives 4a and 4b (excavation, incineration and disposal off the INEEL, and excavation, composting and disposition on the INEEL) would provide effective long-term protection of human health and the environment. This is because all contamination above risk-based levels would be removed and destroyed through treatment. Alternative 4a, which includes incineration, is considered effective in destroying TNT and RDX contamination. Alternative 3a and 3b (excavation and disposal on and off the INEEL) would provide effective long-term protection of human health and the environment because the TNT and RDX fragments, the source of the soil contamination, will be destroyed and all detected soil contamination above risk-based levels would be removed from the TNT/RDX sites and disposed in secure landfills.

Table 24. Detailed analysis summary for the OU 10-04 TNT/RDX contaminated soil sites.

Criteria	Alternative 1 No action	Alternative 3a Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil on the INEEL	Alternative 3b Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil off the INEEL	Alternative 4a Removal, Incineration, and Disposal off the INEEL	Alternative 4b Removal, Composting, and Disposition on the INEEL
<u>Overall Protection of human health and the environment</u>					
Human health protection	No reduction in risk	Minimizes potential exposure to contaminated soil by removing detected contamination from the site	Minimizes potential exposure to contaminated soil by removing detected contamination from the site	Minimizes potential exposure to contaminated soil by removing detected contamination from the site	Minimizes potential exposure to contaminated soil by removing detected contamination from the site
Environmental protection	Allows continued ecological exposures	Minimizes potential exposure to contaminated soil by removing detected contamination from the site	Minimizes potential exposure to contaminated soil by removing detected contamination from the site	Minimizes potential exposure to contaminated soil by removing detected contamination from the site	Minimizes potential exposure to contaminated soil by removing detected contamination from the site
<u>Compliance with ARARs</u>					
Chemical Specific					
Idaho Ground-water Quality Standards—IDAPA 58.01.11.200	Would not meet ARAR	Will meet ARAR by removing contamination and monitoring	Will meet ARAR by removing contamination and monitoring	Will meet ARAR by removing contamination and monitoring	Will meet ARAR by removing contamination and monitoring
Action Specific					
Military Munitions Rule – 40 Code of Federal Regulations 266, Subpart M	Not applicable	Would meet ARAR	Would meet ARAR	Would meet ARAR	Would meet ARAR
Idaho Fugitive Dust Emissions – IDAPA 58.01.01.650 et seq.	Not applicable	Would meet ARAR	Would meet ARAR	Would meet ARAR	Would meet ARAR

Table 24. (continued).

Criteria	Alternative 1 No action	Alternative 3a Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil on the INEEL	Alternative 3b Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil off the INEEL	Alternative 4a Removal, Incineration, and Disposal off the INEEL	Alternative 4b Removal, Composting, and Disposition on the INEEL
Rules and Standards for Hazardous Waste in Idaho – IDAPA 57.01.05.010.006, .008, and .011	Not applicable	Would meet ARAR	Would meet ARAR	Would meet ARAR	Would meet ARAR
Rules and Standards for Hazardous Waste in Idaho—IDAPA 58.01.05.009	Not applicable	Would meet ARAR	Would meet ARAR	Would meet ARAR	Would meet ARAR
Location Specific					
Native American Graves Protection and Repatriation Act—25 USC 32	Would meet ARAR	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary
National Historic Preservation Act—36 Code of Federal Regulation 800	Would meet ARAR	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary
TBCs					
Real Property Contaminated with Munition, Explosives, or Chemical Agents – DoD Standard 60559, Chapter 12	Would not meet TBC because no controls would be implemented	Would meet TBC through removal of contamination and UXO institutional controls	Would meet TBC through removal of contamination and UXO institutional controls	Would meet TBC through removal of contamination and UXO institutional controls	Would meet TBC through removal of contamination and UXO institutional controls
Long-term effectiveness and permanence					
Magnitude of residual risk	No change from existing risk	No detected contamination would remain at the sites	No detected contamination would remain at the sites	No detected contamination would remain at the sites	No detected contamination would remain at the sites

Table 24. (continued).

Criteria	Alternative 1 No action	Alternative 3a Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil on the INEEL	Alternative 3b Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil off the INEEL	Alternative 4a Removal, Incineration, and Disposal off the INEEL	Alternative 4b Removal, Composting, and Disposition on the INEEL
Adequacy and reliability of controls	No control and, therefore, no reliability	TNT and RDX fragments will be destroyed. Disposal facility is assumed to provide adequate and reliable control over soil disposed of for the period of institutional controls.	TNT and RDX fragments will be destroyed. Disposal facility is assumed to provide adequate and reliable control over soil disposed of for the period of institutional controls.	Treatment will destroy all hazardous contaminants and the disposal facility is assumed to provide adequate and reliable control of the treated soil	Treatment will destroy the TNT and RDX contamination in the soil, which will be verified through testing
<u>Reduction of toxicity, mobility, or volume through treatment</u>					
Treatment process used	No treatment process used	TNT and RDX fragments will be destroyed through detonation. Contamination in soil will not be treated	TNT and RDX fragments will be destroyed through detonation. Contamination in soil will not be treated	TNT and RDX fragments will be destroyed through detonation. Contamination in soil will be destroyed through incineration.	TNT and RDX fragments will be destroyed through detonation. Contamination in soil will be destroyed through composting
Amount destroyed or treated	No treatment process used	TNT and RDX fragments will be destroyed through detonation. Contamination in soil will not be treated	TNT and RDX fragments will be destroyed through detonation. Contamination in soil will not be treated	Approximately 100%	Approximately 90%
Reduction of toxicity, mobility, or volume	No reduction in toxicity, mobility, or volume	Detonation of TNT and RDX fragments will result in significant reduction of the toxicity, mobility, and volume of the source material contributing to soil contamination	Detonation of TNT and RDX fragments will result in significant reduction of the toxicity, mobility, and volume of the source material contributing to soil contamination	100% reduction in toxicity, 100% reduction in mobility, 20% reduction in volume	90% reduction in toxicity, 90% reduction in mobility, 300% increase in volume
Irreversible treatment	No treatment process is used	TNT and RDX fragments will be permanently destroyed through detonation	TNT and RDX fragments will be permanently destroyed through detonation	Not reversible, but affords long-term stability	Not reversible, but affords long-term stability
Type and quantity of residuals remaining after treatment	No treatment process used	Detected contamination would not remain at the site	Detected contamination would not remain at the site	Detected contamination would not remain at the site. Incinerator residuals would remain after treatment of the soil.	Detected contamination would not remain at the site. The compost after treatment would be an organically enriched soil.
Statutory preference for treatment	Not applicable	Meets preference	Meets preference	Meets preference	Meets preference

Table 24. (continued).

Criteria	Alternative 1 No action	Alternative 3a Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil on the INEEL	Alternative 3b Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil off the INEEL	Alternative 4a Removal, Incineration, and Disposal off the INEEL	Alternative 4b Removal, Composting, and Disposition on the INEEL
Short-term effectiveness					
Community protection	Increase in potential risks to the public	No increase in potential risks to the public	Slight increase in potential risks to the public during off-Site transportation	Slight increase in potential risks to the public during off-Site transportation	No increase in potential risks to the public
Worker protection	Increase in potential risk to worker	Workers protected by administrative and engineering controls.	Workers protected by administrative and engineering controls.	Workers protected by administrative and engineering controls.	Workers protected by administrative and engineering controls.
Environmental impacts	No change from existing conditions	Limited to disturbances from excavation. The use of dust suppressants would limit the potential for airborne contamination in the form of fugitive dust.	Limited to disturbances from excavation. The use of dust suppressants would limit the potential for airborne contamination in the form of fugitive dust.	Limited to disturbances from excavation. The use of dust suppressants would limit the potential for airborne contamination in the form of fugitive dust.	Limited to disturbances from excavation. The use of dust suppressants would limit the potential for airborne contamination in the form of fugitive dust.
Time until action is complete	Not applicable	Approximately 18 to 24 months	Approximately 18 to 24 months	Approximately 18 to 24 months	Approximately 18 to 24 months
Implementability					
Ability to construct and operate	No construction or operation implemented	Easy; involves available excavation and transportation technology	Easy; involves available excavation and transportation technology	Easy; involves available excavation, treatment, and transportation technology	Easy; involves available excavation, transportation, and composting technology
Ease of implementing additional action if necessary	May require repeat of feasibility study and record of decision process	Easy; any undetected contamination that may remain can be removed and disposed in the future	Easy; any undetected contamination that may remain can be removed and disposed in the future	Easy; any undetected contamination that may remain can be removed, treated, and disposed in the future	Easy; any undetected contamination that may remain can be removed, treated, and disposed in the future
Ability to monitor effectiveness	Monitoring of conditions is readily implemented	The effectiveness in removing all detected contaminated materials associated with site is easily monitored	The effectiveness in removing all detected contaminated materials associated with site is easily monitored	The effectiveness in removing all detected contaminated materials associated with site is easily monitored	The effectiveness in removing all detected contaminated materials associated with site is easily monitored
Ability to obtain approvals and coordinate with regulatory agencies	No approvals required	No difficulties identified	No difficulties identified	No difficulties identified	No difficulties identified

Table 24. (continued).

Criteria	Alternative 1 No action	Alternative 3a Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil on the INEEL	Alternative 3b Removal, Treatment of TNT/RDX Fragments, and Disposal of Soil off the INEEL	Alternative 4a Removal, Incineration, and Disposal off the INEEL	Alternative 4b Removal, Composting, and Disposition on the INEEL
Availability of services and capacity	None required	Services available on-Site and through subcontractor	Services available either on-Site or through subcontractor; disposal capability is assumed to exist at the INEEL	Services available on-Site and through subcontractor	Services available on-Site and through subcontractor
Availability of equipment, specialists, and materials	None required	Equipment and materials are readily available at the INEEL or within surrounding communities	Equipment and materials are readily available at the INEEL or within the surrounding community	Equipment and materials are readily available at the INEEL or within the surrounding community	Equipment and materials are readily available at the INEEL or within surrounding communities
Availability of technology	None required	Readily available at the INEEL	Readily available at the INEEL.	Readily available at the INEEL and commercially	Readily available at the INEEL
Cost (net present worth, 5% discount rate)					
Capital Cost	$0.6 million	$1.3 million	$1.4 million	$2.1 million	$2.0 million
Operating and Maintenance Cost	$2.9 million	$2.6 million	$2.6 million	$2.6 million	$2.6 million
Total Cost	$3.5 million	$3.9 million	$4.0 million	$4.7 million	$4.6 million

9.8.2 Compliance with ARARs

The ARARs for Alternative 1 (no action) will not be met. Alternatives 3a, 3b, 4a, and 4b all meet ARARs.

9.8.3 Long-Term Effectiveness and Permanence

Alternative 1 (no action) would provide the least long-term effectiveness and permanence. Alternatives 4a and 4b (excavation, incineration and disposal off the INEEL; and excavation, composting, and disposition on the INEEL) provide the highest degree of long-term effectiveness and permanence because all detected TNT/RDX contamination would be destroyed through treatment. Alternatives 3a and 3b (removal, treatment of TNT/RDX fragments, and disposal of soil on and off the INEEL, respectively) provides long-term effectiveness and permanence by destroying the source of the soil contamination (the TNT and RDX fragments) and disposing of the contaminated soil in a secure landfill.

9.8.4 Reduction of Toxicity, Mobility, or Volume through Treatment

For the TNT/RDX-contaminated soil sites, Alternatives 4a and 4b would achieve maximum reduction of toxicity mobility, and volume through treatment of the TNT and RDX fragments by detonation and treatment of the soils to destroy chemical contamination. Alternatives 3a and 3b includes segregation of TNT and RDX fragments for subsequent detonation, which will destroy the source of soil contamination, thus reducing the toxicity, mobility, and volume of the TNT/RDX contamination. However, no treatment of the contaminated soils is associated with Alternatives 3a and 3b.

9.8.5 Short-Term Effectiveness

Alternative 1 (no action) is the most effective in the short-term because no actions resulting in additional worker exposure would be performed. No additional environmental impacts would result from this alternative other than the conditions already existing. Contaminant migration from surface soils via wind and water infiltration is of concern.

Alternatives 3b and 4a are considered equally effective for short-term protection. Both alternatives involve about the same degree of soil excavation and transport off the INEEL. Alternative 3a would be considered more effective as contaminated soils would not be transported off the INEEL and, hence, there would not be potential risk to the public. Alternative 4b is less effective than Alternatives 3a, 3b, and 4a in the short-term because additional worker exposure would result from the increased handling of contaminated soil during the composting process.

9.8.6 Implementability

Each of the alternatives retained for detailed analysis is technically implementable. Alternative 1 (no action) is the most implementable for the TNT/RDX soil sites because it requires no change in existing site conditions.

Alternatives 3a, 3b, and 4a are equally implementable. All use conventional excavation equipment and rely on available disposal and treatment facilities. Alternative 4b is considered less implementable, because a temporary building would have to be constructed and specialized equipment obtained for composting the soil.

9.8.7 Cost

Alternative 1 (no action) has an estimated \$3.5 million cost resulting mainly from long-term monitoring, which would be required for at least 100 years. The estimated cost for Alternative 3a is

$3.9 million. The estimated cost of Alternative 3b is $4.0 million. The Alternative 3b cost is slightly higher because of the additional cost to transport soil several hundred miles to a disposal facility off the INEEL. Alternative 3a is the lowest of the four alternatives that meet threshold criteria.

The estimated cost of Alternative 4a is $4.7 million. The estimated cost of Alternative 4b is $4.6 million. The Alternative 4a cost would be higher because of the additional cost to transport soil several hundred miles to a disposal facility off the INEEL. Detailed cost estimates are included in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001, Appendix I).

9.8.8 State Acceptance

The IDEQ has been involved in the development and review of the OU 10-04 RI/FS report (DOE-ID 2001), the Proposed Plan (DOE-ID 2002), and this ROD. All comments received from IDEQ on these documents have been resolved and the documents revised accordingly. In addition, IDEQ has participated in public meetings where public comments and concerns have been received and responses offered. The IDEQ concurs with the selected remedial alternative for the TNT/RDX Contaminated Sites contained in this ROD and is a signatory to the ROD with DOE and EPA.

9.8.9 Community Acceptance

Community participation in the remedy selection process and Proposed Plan reviews included participation in the public meetings held February 7 and 12, 2002 (see Section 3). The 30-day public comment period was extended an additional 30-days from January 28, 2002, through March 29, 2002. The Responsiveness Summary, presented as Part 3 of this ROD, includes verbal and written comments received from the public and the DOE responses to these comments. Representatives of the EPA and IDEQ assisted in the development of the responses.

All comments received on the Proposed Plan were considered during the development of this ROD. Public concerns generally centered on the cost to perform geophysical surveys and remove the TNT and RDX contamination. Consequently, a phased approach to remediation of the TNT/RDX soil sites will be developed during the remedial design phase to reduce costs.

9.9 Selected Remedy for the TNT/RDX Contaminated Sites

The selected remedy for the OU 10-04 TNT/RDX contaminated soil sites is Alternative 3a, removal, treatment, disposal of soil on the INEEL, and institutional controls. This remedy was selected based on the results of the comparative analysis of alternatives. Alternative 3a would be protective of human health and the environment and comply with laws. The long-term effectiveness is high because TNT/RDX contamination will be removed. Reduction of toxicity, mobility, and volume is moderate; although TNT and RDX fragments would be treated by detonation, the rest of the contaminated soil would be removed and disposed but not treated. However, the contaminants would be contained, protecting humans and ecological receptors from exposure. Short-term effectiveness would be moderate, because of the possibility for worker exposure during excavation, treatment, transport, and disposal activities. Implementability of Alternative 3a is high because equipment, technologies, and personnel are all available.

Remediation of the TNT/RDX contaminated soil sites will include the following activities:

- Establish and maintain institutional controls such as access controls and land-use restrictions, and other restrictions such as signs and fences until the TNT/RDX contamination is removed or reduced to acceptable levels. The specific goals of the institutional controls are to control human activity at sites with TNT/RDX contamination and prevent harm from direct exposure to toxic chemicals. Institutional controls will restrict access and monitoring will be performed since buried, undetected TNT and RDX fragments could exist after remediation.

- Perform a visual survey for UXO and TNT/RDX fragments and stained soil and a geophysical survey for UXO.
- Excavate soil contaminated with concentrations in excess of the remediation goals by hand unless it is determined that mechanical excavation equipment can be used. UXO will be removed, if required, to proceed with soil excavation. Otherwise UXO removal will be performed during remediation of the ordnance areas.
- Manually segregate fragments of TNT/RDX from the soil unless safety assessment indicates it is safe to mechanically screen the soil.
- Dispose of the TNT/RDX fragments by detonation at the MDA. Waste generated during detonation activities will be addressed using current disposal practices.
- Use field screening methods and soil sampling with laboratory analysis to determine the extent of soil removal required to meet remediation goals.
- Sample and analyze removed soil to determine the TNT and RDX concentrations and if the soil exhibits any RCRA hazardous waste characteristics. If the soil is less than 10% TNT and RDX and not RCRA regulated, it will be disposed at an approved landfill on or off the INEEL. If the TNT and RDX concentration is above 10% and considered RCRA regulated, the soil will be transported to a permitted RCRA TSD facility for thermal treatment and disposal.
- Backfill areas excavated to depths greater than 0.3 m (1 ft) with uncontaminated soil or contour to match the surrounding terrain and vegetate.
- Monitor air and soil until the TNT/RDX contamination and UXO contamination is removed or reduced to allow unrestricted use.

The UXO surveys and removal, if required, will be performed using standard military techniques. Soils will be characterized and excavated either manually or mechanically, as permitted by safety analysis. The TNT and RDX fragments will be segregated from the soil and detonated at the MDA. Sampling will be performed to determine if products of incomplete combustion are present after detonation events at the MDA. Although detectable levels are not expected, remediation of soil contamination of the MDA will be performed at post remediation if residual risk exceeds 1E-04. Therefore, the MDA will be investigated for remediation after remediation of the ordnance areas and the TNT/RDX sites is complete.

Following separation of the TNT and RDX fragments, the contaminated soil will be disposed at an approved facility on or off the INEEL. Verification sampling will be performed to confirm soils above the remediation goals are removed. The sites will be restored in accordance with the INEEL revegetation procedures.

Institutional controls will be maintained at these sites until the TNT/RDX contamination is removed or reduced to acceptable levels. Controls are required to restrain human activity at areas with TNT/RDX contamination and prevent harm from direct exposure to toxic and hazardous secondary explosive material. In April 1999, the EPA Region 10 developed a policy for institutional controls. During the OU 10-04 remedial design/remedial action (RD/RA) phase for the TNT/RDX contaminated soil sites, an operation and maintenance (O&M) plan will be developed that will contain the institutional controls for the TNT/RDX sites that will follow the guidelines in the policy. This plan will establish uniform requirements of the institutional control remedy components for all TNT/RDX sites and specify the monitoring and maintenance requirements.

Institutional controls will reside with DOE or other government agency until 2095, based on the Comprehensive Facility and Land Use Plan, or until a remedy review or INEEL-wide 5-year statutory review concludes unrestricted land use is allowable.

9.9.1 Estimated Cost for the Selected Remedy

The estimated cost for implementing Alternative 3a, removal, treatment, on-Site disposal of soil and institutional controls, is $3.9 million. The elements of the cost estimate are summarized in Table 25 and details of the cost estimate are provided in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001, Appendix I). The costs are presented in net present values, which allows for the equal comparisons of long-term and short-term alternatives while factoring in inflation. Cost estimates are based on the use and operation of excavation equipment and disposal. Cost allowances were included to account for waste characterization, packaging, and continuing institutional controls. By implementing the remedy in phases, the cost for implementing this remedy can be reduced.

9.9.2 Estimated Outcomes of the Selected Remedy

Remediation of the identified contaminated soil sites to meet the remediation goals (see Table 22) will be achieved by removal of the TNT/RDX fragments and contaminated soil, which will reduce risk to ecological receptors, future workers, and residents. Verification sampling will be performed to confirm soils above the final remediation goals are removed.

However, the total amount of TNT/RDX at the site is not well documented and complete recovery may not be possible. It is possible that buried TNT and RDX fragments may still exist after remediation, that could come to the surface in the future through frost heave and erosion and continue to present an unacceptable risk. Therefore, periodic surveys will be performed and institutional controls established and maintained.

Access to the INEEL is currently restricted for purposes of security and public safety. Site-wide access restrictions will limit accessibility at least until 2095 based on the Comprehensive Facility and Land Use Plan for ordnance areas containing possible UXO that lie within the INEEL boundary. The areas containing TNT and RDX contamination are within known ordnance areas. Based on the possible presence of UXO, access at these sites may also be limited by the installation of additional fences or relocation of the existing fences. Other access control measures may include warning signs, assessing trespassing fines, and establishing training requirements for persons allowed access. Land-use restrictions will be specified if government control of the INEEL is not maintained throughout the institutional control period.

Table 25. Cost estimate summary for OU 10-04 TNT/RDX contaminated soil sites selected remedy.

Description	Cost (Net Present Value)	Totals
Capital Costs		**967,000**
Remedial Design	**514,000**	
Remedial design/remedial statement of work	76,000	
Remedial design work plan	10,000	
Environmental, safety and health plan	94,000	
Sampling and analysis plan	102,000	
Quality assurance project plan	23,000	
Site operation and maintenance plan	34,000	
Draft final design/report preparation	23,000	
Remedial action work plan	59,000	
Plans and specifications	70,000	
Miscellaneous environmental documents	23,000	
Remediation Support	**147,000**	
Quality assurance	22,000	
Project office operations	125,000	
Remediation/Technical Support Activities	**42,000**	
Engineering and technical support	42,000	
Remedial Action	**220,000**	
Mobilization & prep. work	6,000	
Site work	183,000	
Site restoration	8,000	
Demobilization	6,000	
Other	17,000	
Removal Action	**44,000**	
Summary report	44,000	
Operations Cost		**2,021,000**
Cleanup Tech. Admin. Activities Program Management	**1,471,000**	
Project and baseline management/report	1,471,000	
Post ROD Ops and Maintenance	**0**	
Caretaker maintenance	0	
Monitoring	**550,000**	
Field sampling plan	11,000	
Sampling	313,000	
5-year reviews	226,000	
General and Administrative (G&A)		**6,000**
SUBTOTAL COSTS		**2,994,000**
Plus 30% Contingency		**898,000**
TOTAL PROJECT COST IN NET PRESENT VALUE		**3,892,000**

NOTE: Net present value is the cumulative worth of all costs, as of the beginning of the first year of activities, accounting for inflation of future costs. Net present values are estimated assuming variable annual inflation factors for the first 10 years, in accordance with DOE Order 430.1, followed by a constant 5% annual inflation rate. A constant 5% discount rate is assumed.

9.10 Statutory Determinations for the TNT/RDX Contaminated Sites

9.10.1 Overall Protection of Human Health and the Environment

Alternative 3a provides effective, long-term protection of human health and the environment. The removal of all TNT and RDX fragments, and contaminated soil from the TNT/RDX soil sites will minimize potential long-term human health and environmental concerns associated with future exposure to, or contaminant migration from, uncontrolled release sites. Detonation of the TNT and RDX fragments will effectively destroy the material. Contaminated soil will be disposed in a facility designed for long-term isolation and protection. Institutional controls will be maintained to limit access and activity at the sites and monitoring would be performed because there is the potential for buried, undetected TNT and RDX to reach the surface from frost heaves and erosion, thereby posing an unacceptable risk.

Alternative 3a is protective of the environment during implementation because mitigative measures to prevent contaminant migration during excavation activities will be implemented. However, short-term protection of human health is less effective because workers will be exposed to health hazards from the TNT and RDX contamination. However, all potential risks during implementation will be controlled through administrative and engineering controls. Waste generated during remedial actions will consist of TNT/RDX fragments, contaminated soil, and small quantities of equipment decontamination fluids and discarded personal protective equipment.

9.10.2 Compliance with ARARs and To-Be-Considered Guidance

The selected remedy meets the ARARs as shown in Table 26. Available data indicate the soils should contain less than 1% (10,000 ppm) TNT and RDX when excavated, and hence, the soil will not be considered hazardous and can be sent to an industrial waste landfill. This will be confirmed during remediation. If the TNT and RDX concentration is above 10% and considered RCRA regulated, the soil will be transported to a permitted RCRA facility for thermal treatment and disposal. Removal and detonation of TNT and RDX fragments complies with the Military Munitions Rule and the Open Burning, Wastes Explosives provisions of the RCRA. Groundwater ARARs will be met by reduction in TNT and RDX contamination. Compliance with the emission control ARARs will be ensured by implementing dust suppression techniques during excavation. The DoD Standard 6055.9, Chapter 12, "Real Property Contaminated with Ammunition, Explosives, or Chemical Agents," will be met through the survey for UXO, removal and detonation of the TNT and RDX fragments, removal and disposal of contaminated soil, and implementation of institutional controls. All areas affected by WAG 10 remedial activities will be evaluated for cultural resource concerns before disturbance. Activities in sensitive areas will be modified, as required, to meet ARARs. Therefore, the selected remedy complies with ARARs and TBCs.

9.10.3 Cost Effectiveness

The selected remedy is cost-effective because it is the least costly alternative that satisfies threshold criteria. When compared to other potential remedial actions, the selected remedy provides the best balance between cost and effectiveness in protecting human health and the environment.

9.10.4 Use of Permanent Solutions and Alternative Treatment Technologies

The selected remedy provides effective, long-term protection of human health and the environment. The removal of all detected TNT and RDX fragments and contaminated soil will minimize potential long-term human health and environmental concerns associated with future exposure to, or contaminant migration from, uncontrolled release sites. Detonation of the TNT and RDX fragments will effectively destroy the material. The contaminated soil will be disposed in an approved facility on or off the INEEL designed for long-term isolation and protection.

Institutional controls will be maintained to limit access and future activity at the sites and monitoring will be performed because there is the potential for buried TNT and RDX to reach the surface from frost heaves and erosion, thereby posing an unacceptable risk.

9.10.5 Preference for Treatment as a Principal Element

The selected remedy uses permanent solutions through removal and disposal of the TNT and RDX fragments, principal threat wastes, through treatment by detonation. However, no treatment of the contaminated soils is associated with this alternative.

9.10.6 Five-Year Reviews

The effectiveness of the institutional controls and the need for surveys or removal actions will be evaluated as part of the 5-year review process to assure that final remedial actions for the TNT/RDX sites on the INEEL remain protective.

Table 26. ARARs and TBCs for the selected alternative— removal, treatment of TNT/RDX fragments, and disposal of soil on the INEEL—for OU 10-04 TNT/RDX contaminated soil sites.

Category	Citation	Reason	Relevancy[a]
Chemical-specific applicable, relevant, and appropriate requirements (ARARs)			
Idaho Ground Water Quality Rule	IDAPA 58.01.11.200	TNT/RDX leaching from the site must not adversely affect groundwater quality; standards for groundwater quality must be met.	A
Action-specific ARARs			
Rules for the Control of Air Pollution in Idaho	Fugitive Dust IDAPA 58.01.01.650 and .651	Requires control of dust at all times, especially during excavation of the soil.	A
Resource Conservation and Recovery Act – Standards Applicable to Generators of Hazardous Waste	Hazardous Waste Determination IDAPA 58.01.05.006 (40 CFR 262.11)	A RCRA hazardous waste determination is required for the TNT/RDX fragments, any recovered UXO, excavated soil, and other secondary waste generated during remediation, which is to be treated or disposed of on or off the INEEL.	A
Resource Conservation and Recovery Act – Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Units	General Facility Standards for Owners and Operators of Remediation Waste Management Sites IDAPA 58.01.05.008 (40 CFR 264.1[j][1-13])	General RCRA performance standards must be met during remediation.	A
	Equipment Decontamination IDAPA 58.01.05.008 (40 CFR 264.114)	All equipment used during remediation that contact hazardous waste must be decontaminated in accordance with RCRA requirements.	A
	Use and Management of Containers IDAPA 58.01.05.008 (40 CFR 264.171-177)	Hazardous waste generated during remediation that is managed in containers must meet RCRA requirements.	A
	Open Burning, Waste Explosives IDAPA 58.01.05.008 (40 CFR 265.382)	Detonation of TNT/RDX fragments and UXO must be performed in a manner that does not threaten human health or the environment.	A

Table 26. (continued).

Category	Citation	Reason	Relevancy[a]
Resource Conservation and Recovery Act – Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities	Military Munitions Rule 40 CFR 266.205 and 206	TNT/RDX fragments and UXO identified as hazardous waste under RCRA must meet RCRA requirements for storage, if required during remediation on an interim basis, and transport. Any emergency response conducted during remediation involving munitions or explosives will be exempt from RCRA waste generator and transporter requirements.	A
Location Specific ARARs			
National Historic Preservation Act	Historic properties owned or controlled by Federal agencies 16 USC 470 h-2 Identifying Historic Properties 36 CFR 800.4 Assessing Effects 36 CFR 800.5	In accordance with federal requirements, the site must be surveyed for cultural and archeological resources before construction and appropriate actions must be taken to protect any sensitive resources.	A
Native American Graves Protection and Repatriation Act	Custody 25 USC 3002 (43 CFR 10.6) Repatriation 25 USC 3005 (43 CFR 10.10)	In accordance with federal requirements, the site must be surveyed for cultural and archeological resources before construction and appropriate actions must be taken to protect any sensitive resources.	A
TBC			
Real Property Contaminated with Munitions, Explosives, or Chemical Agents	DoD Standard 6-55.9, Chapter 12	Establishes requirements for disposition of real property known or suspected to be contaminated with ammunition, explosives, or chemical agents.	

a. A = Applicable; RA = Relevant and Appropriate

10. STF-02 GUN RANGE

Remedial action is required for the STF-02 Gun Range to address the potential human health and ecological risk posed by the lead contaminated soil. The site characteristics including the nature and extent of contamination, the summary of site risks, remedial action alternatives and the selected remedy are presented below.

The STF area has been used since 1983 for security force practice maneuvers including small arms target practice in a berm approximately 76 m (250 ft) northeast of the former STF-601 (see Figure 19). The berm was used from approximately 1983 to 1990. Approximately five million rounds were fired into the berm, including tracer rounds. None of the lead bullets that were fired into or that ricocheted away from the berm into the “kickout” areas have been picked up. Kickout is a term used to describe the ricocheted effects of lead bullets. Approximately 61 tons of lead and 3.4 tons of copper may be present at the site (Elliot 2000). No radionuclide contamination is anticipated. Figure 20 presents both an aerial photograph of the STF-02 Gun Range and a photograph of the range from the berm behind the Shooting House. More detailed information about the STF-02 Gun Range can be found in the OU 10-04 Comprehensive RI/FS report (DOE-ID 2001).

10.1 Site Investigations

Sampling of the Gun Range berm and surrounding soils was originally planned as part of the OU 10-04 remedial investigation sampling as described in a 1998 field sampling plan (FSP); however, those field activities were never conducted. Sampling at the Gun Range was instead conducted in 2000 according to the Field Sampling Plan (Elliott 2000).

10.2 Nature and Extent of Contamination

The lead contamination associated with the STF-02 Gun Range is from the bullets fired during small arms target practice. The lead contamination is present as large fragments as well as finely disseminated fragments in the soils. The lead contamination is widely distributed across this site with elevated concentrations detected up to 24,400 mg/kg in one of the berms. Two large areas of concern were identified for assessment following the field sampling. The Kickout area and the Remainder area. The Remainder area includes the berms, the area between the berms, the area around EOCR leach pond, the sand area, and the shooting house. The Kickout area was eliminated as a concern for both the HHRA and ERA during the risk assessment. Soil samples were collected at two depth intervals, 0 to 0.15 m (0 to 0.5 ft) and 0.15 to 0.45 m (0.5 to 1.5 ft). There were 85 soil samples and 6 field duplicates. The maximum concentration of lead detected (24,400 mg/kg) occurred in the 0.15 to 0.45 m (0.5 to 1.5 ft) depth range in the Remainder area. This data is presented in Appendix C of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001).

10.3 Summary of Site Risks

The STF-02 Gun Range was retained for risk assessment in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001) to evaluate the human health and ecological risk from lead detected in the remainder area at the facility. Appendix C of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001) contains both summary statistics and exposure point concentrations.

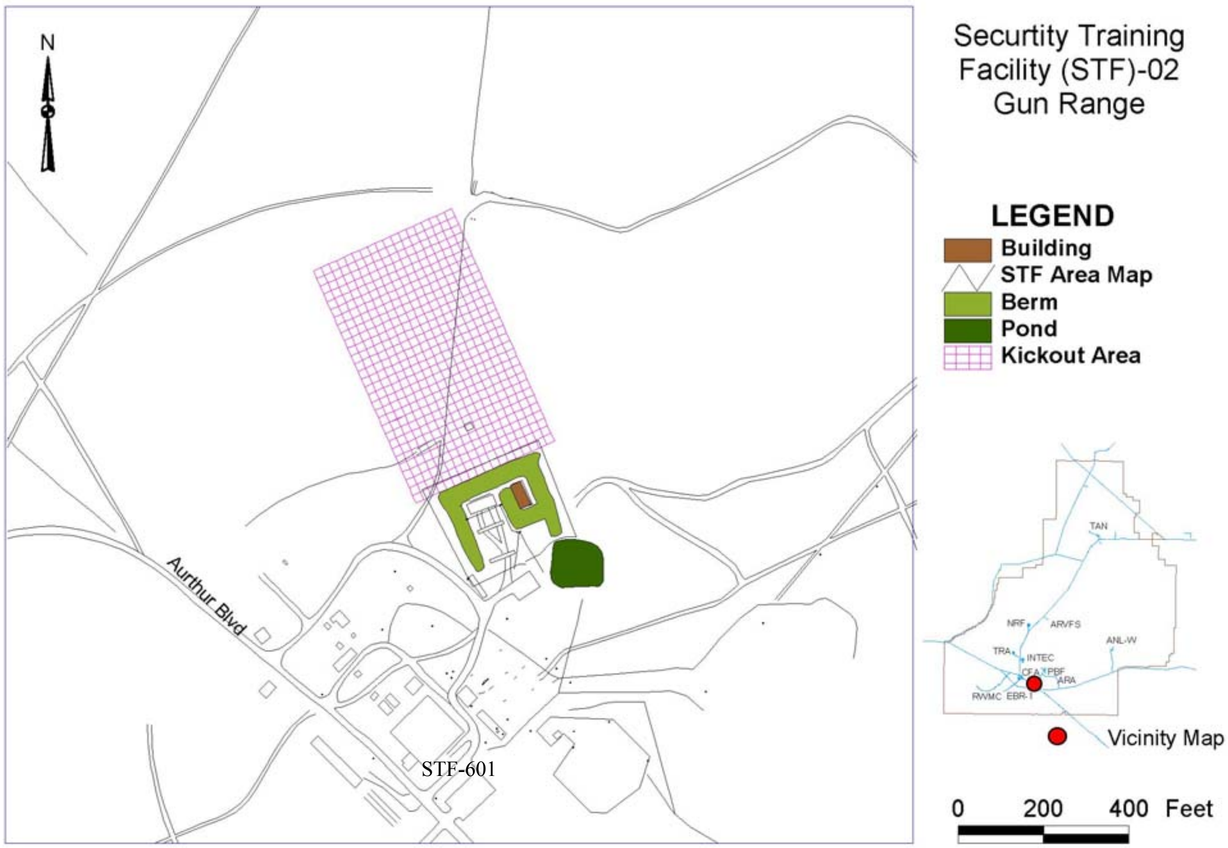

Figure 19. STF-02 Gun Range Site.

Figure 20. The STF-02 Gun Range. The top photograph is an aerial view of the STF Gun Range and the shooting house. The bottom photograph is a back view of the shooting house, gun range, berms, pads, and railroad ties.

The samples taken at the remainder area, in 2000 yielded concentrations of lead in excess of contaminant screening levels for human health, and concentrations of antimony, copper, lead, selenium, and zinc above screening levels for the ecological risk assessment. The results of the human health and ecological risk assessments are given below.

10.3.1 Human Health

The total estimated carcinogenic risk for potential future residents, current occupational workers, and future occupational workers at the STF-02 gun range was not determined because cancer slope factors are not available for lead. The Integrated Exposure Uptake Biokinetic (IEUBK) model, or the methodology presented by the EPA Technical Workgroup for Lead (EPA 1996), could have been used to evaluate the potential of adverse health effects from lead. However, it was not felt that a quantitative HHRA was necessary at this site since the maximum concentration of lead is more than sixty times greater than the screening level of 400 mg/kg given in EPA guidance (EPA 1994b). Due to these concentrations of lead in the soil presented in Table 27, it was determined that an unacceptably high potential exists for adverse health effects under the residential scenario.

Table 27. Soil concentrations for the lead at the STF-02 Gun Range.

Contaminant of Concern	Minimum Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection	Background Concentration (mg/kg)[a]	Exposure Point Concentration (mg/kg)	Statistical Measure[b]
Lead	2.9	24,400	64/72	17	24,400	Maximum

a. The background value for composite samples is from Rood, Harris, and White (1996).

b. The lower of either the maximum or the 95% UCL (95% upper confidence limit on the mean soil concentration) was used in the assessment.

10.3.2 Ecological

Lead was identified as a COC for the STF-02 Gun Range, based on HQs for ecological receptors. The ecological assessment indicated that the HQs for exposure to lead in the surface and subsurface soil range from 2 for the ferruginous hawk to a maximum of 2,000 for the sage sparrow. The black-billed magpie, burrowing owl, deer mouse, loggerhead shrike, mourning dove, Townsend's western big-eared bat, pygmy rabbits, and plants also have HQs exceeding 1.0. The pygmy rabbit is classified as a species of special concern by the State of Idaho.

10.4 Remediation Objectives for the STF-02 Gun Range

Remediation objectives based on the unacceptable risks discussed previously (Section 10.3) were developed for the STF-02 Gun Range. Unacceptable ecological risk is associated with the lead concentration in the soil at the STF-02 Gun Range. Lead concentrations exceed the 400 mg/kg EPA screening level (EPA 1994) and, if allowed to migrate, could result in groundwater contamination exceeding the MCL for lead.

Remedial Action Objectives for the Gun Range were developed in accordance with the *National Oil and Hazardous Substances Contingency Plan* (NCP) (40 CFR 300) and EPA guidance (EPA 1988) and through the consensus of DOE-ID, EPA, and IDEQ participants. The RAOs are based on the results of both human health requirements and ERAs and are specific to lead as the only COC.

The RAOs specified for protecting human health are expressed both in terms of risk and exposure pathways, because protection can be achieved through reducing contaminant levels as well as through restricting or eliminating exposure pathways. The RAOs specified for protecting ecological receptors inhibit adverse effects from contaminated soil on resident populations of flora and fauna.

The RAOs developed for the STF-02 Gun Range to protect human health and ecological receptors are as follows:

- Prevent exposure to soils contaminated with lead at concentrations greater than 400 mg/kg.
- Prevent groundwater contamination.
- Inhibit ecological receptor exposures to soil contaminated with COCs, primarily concentrations in soils that result in an HQ greater than or equal to 10.0. The RAO excludes naturally occurring elements and compounds that are not attributable to historic releases.

To meet these objectives, remediation goals were established. The remediation goal and basis for the goal are provided in Table 28. The remediation goal can be satisfied by cleaning up to the identified contaminant concentration in the soil to below 400 mg/kg. Removal of the contaminated media from the STF-02 site will further reduce any potential groundwater risk. The area and volumes of contaminated media at STF-02 is presented in Table 29.

Table 28. Remediation goal for the OU 10-04 STF-02 Gun Range.

		Human Health		Ecological		Range of Detected COC Concentrations at Site (mg/kg)	
Site	Exposure Pathway	COC	Final Remediation Goal (mg/kg)	COC	Final Remediation Goal (mg/kg)	Minimum Concentration	Maximum Concentration
STF-02	Direct exposure and Groundwater	Lead	400[a]	Lead	400[b]	3.05	24400

a. Region 9, EPA remediation goal for soil under the residential scenario.

b. Development of remediation goal for ecological receptors presented in Appendix K (DOE-ID 2001).

Table 29. Areas and volumes of contaminated media for the OU 10-04 STF-02 Gun Range.

Site Name	Area of Site m^2 (yd^2)	Contaminated Soil Volume m^3 (yd^3)	Waste and Debris Volume m^3 (yd^3)
STF-02 Gun Range			
Gun Range soil site	9,570 (11,450)	14,900 (19,450)	NA
Leach Pond	1,300 (1,600)	405 (530)	NA
70 creosote-treated railroad ties (6 in. ×8 in. ×10 ft)	NA	NA	6.7 (8.7)
Asphalt pads	90 (107)	NA	2.1 (2.7)
STF-612 wooden building	NA	NA	3.8 (5)
Lead debris (fragments, unfired rounds)	NA	NA	4.8 (6.3)
Copper debris (fragments, unfired rounds)	NA	NA	0.2 (0.3)

10.5 Description of Alternatives for the STF-02 Gun Range

Three major remedial alternatives were developed to address the lead contaminated soils at the STF-02 Gun Range: Alternative 1, no action; Alternative 2, limited action; Alternative 3, removal, ex situ treatment and disposal or return of treated soils to the excavation sites. The third alternative has two variations, Alternative 3a and 3b. Alternative 1 (no action) and 2 (limited action) were not considered for selection because they would not meet the threshold criteria for protection of human health and the environment and compliance with laws. However, the no action alternative was evaluated in detail to provide a baseline for comparison of the alternatives as required under CERCLA.

10.5.1 Alternative 1: No Action

Formulation of a no action alternative is required by the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP) (40 CFR 300.430[e][6]) and guidance for conducting feasibility studies under CERCLA (EPA 1988). The no action alternative serves as the baseline for evaluating other remedial action alternatives. The alternative includes environmental monitoring, but does not include any actions to reduce potential exposure pathways, such as fencing, deed restrictions, or administrative controls (EPA 1988).

10.5.2 Alternative 3: Removal, Ex Situ Treatment, and Disposal or Return to Excavations

Implementation of this alternative involves excavation of the berms and surroundings soils with concentrations greater than the final remediation goal, physical separation to remove metal fragments and bullets, recycling of the metal fragments as allowed by DOE policy or stabilization and disposal, treatment of the soils with subsequent disposal on or off the INEEL or return to the excavation sites. Conventional excavation and soil screening equipment would be used. Verification sampling would be conducted to ensure that all contamination at concentrations exceeding final remediation goals was removed. Excavations exceeding 1 ft in depth would be backfilled with clean soil following the excavation. Shallow excavations would be recontoured to blend with the existing landscape.

In addition, the railroad ties used to support the targets would be removed, and disposed of in an appropriate landfill, such as the Waste Management Northwest landfill in Arlington, Oregon, or the ICDF. Treatment of the railroad ties by encapsulation is required, as they are RCRA characteristic for lead. The small wooden building (the shooting house) and asphalt pads would be removed and disposed of as debris at a facility on the INEEL, such as the CFA landfill.

Under Alternative 3, the metal fragments and bullets would be physically separated from the soils and sent for recycling if allowed by DOE policy. If DOE does not allow recycling of the lead fragments, they will be stabilized and disposed in an approved landfill. As much particulate metal will be removed physically from the soil as possible. After physical separation, soils would be sampled, and if determined to exceed the RCRA lead toxicity characteristic limit, they would be treated to meet RCRA disposal criteria and disposed in an approved landfill. If the soil concentrations exceed the final remediation goal, but are not RCRA toxic for lead, the soil would be disposed without further treatment at the CFA Landfill, the proposed ICDF, or other approved landfill on or off the INEEL. If the soils do not exceed the final remediation goal and the RCRA toxicity limit for lead, they would be returned to the excavation sites without further treatment.

10.5.2.1 Alternative 3a: Removal, On-Site Stabilization, and Disposal. Implementing this alternative involves removal of the berms and excavation of all surrounding soils with concentrations above the final remediation goal, physical separation to segregate the metal fragments and bullets (which will be sent for recycling if allowed by DOE policy), and treatment of soil by stabilization if sampling indicates the soil is RCRA characteristic for lead. If DOE does not allow recycling of the metal fragments, they would be stabilized and disposed in an approved landfill. If the soil concentrations, after physical separation, exceed the final remediation goals, but are not RCRA toxic for lead, they would be disposed without further treatment at an approved facility on or off the INEEL. Soil not exceeding the final remediation goal and the RCRA lead toxicity limit would be returned to the excavation sites.

10.5.2.2 Alternative 3b: Removal, On-Site Soil Washing, and Return of Soil to the Excavations. Implementing this alternative would involve removal of the berms and excavation of all surrounding soils with concentrations above the final remediation goal, and physical separation to remove metal fragments and bullets; which will be sent for recycling if allowed by DOE policy. If DOE does not allow recycling of the metal fragments, they would be stabilized and disposed in an approved landfill. As much particulate metal will be removed physically from the soil as possible. After physical separation, soils would be sampled, and if determined to exceed the RCRA lead toxicity characteristic limit, they would be washed with an acid. If the final remediation goal for lead is achieved after soil washing, the soil would be returned to the excavated sites. If after washing the soil exceeds final remediation goals, but is not RCRA toxic for lead it would be disposed of without further treatment at a landfill such as CFA or ICDF. The soil washing secondary waste would be treated and disposed on the INEEL at an approved facility. If the soil concentrations exceed the final remediation goal, but are not RCRA toxic for lead, the soil would be disposed without further treatment at an approved industrial landfill on or off the INEEL. If the soils do not exceed the final remediation goal and the RCRA toxicity limit for lead, they would be returned to the excavation sites without treatment.

10.5.3 Comparison of Elements and Distinguishing Features of Each Alternative

The relative performance of each alternative is described in Table 30.

10.6 Comparative Analysis of Alternatives for the STF-02 Gun Range

The alternatives were evaluated using the nine evaluation criteria as specified by CERCLA (40 CFR 300.43[f][5][i]). The purpose of this comparison is to identify the relative advantages and disadvantages associated with each alternative. The comparative analyses of alternatives for the nine criteria are summarized below.

10.6.1 Overall Protection of Human Health and the Environment

Under the no action alternative, human health and environmental risks would not be mitigated. The absence of controls for the STF-02 Gun Range lead, debris, and contaminated soils results in no reduction of risks and the RAOs would not be met. Alternatives 3a and 3b would provide highly effective, long-term protection of human health and the environment. Removal of the metal fragments would eliminate potential risks from contaminant migration. Removal and treatment of contaminated soils would also eliminate risk from exposure and migration. Therefore, Alternatives 3a and 3b meet specified RAOs and provide for overall protection of human health and the environment.

10.6.2 Compliance with ARARs

Comparison of compliance with ARARs is summarized in Table 30 for the STF-02 Gun Range. The ARARs for Alternative 1 (no action) would not be met for the STF-02 Gun Range. Alternatives 3a and 3b would both meet all ARARs for STF-02 Gun Range

Table 30. Detailed analysis summary for the OU 10-04 STF-02 Gun Range.

Criteria	Alternative 1 No Action	Alternative 3a Removal, Ex Situ Stabilization, and Disposal	Alternative 3b Removal, Soil Washing, and Disposition on the INEEL
<u>*Overall protection of human health and the environment*</u>			
Human health protection	No reduction in risk	Eliminates potential exposure to waste by removing contamination from the site	Eliminates potential exposure by removing contamination from the site
Environmental protection	Allows continued ecological exposures	Eliminates potential ecological exposure to waste by removing contamination from the site	Eliminates potential ecological exposure to waste by removing contamination from the site
<u>*Compliance with ARARs*</u>			
Chemical-specific			
Idaho Groundwater Quality Standards – IDAPA 58.01.11.200	Would not meet ARAR	Would meet ARAR	Would meet ARAR
Action-Specific			
Rules and Standards for Hazardous Waste in Idaho– IDAPA 58.01.05.010.006, .008, and .011	Not applicable	Would meet ARAR	Would meet ARAR
Requirements for Recyclable Materials – 40 Code of Federal Regulation 261.6	Not applicable	Would meet ARAR	Would meet ARAR
Hazardous Waste Determination – 40 Code of Federal Regulation 262.11	Not applicable	Would meet ARAR	Would meet ARAR
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities – 40 Code of Federal Regulation 264	Not applicable	Would meet ARAR	Would meet ARAR
Idaho Fugitive Dust Emissions—IDAPA 58.01.01.650 through .651	Not applicable	Would meet ARAR through use of engineering controls	Would meet ARAR through use of engineering controls
Rules for Control of Air Pollution in Idaho—IDAPA 58.01.01.161, IDAPA 58.01.01.500.2, and IDAPA 58.01.01.585 through .586:	Not applicable	Would meet ARAR through use of engineering controls	Would meet ARAR through use of engineering controls
NESHAPS—40 Code of Federal Regulation 63.543 - .545	Not applicable	Would meet ARAR through use of engineering controls	Would meet ARAR through use of engineering controls

Table 30. (continued).

Criteria	Alternative 1 No Action	Alternative 3a Removal, Ex Situ Stabilization, and Disposal	Alternative 3b Removal, Soil Washing, and Disposition on the INEEL
Location-specific			
Native American Graves Protection and Repatriation Act—25 USC 32	Not applicable	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary
National Historic Preservation Act—36 Code of Federal Regulation 800	Not applicable	Would meet ARAR through surveys and assessments and actions deemed necessary	Would meet ARAR through surveys and assessments and actions deemed necessary
Long-term effectiveness and permanence			
Magnitude of residual risk	No change from existing risk	No residual risk would remain at site	No residual risk would remain at site
Adequacy and reliability of controls	No control and, therefore, no reliability	Disposal facilities for treated waste, contaminated soils and debris are assumed to provide adequate and reliable control for the period of institutional control; stabilized waste form estimated to provide reliable control over contamination in waste for at least 1000 years	Soil washing is expected to remove at least 90% of lead contamination from the soil; the secondary waste can be effectively treated to provide reliable controls for at least 1000 years
Reduction of toxicity, mobility, or volume through treatment			
Treatment process used	Not applicable	Stabilization	Soil washing
Amount destroyed or treated	Not applicable	Approximately 100%	Approximately 90%
Reduction of toxicity, mobility, or volume	Not applicable	30 –50% volume reduction, 95% mobility reduction, and 0% toxicity reduction	20% volume increase, >90% mobility reduction, 0% toxicity reduction
Irreversible treatment	Not applicable	Not reversible, but affords long-term stability	Not reversible, but affords long-term stability
Type and quantity of residuals remaining after treatment	Not applicable	No waste would be left at the site; soil would be stabilized and railroad ties would be encapsulated	No waste would be left at the site. Soils would be returned to the site after treatment; the secondary waste from soil washing would be treated and disposed, most likely by stabilization; the railroad ties would be encapsulated
Statutory preference for treatment	Not applicable	Meets preference	Meets preference
Short-term effectiveness			
Community protection	No increase in potential risks to the public	No increase in potential risks to the public during transportation	No increase in potential risks to the public

Table 30. (continued).

Criteria	Alternative 1 No Action	Alternative 3a Removal, Ex Situ Stabilization, and Disposal	Alternative 3b Removal, Soil Washing, and Disposition on the INEEL
Worker protection	Not applicable	Workers protected by engineering and administrative controls	Workers would be exposed to acids and hazardous secondary waste, but would be protected by engineering and administrative controls
Environmental impacts	No change from existing conditions	Limited to disturbances from vehicle and material transport activities associated with excavation of the soils and debris	Limited to disturbances from vehicle and material transport activities associated with excavation of the soils and debris
Time until action is complete	Not applicable	Approximately 18 to 24 months	Approximately 18 to 24 months
Implementability			
Ability to construct and operate	No construction or operation	Easy, involves available excavation, transportation, and stabilization technology	Easy, involves available excavation, transportation and treatment technology
Ease of implementing additional action if necessary	May require repeat of feasibility study and record of decision process	Easy, would only involve removal and treatment of additional soil	Easy, would only involve removal and treatment of additional soil
Ability to monitor effectiveness	Monitoring of conditions is readily implemented	The effectiveness in stabilizing all contaminants is easily monitored	Sampling to verify treatment performance is easily performed
Ability to obtain approvals and coordinate with regulatory agencies	No approvals required	No difficulties identified	No difficulties identified
Availability of services and capacity	None required	Services available on-Site or through subcontractor	Services available on-Site or through subcontractor
Availability of equipment, specialists, and materials	None required	Equipment and materials are available either on-Site, through subcontractors, or will be purchased	Equipment and materials are available either on-Site, through subcontractors, or will be purchased
Availability of technology	None required	Available at the INEEL and commercially	Available at the INEEL and commercially
Cost (net present worth, 5% discount rate)			
Capital Cost	\$0.6 million	\$3.5 million	\$8.1 million
Operations and Maintenance Cost	\$2.7 million	NA	NA
Total Cost	\$3.3 million	\$3.5 million	\$8.1 million

10.6.3 Long-Term Effectiveness and Permanence

Alternative 1 (no action) would provide the least long-term effectiveness and permanence for the STF-02 Gun Range. Alternative 3a (excavation, stabilization, and disposal) would provide a high degree of long-term effectiveness and permanence, because the waste would be removed from the site, treated, and disposed of in a secure landfill. Alternative 3b (excavation, soil washing, and disposition at the site) is equally protective. Some lead contamination (below risk-based levels) could be returned to the site since treatment may not be 100% effective in removing lead contamination from the soil and the amount of residual lead contamination returned to the site is likely to be the same for both Alternatives 3a and 3b.

10.6.4 Reduction of Toxicity, Mobility, or Volume through Treatment

There is no reduction of toxicity, mobility, or volume through treatment in Alternative 1 (no action). In alternatives 3a and 3b the soil is treated to remove lead, the principal threat waste. While the toxicity of the lead will not be reduced, the lead would be stabilized to reduce mobility. The waste volume would increase from stabilization and soil washing.

10.6.5 Short-Term Effectiveness

Alternative 1 (no action) would be the most effective in the short-term because no actions would be taken to cause worker exposure. No off-Site exposures would occur because none of the sites are located near inhabited areas and no public roads are in the vicinity. No additional environmental impacts would result from this alternative other than the conditions already existing. Contaminant migration from surface soils via wind and water infiltration is of concern.

Alternative 3a, removal, ex situ stabilization and disposal, is considered effective for short-term protection as the exposure risk to workers during excavation, screening, treatment, transport, and disposition of the soils and debris would be low. Alternative 3b, removal, soil washing, and disposal is considered less effective as the soil washing process involves use of concentrated acid, which poses safety concerns for workers conducting the treatment. The soil washing process also takes much longer to perform than stabilization and creates a significant volume of hazardous secondary waste, which also increases risk to on-Site workers.

10.6.6 Implementability

Each of the alternatives retained for detailed analysis is technically implementable. Alternative 1 (no action) would be the most implementable for the STF-02 Gun Range, because it requires no actions or changes to existing site conditions.

Alternative 3a for the STF-02 Gun Range is considered more implementable than Alternative 3b. The stabilization process for soil uses conventional and readily available equipment and technology known to be effective. The effectiveness of soil washing is not as well demonstrated. Treatability studies would be required to determine the effectiveness on the soils at the STF-02 Gun Range, and there is some uncertainty that the technology would not meet final remediation goals.

10.6.7 Cost

Alternative 1 (no action) has an estimated cost of $3.3 million from long-term monitoring, which would be required until 2095 based on the Comprehensive Facility and Land Use Plan. The estimated cost for Alternative 3a is $3.5 million and for Alternative 3b the cost is $8.1 million. Details of the cost estimates are provided in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001, Appendix I).

10.6.8 State Acceptance

The IDEQ has been involved in the development and review of the OU 10-04 RI/FS report (DOE-ID 2001), the Proposed Plan (DOE-ID 2002), and this ROD. All comments received from IDEQ on these documents have been resolved and the documents revised accordingly. In addition, IDEQ has participated in public meetings where public comments and concerns have been received and responses offered. The IDEQ concurs with the selected remedial alternative for the STF-02 Gun Range contained in this ROD and is a signatory to the ROD with DOE and EPA.

10.6.9 Community Acceptance

Community participation in the remedy selection process and Proposed Plan reviews included participation in the public meetings held February 7 and 12, 2002 (see Section 3). The 30-day public comment period was extended an additional 30-days due to an extension request from the public. The public comment period began on January 28, 2002 and ended March 29, 2002. The Responsiveness Summary, presented as Part 3 of this ROD, includes verbal and written comments received from the public and the DOE responses to these comments. Representatives of the EPA and IDEQ assisted in the development of the responses.

All comments received on the Proposed Plan were considered during the development of this ROD. While some concerns were raised regarding the need to process all soil in the berms and kick-out areas, and control air emissions during remediation, in general the public was supportive of the preferred alternative for the STF-02 Gun Range and concurred with the conclusion that removal of the lead in the soil is required to satisfy the CERCLA threshold criteria for protection of human health and the environment and compliance with the regulations.

10.7 Selected Remedy for the STF-02 Gun Range

The selected remedy for the STF-02 Gun Range is Alternative 3a, removal, treatment, and disposal of soil on or off the INEEL. This remedy was selected based on the results of the comparative analysis of alternatives. Alternative 3a will be protective of human health and the environment and comply with laws. It has high long-term effectiveness because contaminants and other waste will be removed from the site. Reduction of toxicity, mobility, and volume will be moderate; lead fragments will be separated from the soil (and either recycled or treated and disposed), contaminated soil exceeding RCRA lead toxicity limits will be stabilized and disposed, and contaminated soil exceeding the final remediation goal, but below RCRA toxicity limits, will be removed and disposed in a secure landfill. As a result, contaminants will be contained, protecting humans and ecological receptors from exposure. Short-term effectiveness will be high, because there is no acute toxicity, and use of personal protective equipment and adherence to standard protocols for sampling and processing the soil will minimize exposure risks to workers. Implementability of Alternative 3a is high because equipment, technologies, and personnel are all available.

Remediation of the STF-02 Gun Range will include the following activities:

- Excavate the berms, surrounding soil and the adjacent pond with mechanical equipment to remove soil above the remediation goal for lead. Field screening will be used to initially identify the extent of soil excavation required to meet the remediation goal.
- Perform physical separation to remove copper and lead fragments (bullets, casings, etc.), which will be recycled off the INEEL if allowed by DOE policy. If DOE policy prohibits recycling of the recovered metal, it will be stabilized and disposed in a RCRA compliant facility on or off the INEEL.
- After sorting, return soil containing lead in concentrations below the remediation goal to the site. Stabilize soil that is RCRA characteristic for lead and send to an approved facility located off or on the INEEL for permanent disposal, such as the CFA landfill or the proposed INEEL CERCLA

Disposal Facility (ICDF). Dispose of soil above the remediation goal, but not RCRA characteristic for lead without further treatment at the CFA landfill, the ICDF, or other approved location on or off the INEEL.

- Encapsulate the railroad ties and send to a RCRA compliant landfill on or off the INEEL.
- Dispose of the wooden building and asphalt pads as nonhazardous construction debris on the INEEL in an appropriate landfill, such as the Central Facilities Area (CFA) landfill or the ICDF.
- Contour the excavated areas to match the surrounding terrain, and vegetate.
- Sample and analyze soil to verify the remediation goal is achieved. Because all contamination above the remediation goal will be removed, monitoring and sampling after remediation will not be required and the need for institutional control is not anticipated.

10.7.1 Cost

The estimated cost for Alternative 3a, removal, treatment, and disposal, is $3.5 million (see Table 31).

10.7.2 Estimated Outcomes of the Selected Remedy

Remediation of the STF-02 site by soil removal, sorting, and treatment to meet the remediation goal will reduce risk to ecological receptors, future workers, and residents. To help simplify the soil removal process, debris such as the small wooden building, railroad ties and asphalt pads will be removed and disposed. While current land-use projections indicate that this area is designated for continued industrial use, the remediation goal also ensures adequate protection of future residents if this area becomes available for residential use.

10.8 Statutory Determinations for the STF-02 Gun Range

10.8.1 Overall Protection of Human Health and the Environment

Alternative 3a provides highly effective, long-term protection of human health and the environment. Removal of the metal fragments will eliminate potential long-term risks from contaminant migration. Removal and treatment of contaminated soils eliminates risk from exposure and migration. Therefore, Alternative 3a will meet specified RAOs and provide for overall protection of human health and the environment.

10.8.2 Compliance with ARARs and TBCs

Table 32 presents the evaluation of Alternative 3a for compliance with ARARs and TBCs. The removal of lead contamination will prevent contamination of groundwater; hence, the groundwater standards will be met.

The lead fragments recovered from the initial soil screening will be sent off-Site for recycling, if allowed by DOE policy, or stabilized to meet RCRA disposal criteria and disposed in a RCRA-compliant facility. Stabilization of lead contaminated soil will be in compliance with RCRA requirements for hazardous waste disposal. These actions will satisfy Idaho hazardous waste and RCRA ARARs.

Using air monitoring, dust suppression techniques, and air emission controls during excavation and treatment would ensure compliance with emissions ARARs. The site will be surveyed for cultural resources, and Native Americans will be consulted to identify appropriate actions needed to satisfy ARARs protection of sensitive resources. Alternative 3a is therefore, capable of satisfying all ARARs and TBCs.

Table 31. Cost estimate summary for OU 10-04 STF Gun Range selected remedy.

Description	Cost (Net Present Value)	Totals
Capital Costs		**2,676,000**
Remedial Design	**514,000**	
Remedial design/remedial statement of work	76,000	
Remedial design work plan	10,000	
Environmental, safety and health plan	94,000	
Sampling and analysis plan	102,000	
Quality assurance project plan	23,000	
Site operation and maintenance plan	34,000	
Draft final design/report preparation	23,000	
Remedial action work plan	59,000	
Plans and specifications	70,000	
Deed restriction reviews	0	
Miscellaneous environmental documents	23,000	
Remediation Support	**146,000**	
Quality assurance	22,000	
Project office operations	124,000	
Remediation/Technical Support Activities	**42,000**	
Engineering and technical support	42,000	
Remedial Action	**1,929,000**	
Mobilization & prep. work	12,000	
Site work	1,880,000	
Site restoration	8,000	
Demobilization	12,000	
Other	17,000	
Removal Action	**44,000**	
Summary report	44,000	
Operations Cost		**NA**
Cleanup Tech. Admin. Activities Program Management	**0**	
Project and baseline management/report	0	
Post ROD Ops and Maintenance	**0**	
Caretaker maintenance	0	
Monitoring	**0**	
Field sampling plan	0	
Sampling	0	
5-year reviews	0	
General and Administrative (G&A)		**44,000**
SUBTOTAL COSTS		**2,719,000**
Plus 30% Contingency		**816,000**
TOTAL PROJECT COST IN NET PRESENT VALUE		**3,535,000**

NOTE: Net present value is the cumulative worth of all costs, as of the beginning of the first year of activities, accounting for inflation of future costs. Net present values are estimated assuming variable annual inflation factors for the first 10 years, in accordance with DOE Order 430.1, followed by a constant 5% annual inflation rate. A constant 5% discount rate is assumed.

Table 32. ARARs and TBCs for selected alternative—removal, ex situ treatment, and disposition—for OU 10-04 STF-02 Gun Range.

Category	Citation	Reason	Relevancy[a]
Chemical-specific applicable, relevant, and appropriate requirements (ARARs)			
Idaho Ground Water Quality Rule	IDAPA 58.01.11.200	Lead leaching from the site must not adversely affect groundwater quality; standards for groundwater quality must be met.	A
Action-specific ARARs			
Rules for the Control of Air Pollution in Idaho	Fugitive Dust IDAPA 58.01.01.650 and .651	Requires control of dust at all times, especially during excavation and processing of the soil.	A
	Toxic Substances IDAPA 58.01.01.161 Toxic Air Emissions IDAPA 58.01.01.585 and .586	The release of carcinogenic and non-carcinogenic contaminants into the air must be estimated before the start of construction, controlled if necessary, and monitored during excavation and processing of soil	A
	Requirements for Portable Equipment IDAPA 58.01.01.500.2	Portable equipment for soil excavation and processing must be operated to meet state and federal air emission rules.	A
National Emission Standards for Hazardous Air Pollutants (NESHAP)	National Emission Standards for Hazardous Air Pollutants from Secondary Lead Smelting 40 CFR 63.543(a)	Lead emissions from soil excavation and processing can not exceed 2.0 mg per dry standard cubic meter.	RA
Resource Conservation and Recovery Act – Standards Applicable to Generators of Hazardous Waste	Requirements for Recyclable Materials IDAPA 58.01.05.005 (40 CFR 261.6[a]([b])	Recovered scrap metal sent for recycling will be considered recyclable materials and will not be subject to RCRA requirements for generators, transporters, or storage.	A
	Hazardous Waste Determination IDAPA 58.01.05.006 (40 CFR 262.11)	A RCRA hazardous waste determination is required for the soil, debris, recovered metal, and other secondary waste generated during remediation, which is to be treated or disposed of on or off the INEEL.	A

Table 32. (continued).

Category	Citation	Reason	Relevancy[a]
Resource Conservation and Recovery Act – Standards Applicable to Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Units	General Facility Standards for Owners and Operators of Remediation Waste Management Sites IDAPA 58.01.05.008 (40 CFR 264.1[j][1-13])	General RCRA performance standards must be met during remediation.	A
	Equipment Decontamination IDAPA 58.01.05.008 (40 CFR 264.114)	All equipment used during remediation that contact hazardous waste must be decontaminated in accordance with RCRA requirements.	A
	Use and Management of Containers IDAPA 58.01.05.008 (40 CFR 264.171-177)	Hazardous waste generated during remediation that is managed in containers must meet RCRA requirements.	A
	Staging Piles IDAPA 58.01.05.008 (40 CFR 264.554)	Any hazardous waste managed as a staging pile during remediation must meet RCRA requirements, and at the end of remediation the staging pile must be closed in accordance with RCRA requirements.	A
Resource Recovery and Conservation Act – Land Disposal Restrictions	Treatment Standards IDAPA 58.01.01.11 (40 CFR 268.40[a][b][e])	Any recovered metal and debris that can not be recycled that is a RCRA hazardous waste must be treated if necessary to meet RCRA land disposal restriction criteria before disposal.	A
	Treatment Standards for Hazardous Debris IDAPA 58.01.05.011 (40 CFR 268.45 [a-d])		
	Universal Treatment Standards IDAPA 58.01.05/011 (40 CFR 268.48[a])		
	Alternative Treatment Standards for Contaminated Soil IDAPA 58.01.05.011 (40 CFR 268.49)	Applies to any contaminated soil that is to be removed from the STF-02 Gun Range Site and disposed of in an approved facility on or off the INEEL.	A

Table 32. (continued).

Category	Citation	Reason	Relevancy[a]
Clean Water Act of 1977 (33 U.S.C. 121 *et seq.*)	National Pollutant Discharge Elimination System (NPDES) (40 CFR 122.26)	A project-specific storm water pollution prevention plan is required for construction activities at the STF-02 Gun Range Site.	A
Location-specific ARARs			
National Historic Preservation Act	Historic properties owned or controlled by Federal agencies 16 USC 470 h-2 Identifying Historic Properties 36 CFR 800.4 Assessing Effects 36 CFR 800.5	In accordance with federal requirements, the site must be surveyed for cultural and archeological resources before construction and appropriate actions must be taken to protect any sensitive resources.	A
Native American Graves Protection and Repatriation Act	Custody 25 USC 3002 (43 CFR 10.6) Repatriation 25 USC 3005 (43 CFR 10.10)	In accordance with federal requirements, the site must be surveyed for cultural and archeological resources before construction and appropriate actions must be taken to protect any sensitive resources.	A

a. A = Applicable; RA = Relevant and Appropriate

10.8.3 Cost-Effectiveness

The selected remedy is cost-effective because it is the least costly alternative that satisfies threshold criteria. When compared to other potential remedial actions, the selected remedy provides the best balance between cost and effectiveness in protecting human health and the environment.

10.8.4 Use of Permanent Solutions and Alternative Treatment Technologies

The selected remedy provides effective, long-term protection of human health and the environment. The removal of all contaminated soil above the final remediation goal from the STF-02 Gun Range will minimize potential long-term human health and environmental concerns associated with future exposure to, or contaminant migration from, uncontrolled release sites. The disposal facility will provide long-term isolation of the contaminated soil and debris. Since all contaminated soils, above the final remediation goal will be removed during the cleanup process, institutional controls after remediation are not necessary.

10.8.5 Preference for Treatment as a Principal Element

The selected remedy, Alternative 3a, removal, on-Site stabilization, and disposal, prescribes treatment of the lead contaminated soil and debris, a principal threat waste, by stabilization followed by disposal in an approved disposal facility. Therefore, the selected alternative satisfies the preference for treatment as a principal element of the selected remedy.

10.8.6 Five-Year Reviews

Five-year reviews will be conducted for all sites with institutional controls. Land use will be restricted at STF-02 until remediation is implemented as prescribed in this ROD. Land use controls will not be required after remediation is all contamination above remediation goals is removed. Otherwise, institutional controls will be maintained until discontinued based on results of a 5-year review.

11. LIMITED ACTION

Limited action comprising institutional controls will be implemented at seven sites within OU 10-04 because residual contamination precludes unrestricted use. In addition, all nine sites addressed by the remedial actions discussed in Sections 8, 9, and 10 will be controlled until remediation is implemented, then evaluated for post-remediation controls. The 16 sites that will be managed initially through institutional controls and the future development of the WAGs 6 and 10 O&M Plan that will contain the plans for institutional controls are discussed below.

No action with Site-wide long-term ecological monitoring at the INEEL will also be implemented. The need for long-term ecological monitoring was based on the results of the INEEL-wide ecological risk assessment to ensure protection of this important ecosystem.

11.1 Institutional Controls in Waste Area Groups 6 and 10

Institutional controls will be maintained by DOE at any CERCLA site at the INEEL where risk is greater than 1E-04 (i.e., 1 in 10,000) for a hypothetical current residential scenario. However, baseline risk assessments at the INEEL typically do not estimate risk for a current residential scenario (LMITCO 1995). For purposes of evaluating the need for institutional controls at WAGs 6 and 10, the potential for current residential risk in excess of 1E-04 was inferred from the risk assessment for the 100-year future residential scenario. Any site with 100-year future residential scenario with an estimated risk of 1E-06 (i.e., 1 in 1,000,000) or greater was assumed to pose a current residential risk of 1E-04. Institutional controls will remain in place at each of these seven limited action sites until at least 2095, based on the Comprehensive Facility and Land Use Plan, or until the site is released for unrestricted use in a 5-year review.

Of the seven limited action sites, one is an ordnance site. Risks estimates for the 100-year future residential scenario for residual soil contamination at the other six limited action sites are less than 1E-04, but current risks for these sites may be greater than 1E-06 for a residential scenario.

Institutional controls will be maintained in the interim until the selected remedy has been implemented at all nine sites identified for remediation in this ROD. For all nine sites (i.e., NPG, Arco High Altitude Bombing Range, Twin Buttes Bombing Range, Experimental Field Station, Fire Station II Zone and Range Fire Burn Area, Land Mine Fuze Burn Area, NOAA, NODA, and STF Gun Range), existing controls such as access restrictions and signs will be maintained until remediation is complete. Long-term institutional control requirements for these sites will be determined based on the analysis of post-remediation confirmation samples.

In accordance with the INEEL Land Use Plan (DOE-ID 1997), DOE will provide institutional controls for sites subject to land-use restrictions until at least 2095, based on the Comprehensive Facility and Land Use Plan, unless a 5-year statutory or periodic remedy review concludes that unrestricted land use is allowable. After year 2095, DOE may no longer manage INEEL activities and controls may take the form of land-use restrictions. Although land use after the year 2095 is highly uncertain, it is likely that industrial applications will continue at the INEEL and WAGs 6 and 10. The Hall Amendment of the National Defense Authorization Act of 1994 (Public Law 103–160) requires concurrence from EPA on the lease of any National Priorities List sites during the period of DOE control, and CERCLA [42 USC 9620 § 120] requires notification to the state of a lease involving contamination. When DOE no longer manages INEEL activities, and controls are needed, CERCLA [42 USC 9620 § 120] requires that DOE document the presence of contamination and any restrictions in property transfer documentation.

Institutional controls will be applied initially to 16 of the 50 sites in OU 10-04 and will not be required for the other 34 sites. A summary of the analysis conducted to identify no action and institutional control sites is presented in Table 33. A preliminary description of the controls that will be applied is provided in Table 34, and the costs estimated for maintaining institutional controls for 100 years are reported in Table 35.

11.2 Waste Area Groups 6 and 10 and Comprehensive INEEL Institutional Control Plan

A comprehensive approach for establishing, implementing, enforcing, and monitoring institutional controls will be developed in accordance with EPA Region 10 policy (EPA 1999b) as part of the Operations and Maintenance (O&M) Plan, an FFA/CO Primary document, during the RD/RA phase. The O&M Plan will be the mechanism for the implementation of institutional controls at WAG 6 and 10 institutional control sites and all INEEL CERCLA sites that require institutional controls. The following elements for the WAG 6 and 10 institutional control plan and the comprehensive INEEL-wide institutional control plan will involve procedures for controlling activities as outlined in the policy:

- A comprehensive listing of all areas or locations in WAGs 6 and 10 and all other areas and locations on the INEEL that have or will have institutional controls for protection of human health or the environment. The information in this list will include, at a minimum, the location of the area, the objectives of the restriction or control, the timeframe for which the restrictions apply, and the tools and procedures that will be applied to implement the restrictions or controls and to evaluate the effectiveness of these restrictions or controls.

- Identification, made legally binding where appropriate, of all entities and persons, including but not limited to, employees, contractors, lessees, agents, licensees, and invitees relevant to the INEEL and WAGs 6 and 10 institutional controls.

- Identification of all activities, and reasonably anticipated future activities, including but not limited to, future soil disturbance, routine and nonroutine utility work, well placement and drilling, grazing activities, groundwater withdrawals, paving, construction, renovation work on structures, or other activities that could occur on INEEL CERCLA sites with institutional controls.

- A tracking mechanism that identifies all land areas under restriction or control.

- A process to promptly notify both the EPA and the State of Idaho before any anticipated change in land-use designation, restriction, land users, or activity for any institutional control required by a decision document.

In addition, the WAGs 6 and 10 and the INEEL-wide comprehensive approach will incorporate by reference the INEEL Land Use Plan (DOE-ID 1997), installation maps, a comprehensive permitting system, and other installation policies and orders.

Table 33. No action sites and sites requiring institutional controls in WAGs 6 and 10.

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
WAG 6				
BORAX-01	BORAX II through V Leach Pond	Institutional controls	The estimated baseline risk for this RI/FS site is 4E-05 for the 100-year future residential scenario from exposure to Cs-137. Risks to the current and 100-year future worker are 2E-04 and 2E-05 respectively, because of external exposure to Cs-137. The leach pond is inactive; however, low-level radionuclide contaminated soil has been buried under clean soil (DOE-ID 2001).	Land use will be restricted to prohibit potential exposure to radiologically contaminated soil. Institutional controls will be maintained until discontinued based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.
BORAX-02	BORAX-I Burial Site	Institutional controls	The estimated baseline risk for this RI/FS site is 4E-05 for the 100-year future residential scenario from exposure to Cs-137. Risks to the current and 100-year future worker are 2E-04 and 2E-05 respectively, because of external exposure to Cs-137. Radionuclide contaminated surface soil was consolidated with the reactor vessel and buried in place. BORAX-02 was capped in 1996 and a fence was built around the perimeter of the site.	Maintain land-use controls to inhibit intrusion into the buried waste and radionuclide contaminated soil. Institutional controls will be maintained until discontinued based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.
BORAX-03	BORAX Argonne Experimental Facility (AEF) Septic Tank (AEF-703)	No action	Tank was removed during a 1995 decontamination and decommissioning (D&D) action. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
BORAX-04	BORAX Trash Dump	No action	Dump has been inactivated and all waste removed. The site has been covered with clean soil and vegetated.	None
BORAX-05	BORAX Fuel Oil Tank, SW of AEF-602	No action	The Underground Storage Tank (UST) was removed during the 1990 tank program. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
BORAX-07	BORAX Inactive Fuel Oil Tank by AEF-601	No action	The UST was removed during the 1990 tank program. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
BORAX-08	BORAX Ditch	Institutional controls	The estimated baseline risk for this RI/FS site is 4E-05 for the 100-year future residential scenario from exposure to Cs-137. Risks to the current and 100-year future worker are 2E-04 and 2E-05 respectively, because of external exposure to Cs-137. Radionuclide contaminated soil was removed during the 1995 NTCRA (DOE-ID 2001).	Land use will be restricted to prohibit potential exposure to radiologically contaminated soil. Institutional controls will be maintained until discontinued based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.
BORAX-09	BORAX II through V	Institutional controls	The estimated baseline risk for this RI/FS site is 4E-05 for the 100-year future residential scenario from exposure to Cs-137. Risks to the current and 100-year future worker are 2E-04 and 2E-05 respectively, because of external exposure to Cs-137. The BORAX-09 reactor was entombed with concrete and buried under clean soil. The chain-link fence on the perimeter of the former reactor building site was left in place (DOE-ID 2001).	Maintain land-use controls to inhibit intrusion into the buried waste and radionuclide contaminated soil. Institutional controls will be maintained until discontinued based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.
None	EBR-I Reactor Building Area (including Heat Transfer Reactor Experiment [HTRE])	No action	The EBR-I Reactor Building includes the EBR-601 Reactor Building and Annex, the EBR-602 Security Control House, and the two ANP jet engines displayed outside the EBR-I perimeter fence. EBR-I is a part of a Registered National Historic Landmark to which the public has access. This site is currently an active tourist attraction. The risk issues for the EBR-I site and HTRE assemblies are addressed by current management controls (DOE-ID 2001).	The EBR-I Reactor building will be maintained and operated as a National Historic Landmark into the foreseeable future. If circumstances, such as a natural disaster, rule out the preservation of the site, D&D will be scheduled. The performance standards ensure that the EBR-I Reactor Building Area will not pose an unacceptable cumulative risk following closure. Future assessment and closure will be managed by EBR-I Operations.
EBR-02	EBR-I Septic Tank (AEF-702) and Seepage Pit (AEF-703)	No action	Tank was removed during 1995 D&D action and no evidence of leakage was observed. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
EBR-03	EBR-I Seepage Pit (WMO-702)	No action	Pit removed during 1995 D&D action. The seepage pit does not appear to have received hazardous waste (DOE-ID 2001).	None

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
EBR-04	EBR-I Septic Tank (WMO-701)	No action	Tank removed during 1995 D&D action, however during removal a radionuclide-contaminated product was discovered in the EBR-04 Septic Tank associated with the EBR-03 Seepage Pit. All detected radionuclides were below INEEL background levels or estimated risk values based on cancer risk levels of 1E-06 (DOE-ID 2001).	None
EBR-05	EBR-I Cesspool, Septic Tank (EBR-709) and Seepage Pit (EBR-713)	No action	EBR-05 is currently an active site in the EBR-I facility. The EBR-I Reactor Building is a historical landmark to which the public has access (DOE-ID 2001).	The EBR-I Reactor building will be maintained and operated as a National Historic Landmark into the foreseeable future. If circumstances, such as a natural disaster, rule out the preservation of the site, D&D will be scheduled. Although not expected, detection of contamination within EBR-05 will be addressed and mitigated at that time. Future assessment and closure will be managed by EBR-I Operations.
EBR-06	EBR-I Septic Tank (EBR-714) and Seepage Pit (EBR-716)	No action	Tank was removed during 1995 D&D action. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
EBR-07	EBR-I (AEF-704) Fuel Oil Tank at AEF-603	No action	The UST was removed during the 1990 tank program. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
EBR-08	EBR-I (WMO-703) Fuel Oil Tank	Institutional controls	The UST was removed during the 1990 tank program. The soil under the UST showed evidence of leakage. The estimated baseline risk for this RI/FS site is 7E-06 for the current residential scenario from exposure to TPH-diesel (DOE-ID 2001).	Restrict the site to industrial land use until discontinued based on the results of a 5-year review.
EBR-09	EBR-I (WMO-704) Fuel Oil Tank at WMO-601	No action	Because of the location of the tank (partially underneath the footing of WMO-601), the tank was grouted in place with cement during the 1995 D&D action. The condition of the tank is unknown and the possible contents are unaccounted for (DOE-ID 2001).	None
EBR-10	EBR-I (WMO-705) Gasoline Tank	No action	The UST was removed during the 1990 tank program. There was some evidence of contaminated soil from diesel fuel. Sample results were evaluated using the Risk –Based Corrective Action (RBCA) model and estimated risk values fell below the cancer risk levels of 1E-06 (DOE-ID 2001).	None

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
EBR-11	EBR-I Fuel Oil Tank (EBR-706)	No action	The UST was removed during the 1990 tank program. Some diesel fuel soil contamination remains at the site at the excavation depth of 8 to 10 ft; however, sample results fall well beneath the state RBCA action limit (DOE-ID 2001).	None
EBR-12	EBR-I Diesel Tank (EBR-707)	No action	The UST was removed during the 1990 tank program. Some diesel fuel soil contamination remains at the site at the excavation depth of 1 to 9 ft; however, sample results fall well beneath the state RBCA action limit (DOE-ID 2001).	None
EBR-13	EBR-I Gasoline Tank (EBR-708)	No action	The UST was removed during the 1990 tank program. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
EBR-14	EBR-I Gasoline Tank (EBR-717)	No action	The tank was not located and remains unaccounted for (DOE-ID 2001).	None
EBR-15	Radioactive Soil Contamination (EBR-I)	No action	Radioactive contaminated soil was removed in the 1995 NTCRA. Following removal, all detected radionuclides were below INEEL background levels or estimated risk values based on cancer risk levels of 1E-06 (DOE-ID 2001).	None
WAG 10				
ARVFS-01	Army Reentry Vehicle Facility Site (ARVFS) Containers of Contaminated NaK	No action	The NaK was removed during the RCRA action in 1995 (DOE-ID 2001).	None
ARVFS-02	ARVFS Tank Containing Low-level Radioactive Waste (under white building)	No action	The tank was removed during the 1989 D&D action (DOE-ID 2001).	None
CPP-66	Fly Ash Pit	No action	This site was evaluated under OU 10-04 for ecological risks. This site is a no action under CERCLA.	None
DF-1	Dairy Farm Disposal Pit	No action	The pit is inactive and the waste was removed in 1989.	None
EOCR-01	EOCR Leach Pond	No action	This site was never active. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
EOCR-02	EOCR Injection Well	No action	This site was never active. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
EOCR-03	EOCR Oxidation Pond	No action	This site was never active. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
EOCR-04	EOCR Septic Tank	No action	This tank is currently inactive. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
EOCR-05	EOCR Blowdown Sump (EOCR-719)	No action	This site was never active. This site contains no hazardous substances or radiological contamination (DOE-ID 2001).	None
LCCDA-01	LCCDA Old Disposal Pit (west end)	No action	A correction factor was applied to the detected levels of Ra-226 at this site, and resulting concentrations were similar to INEEL background levels. The estimated baseline risk for this RI/FS site is 7E-06 for the 100-year future residential scenario from exposure to Cs-137. Risks to the current and 100-year future worker are 4E-05 and 4E-06 respectively, because of external exposure to Cs-137 (DOE-ID 2001).	None
LCCDA-02	LCCDA Limestone Treatment and Disposal Pit (east end)	No action	A correction factor was applied to the detected levels of Ra-226 at this site, and resulting concentrations were similar to INEEL background levels. The estimated baseline risk for this RI/FS site is 7E-06 for the 100-year future residential scenario from exposure to Cs-137. Risks to the current and 100-year future worker are 4E-05 and 4E-06 respectively, because of external exposure to Cs-137 (DOE-ID 2001).	None

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
OMRE-01	OMRE Leach Pond	Institutional controls	The estimated baseline risk for this RI/FS site is 9E-05 for the 100-year future residential scenario from exposure to Cs-137. Risks to the current and 100-year future worker are 1E-04 and 2E-05 respectively, because of external exposure to Cs-137 (DOE-ID 2001).	Land use will be restricted to prohibit potential exposure to radiologically contaminated soil. Institutional controls will be maintained until discontinued based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.
ORD-01	Arco High Altitude Bombing Range	Institutional Control	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in allocations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.
ORD-02	Naval Ordnance Test Facility	No action	No UXO or soil contamination has been found in this area (DOE-ID 2001).	None

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-03	CFA-633 Naval Firing Site and Downrange Area	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-04	CFA Gravel Pit	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-05	CFA Sanitary Landfill Area	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-06	Naval Ordnance Disposal Area	Institutional controls	The estimated baseline risk for NODA is 2E-02 for the 100-year future residential scenario from exposure to RDX. Risks to the current and 100-year future worker are 4E-05 and 4E-05 respectively, because of exposure to RDX (DOE-ID 2001). There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control will not be required after remediation if all TNT/RDX fragments and contaminated soil above the final remediation goal are removed, and it can be confirmed that all UXO is removed. However, remediation may not be 100% effective, and buried, undetected TNT/RDX fragments may remain at the site. Also, confirmation of complete UXO removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some area. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from buried, undetected TNT/RDX and/or UXO. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-07	Explosive Storage Bunkers – North of INTEC	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-08	National Oceanic and Atmospheric Administration	Institutional control	The estimated baseline risk for NODA is 1E-03 for the 100-year future residential scenario from exposure to TNT and RDX. Risks to the current and 100-year future worker are 2E-04 and 2E-04 respectively, because of exposure to TNT and RDX (DOE-ID 2001). There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control will not be required after remediation if all TNT/RDX fragments and contaminated soil above the final remediation goal are removed, and it can be confirmed that all UXO is removed. However, remediation may not be 100% effective, and buried, undetected TNT/RDX fragments may remain at the site. Also, confirmation of complete UXO removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some area. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from buried, undetected TNT/RDX and/or UXO. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-09	Twin Buttes Bombing Range	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-10	Fire Station II Zone and Range Fire Burn Area	Institutional controls	The estimated baseline risk for this RI/FS site is 1E-04 for the 100-year future residential scenario from exposure to TNT and RDX. Risks to the current and 100-year future worker are 2E-05 and 2E-05 respectively, because of exposure to TNT and RDX (DOE-ID 2001). There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control will not be required after remediation if all TNT/RDX fragments and contaminated soil above the final remediation goal are removed, and it can be confirmed that all UXO is removed. However, remediation may not be 100% effective, and buried, undetected TNT/RDX fragments may remain at the site. Also, confirmation of complete UXO removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some area. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from buried, undetected TNT/RDX and/or UXO. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-11	Anaconda Power Line	Institutional control	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-12	Old Military Structures	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-13	Mass Detonation Area	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-14	Dairy Farm Revetments	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-15	Experimental Field Station	Institutional controls	The estimated baseline risk for this RI/FS site is 9E-05 (with a hazard quotient of 10) for the 100-year future residential scenario from exposure to TNT. Risks to the current and 100-year future worker are 6E-05 and 6E-05 respectively, because of exposure to TNT (DOE-ID 2001). There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control will not be required after remediation if all TNT/RDX fragments and contaminated soil above the final remediation goal are removed, and it can be confirmed that all UXO is removed. However, remediation may not be 100% effective, and buried, undetected TNT/RDX fragments may remain at the site. Also, confirmation of complete UXO removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some area. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from buried, undetected TNT/RDX and/or UXO. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-16	UXO East of TRA	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-17	Burn-Ring South of Experimental Field Station	Institutional controls	This site is located in the NPG where there is a potential for UXO to remain. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-18	Igloo-Type Structures Northwest of Experimental Field Station	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-19	Rail Car Explosion Area	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-20	UXO East of ARVFS	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.
ORD-21	Juniper Mine	Institutional controls	An estimated 16,000 pounds of explosive material remain buried 135 ft below ground (DOE-ID 2001). However, there is significant uncertainty as to the explosive characteristics of this material now (buried in 1974).	Maintain land use controls to inhibit intrusion into the buried explosive material. Institutional controls will be maintained until discontinued based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-22	Projectiles Found Near Mile Markers 17 and 19	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.
ORD-23	Rifle Range	No action	No UXO or soil contamination has been found in this area (DOE-ID 2001).	None

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-24	Land Mine Fuze Burn Area	Institutional controls	The estimated baseline risk for this RI/FS site is 6E-03 for the 100-year future residential scenario from exposure to TNT. Risks to the current and 100-year future worker are 4E-03 and 4E-03 respectively, because of exposure to TNT (DOE-ID 2001). There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control will not be required after remediation if all TNT/RDX fragments and contaminated soil above the final remediation goal are removed, and it can be confirmed that all UXO is removed. However, remediation may not be 100% effective, and buried, undetected TNT/RDX fragments may remain at the site. Also, confirmation of complete UXO removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some area. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from buried, undetected TNT/RDX and/or UXO. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-25	Ordnance & Dry Explosives East of the Big Lost River (This site is the same site as the Rail Car Explosion Area)	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-26	Zone East of the Big Lost River	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-27	Dirt Mounds Near the Experimental Field Station, NOAA, and NRF	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ORD-28	Craters East of INTEC	Institutional controls	There is a potential for UXO to remain in the area. UXO poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.	Restrict sites to industrial land-use until remediation is implemented as prescribed in this ROD then, based on analysis of residual risk, determine potential land-use. Land-use control after remediation will not be required if it can be confirmed that all UXO is removed; however, confirmation of complete removal may not be possible in all locations, and complete UXO removal may not be practical or feasible in some areas. As determined by post-remediation risk analysis, land-use restrictions will be established and maintained as required for areas that potentially pose a threat from UXO contact. Institutional controls will be maintained until residual risk is removed or reduced to acceptable levels based on the results of a 5-year review. DOE-ID will notify EPA and the State before any transfer, sale or lease to a non-Federal entity (such as a state or local government or a private person) of any DOE-ID managed real property that is the subject of institutional controls required by a CERCLA decision document, and will discuss with EPA and the State appropriate provisions in the conveyance or lease documents to maintain effective institutional controls.
ORD-29	Big Southern Butte	No action	No live rounds were fired at this site. It is unexpected for UXO to be located within this area (DOE-ID 2001).	None
STF-01	STF-601 Sumps and Pits	No action	The contaminated media from this site were removed during D&D activities (DOE-ID-2001).	None
STF-02	STF Gun Range	Institutional controls	Risk values were not calculated for this site because the maximum detected value for lead, 24,400 mg/kg (average concentration was 1,303 mg/kg), was well above the EPA Region 9 lead PRG of 400 mg/kg, thus, indicating that the site presented an obvious risk (DOE-ID 2001).	Restrict the site to industrial land use until remediation is implemented as prescribed in this ROD, then reevaluate requirements. All contamination above the final remediation goal will be removed during remedial efforts. Thus, monitoring will not be required following remediation and the need for institutional controls or land-use controls are not anticipated.
None	Telecommunication Cable	No action	The cable was cut and rendered useless in the spring of 1990 when U.S. West installed a new fiber optic replacement cable. There is insignificant risk associated with the buried cable in its present state. It is expected that the cable will not be removed but left in place indefinitely (DOE-ID 2001).	None

Table 33. (continued).

Site Code[a]	Site Name	No Action[b] or Institutional Controls[c]	Basis for No Action or Institutional Controls	Goals of Institutional Controls
ZPPR-01	Zero Power Physics Reactor (ZPPR) Disposal Pit (outside ANL-W fence)	No action	This disposal pit is currently inactive. It was used to dispose of excess fill rock, dirt, and small amounts of concrete, asphalt, rebar, and wood. There is no evidence of hazardous materials being disposed (DOE-ID 1999).	None

Hazardous substances and radiological contamination are both mentioned specifically because the Resource Conservation and Liability Act (42 USC 6901 et seq.), which identifies and classifies hazardous contaminants, does not address radioactivity. Both chemical and radiological contaminants can be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (42 USC 9601 et seq.).

a. The site codes BORAX-06 and EBR-01 were not assigned.

b. Unrestricted land use can be allowed for no action sites, and 5-year reviews are not required.

c. Unless specified otherwise, land use will be restricted at each institutional control site until discontinued based on the results of a 5-year review. According to DOE land-use projections (DOE-ID 1997), DOE control is anticipated until 2095.

Table 34. Institutional control requirements for WAGs 6 and 10.

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Site BORAX –02, BORAX-I Burial Site.[b] The site is the former location of the BORAX-I reactor. The facility was deliberately destroyed in July of 1954. Following the excursion, the remaining aboveground structures were removed and the reactor was buried in place along with surrounding radionuclide-contaminated soil. An engineered barrier was constructed over the site. Current occupational scenario risk estimates are greater than 1E-04.					
Current DOE operations	Burial site—no unauthorized intrusion into capped area	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating)	*Federal Facility Agreement and Consent Order* (FFA/CO) (DOE-ID 1991) Worker protection (10 CFR 835) Radiation protection of the public and as low as reasonably achievable principles (DOE Order 5400.5) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120]
DOE control post operations (i.e., after operations cease and before DOE institutional controls are terminated)	Burial site—no unauthorized intrusion into capped area	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][c] Hall Amendment of the National Defense Authorization Act (Public Law 103–160)[c] Property release restrictions (DOE Order 5400.5)

Table 34. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post DOE control	Burial site—no unauthorized intrusion into capped area	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criteria for Bureau of Land Management (BLM) acceptance of property 43 CFR 2374.2[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)
Site: BORAX-09, BORAX II through V. The site consists of the entombed belowground structures remaining from AEF-601. Current occupational scenario risk estimates are greater than 1E-04.					
Current DOE operations	Burial site—no unauthorized intrusion into the entombed structures and buried waste	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating)	*Federal Facility Agreement and Consent Order* (FFA/CO) (DOE-ID 1991) Worker protection (10 CFR 835) Radiation protection of the public and as low as reasonably achievable principles (DOE Order 5400.5) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120]

Table 34. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
DOE control post operations (i.e., after operations cease and before DOE institutional controls are terminated)	Burial site—no unauthorized intrusion into the entombed structures and buried waste	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][c] Hall Amendment of the National Defense Authorization Act (Public Law 103–160)[c] Property release restrictions (DOE Order 5400.5)
Post DOE control	Burial site—no unauthorized intrusion into the entombed structures and buried waste	Radionuclides—exposure to subsurface soil and buried waste	Maintain integrity of containment barrier	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criteria for Bureau of Land Management (BLM) acceptance of property 43 CFR 2374.2[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)
Sites: Land Mine Fuze Burn Area (ORD-24), NOAA (ORD-08), and STF-02. Current occupational scenario risk estimates are greater than 1E-04 at both ordnance areas. Lead concentrations at STF-02 greatly exceed the EPA screening level (EPA 1994). Interim controls will be maintained to protect workers until the selected remedies have been implemented.					
Current DOE operations until remedial action is implemented	Industrial	Explosive materials at ORD-24 and ORD-08. Lead contaminated soil at STF-02.	Prevent exposure to contaminated soil, except for approved activities pursuant to the FFA/CO (DOE-ID 1991).	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating)	FFA/CO (DOE-ID 1991) Worker protection (10 CFR 835) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120]

Table 34. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Sites: Experimental Field Station (ORD-15), Fire Station II Zone and Range Fire Burn Area (ORD-10), Land Mine Fuze Burn Area (ORD-24), NOAA (ORD-08), and NODA (ORD-06). Future residential risk may be greater than 1E-06 after the selected remedies have been implemented because remediation goals are based on the 100-year future residential scenario. Land-use restrictions will be maintained until discontinued based on the results of a 5-year review. Land-use controls will not be required after remediation if contaminant concentrations are below the final remediation goals.					
DOE control post operations (i.e., after operations cease and before DOE institutional controls are terminated)	Industrial	Toxic energetic materials	Control land use as industrial until discontinued based on the results of a 5-year review.	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][c] Hall Amendment of the National Defense Authorization Act (Public Law 103–160)[c] Property release restrictions (DOE Order 5400.5)
Post DOE control	Industrial	Toxic energetic materials	Control land use as industrial until discontinued based on the results of a 5-year review.	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)

Table 34. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Sites: Naval Proving Ground (including 23 smaller ordnance sites: ORD-03, ORD-04, ORD-05, ORD-06, ORD-07, ORD-08, ORD-10, ORD-11, ORD-12, ORD-13, ORD-14, ORD-15, ORD-16, ORD-17, ORD-18, ORD-19, ORD-20, ORD-22, ORD-24, ORD-25, ORD-26, ORD-27, and ORD-28), Arco High-Altitude Bombing Range (ORD-01), and Twin Buttes Bombing Range (ORD-09). Current occupational scenario risk estimates are presented to human health from unintentional detonation of UXO. Interim controls will be maintained to protect workers until the selected remedies have been implemented. Institutional controls will be maintained until discontinued based on the results of a 5-year review. Land-use controls will not be required after remediation if detection methods allow for a complete removal of UXO from the site.					
Current DOE operations until remedial action is implemented	Industrial	UXO — potential for unintentional detonation	Prevent exposure to potential UXO, except for approved activities pursuant to the FFA/CO (DOE-ID 1991).	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating)	*Federal Facility Agreement and Consent Order* (FFA/CO) (DOE-ID 1991) Worker protection (10 CFR 835) Radiation protection of the public and as low as reasonably achievable principles (DOE Order 5400.5) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120]
DOE control post operations (i.e., after operations cease and before DOE institutional controls are terminated)	Industrial	UXO — potential for unintentional detonation	Control land use as industrial until discontinued based on the results of a 5-year review.	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][c] Hall Amendment of the National Defense Authorization Act (Public Law 103–160)[c] Property release restrictions (DOE Order 5400.5)

Table 34. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post DOE control	Industrial	UXO — potential for unintentional detonation	Control land use as industrial until discontinued based on the results of a 5-year review.	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)
Sites: BORAX-01, BORAX-08, OMRE-01. Risk estimates for the current worker scenario are between 1E-06 and 1E-04. Institutional controls will be maintained until discontinued based on the results of a 5-year review.					
Current DOE operations	Industrial	Radionuclides — external radiation	Prevent exposure to contaminated soil, except for approved activities pursuant to the FFA/CO (DOE-ID 1991).	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating)	FFA/CO (DOE-ID 1991) Worker protection (10 CFR 835) National Oil and Hazardous Substances Pollution Control Plan (40 CFR Part 300) CERCLA [42 USC 9620 § 120]
DOE control post operations (i.e., after operations cease and before DOE institutional controls are terminated)	Industrial	Radionuclides—minimal concern	Control land use as industrial until discontinued based on the results of a 5-year review.	Property lease requirements including control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][c] Hall Amendment of the National Defense Authorization Act (Public Law 103–160)[c] Property release restrictions (DOE Order 5400.5)

Table 34. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post DOE control	Industrial	Radionuclides—minimal concern	Control land use as industrial until discontinued based on the results of a 5-year review.	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h) (3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h)(3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)
Sites: EBR-08 and ORD-21. Buried contaminated media remain at these two sites. At EBR-08, soil contaminated with TPH-diesel is present at a depth of 18 ft below the surface. At ORD-21, an estimated 16,000 pounds of UXO remains buried 135 ft below ground.					
Current DOE operations	Industrial	Various—minimal concern	Prevent exposure to potential UXO or contaminated soil, except for approved activities pursuant to the FFA/CO (DOE-ID 1991).	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating)	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][c] Hall Amendment of the National Defense Authorization Act (Public Law 103–160)[c] Property release restrictions (DOE Order 5400.5)
DOE control post operations (i.e., after operations cease and before DOE institutional controls are terminated)	Industrial	Various—minimal concern	Control land use as industrial until discontinued based on the results of a 5-year review.	1. Visible access restrictions (warning signs) 2. Control of activities (drilling or excavating) 3. Property lease requirements including control of land use consistent with the OU 10-04 ROD	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(5)][c] Hall Amendment of the National Defense Authorization Act (Public Law 103–160)[c] Property release restrictions (DOE Order 5400.5)

Table 34. (continued).

Timeframe	Land Restriction[a]	Exposure Concern	Objective	Controls	Regulatory Basis or Authority
Post DOE control	Industrial	Various—minimal concern	Control land use as industrial until discontinued based on the results of a 5-year review.	Property transfer requirements including issuance of a finding of suitability to transfer and control of land use consistent with the OU 10-04 ROD.	FFA/CO (DOE-ID 1991) CERCLA [42 USC 9620 § 120(h)(3)][d] CERCLA [42 USC 9620 § 120(h)(3)(C)(ii)][e] CERCLA [42 USC 9620 § 120(h) (3)(A)(iii)][f] CERCLA [42 USC 9620 § 120(h)(1)-(3)][g] CERCLA [42 USC 9620 § 120(h)(4)][h] Property relinquishment notification (43 CFR 2372.1)[i] Criterion for BLM acceptance of property (43 CFR 2374.2)[j] Excess property reporting requirements (41 CFR 101-47.202-1,-2,-7)[k] Property release restrictions (DOE Order 5400.5)

a. Institutional controls are applicable only to sites where hazardous substances, pollutants, or contaminants are present that preclude unlimited land use. Surveillance will be conducted every 5 years to ensure that controls are in place.

b. The BORAX-02 site was previously remediated under the WAG 5 ROD for the Stationary Low Power Reactor 1 (SL-1) OU 5-05 and BORAX I Burial Grounds OU 6-01 and ten No Action sites. The selected remedy included, periodic aboveground radiological surveys to assess the effectiveness of the remedial action; periodic inspections and maintenance to ensure cap integrity and surface drainage away from the barriers; access restrictions consisting of fences, posted signs, and permanent markers; restrictions limiting land use to industrial applications for at least 100 years following completion of the cap; and review of the remedy no less often than every five years until determined by the regulatory agencies to be unnecessary.

c. Consult and request concurrence of U.S. Environmental Protection Agency with proposed leases of sites that are on the National Priorities List (54 FR 48184) sites.

d. A statement that remedial action is complete is required in the deed.

e. If response action for which the federal government is responsible is not complete, restrictions, the response guarantee, the schedule for investigation, and completion of all necessary response actions and budget assurances must be included in the deed.

f. A clause allowing the U.S. government access to the property must be included in the deed.

g. A notice of information about hazardous substances present on the property must be included in the deed.

h. Uncontaminated parcels of land must be identified with concurrence of the EPA administrator before termination of operations.

i. A Notice of Intent with contamination information and protection needs is required to relinquish the property to the U.S. Department of Interior.

j. Transfer to the U.S. Department of Interior must indicate continuation of DOE responsibility.

k. Report to the General Services Administration on contamination information and allowable land use for excess real property is required.

Table 35. Cost estimate summary for WAGs 6 and 10 institutional controls.

Planned Activity		Cost (Fiscal Year 2001 dollars)
FFA/CO management and oversight		
	WAG 10 management	NA
Remedial design		NA
Remedial action—construction subcontract		NA
Project construction management		NA
CAPITAL COST SUBTOTAL		NA
TOTAL CAPITAL COST IN FISCAL YEAR 2001 DOLLARS		NA
TOTAL CAPITAL COST IN NET PRESENT VALUE		NA
Operations		
	Program management	NA
	Data collection and management for WAG-wide 5-year reviews (100 years)	557,000
	Caretaker/maintenance	3,704,000
	Sampling	632,000
	Decontamination and dismantlement	NA
	Surveillance	NA
OPERATIONS AND MAINTENANCE COST SUBTOTAL		4,893,000
	Contingency @ 30%	1,467,900
TOTAL OPERATIONS AND MAINTENANCE COST IN FISCAL YEAR 2001 DOLLARS		6,360,900
TOTAL OPERATIONS AND MAINTENANCE COST IN NET PRESENT VALUE		2,957,500
TOTAL PROJECT COST IN NET PRESENT VALUE		2,957,500

Within 6 months of the signature of this ROD, a status report about monitoring the effectiveness of WAGs 6 and 10 institutional controls will be submitted to the EPA and IDEQ, which will be followed by a Comprehensive INEEL-wide institutional control status report. An updated institutional control monitoring report based on the results of onsite inspections will be submitted to the EPA and IDEQ at least annually thereafter until the first 5-year review. The deadline for the initial and subsequent monitoring reports may be modified, subject to approval by the EPA and IDEQ, to accommodate the submittal of one monitoring report for all operable units and all institutional controls within WAGs 6 and 10, and possibly one or more monitoring reports for all INEEL waste area groups, and thereby allow integration of different decision document signature dates. In addition, after the INEEL comprehensive approach is well established and its effectiveness has been demonstrated, the frequency of future monitoring reports may be modified, subject to approval by the EPA and IDEQ. At a minimum, the institutional controls monitoring report will contain the following components:

- A description of the means employed to meet institutional control requirements
- A description of the means employed to meet waste site-specific objectives, including the results of visual field inspections of all areas subject to waste site-specific restrictions

- An evaluation of the effectiveness of the approach at meeting all WAG-wide institutional control requirements and waste site-specific objectives

- A description of any deficiencies of the approach and the efforts or measures that have been or will be taken to correct problems.

The DOE will notify the EPA and IDEQ immediately upon the discovery of any activity that is inconsistent with institutional control objectives or of any change in the land use or land-use designation of a site addressed in the WAGs 6 and 10 list of areas or locations covered by institutional controls. The DOE will work together with the EPA and IDEQ to determine a plan of action to rectify the situation, except when DOE believes that an activity creates an emergency situation. The DOE can respond to the emergency immediately upon notification to the EPA and IDEQ and need not wait for the EPA or IDEQ input to determine a plan of action. The DOE will identify the problems with the institutional control process, determine the changes necessary to correct the process to avoid future problems, and implement these changes after consulting with the EPA and IDEQ.

The DOE will identify a point of contact for implementing, maintaining, and monitoring institutional controls.

The DOE will notify EPA and IDEQ at least 6 months before the transfer, sale, or lease of any property subject to institutional controls required by a decision document. Such notification will allow the involvement of the EPA and IDEQ in discussions to ensure that appropriate provisions are included in the conveyance documents to maintain effective institutional controls. If it is not possible for DOE to notify the EPA and IDEQ at least 6 months before the transfer, sale, or lease of any property subject to institutional controls, then DOE will notify the EPA and IDEQ as soon as DOE learns of the possible transfer.

The DOE will not delete or terminate any institutional control unless the EPA and IDEQ have concurred in the deletion or termination.

Operable unit-specific institutional controls will be transitioning to site-wide institutional controls. A comprehensive site-wide institutional control approach will be developed as part of the OU 10-04 O&M plan.

11.2.1 INEEL-Wide Ecological Monitoring

No action with long-term ecological monitoring will be implemented under this ROD because of concerns at the INEEL to sustain a healthy environment and the many uncertainties that resulted from the comprehensive INEEL-Wide ERA. Concern about the impact of the INEEL's activities on the environment has been reflected in long-term monitoring, research, and analysis of the environment during the 50 years that the INEEL has been in operation. The OU 10-04 comprehensive investigation included a comprehensive analysis of ecological risk information available from the 10 WAGs encompassed by the INEEL environmental restoration mission. The purpose of the INEEL-wide ecological risk assessment (ERA) was to compile the information from all previous investigations of risk to ecological receptors at each WAG into a depiction of the effects of contamination on the environment of the INEEL as a whole.

An ecological risk assessment usually requires consideration of many more factors than does a human health risk assessment. For example, more than 200 species of plants and animals can be found on the INEEL, either part or all of the year. These species interact in numerous and complex ways, such as predation, plant eating, and scavenging, which must be taken into account. As well, the ecological risk assessment must take into account wide variations in ranges including migration patterns, and must also account for the tendency for many contaminants to accumulate as they move up the food chain. Finally, since many plant and animal species on the INEEL have not been extensively studied in terms of their habitat requirements, life cycle, or tolerance to the range of contaminants released, the ERA is subject to a number of areas of uncertainty. These uncertainties were identified by the Agencies in 1997 through 1999 as part of the INEEL-wide ERA planning process. Uncertainty issues relevant to the INEEL-wide ERA are presented in Section 17 and Appendix F of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001).

The OU 10-04 INEEL-wide ERA used a multiple line of evidence approach to support the risk conclusions. This approach included assessments of ecologically sensitive areas, ecological sampling on site, breeding bird survey, long-term vegetation transect, radiological biota studies, air dispersion modeling, biological surveys for sensitive species and/or habitat, spatial distribution of contamination, and WAG ERA summaries. The spatial analysis concluded that less than 20 percent of the habitats present on the INEEL are lost to facility activities and that there is minimal risk to the INEEL's diverse plant and animal communities. However, based on the multiple uncertainties and assumptions in the assessment it was determined that ecological monitoring would be critical to ensure protection of this important ecosystem.

Long-term ecological monitoring at the INEEL will include the following activities:

- Activities will be planned to develop a comprehensive surveillance and monitoring plan that supports eliminating the uncertainty in the Site-wide ERA, allows coordination with on-going air, soils, surface water, groundwater and vadose zone surveillance and monitoring efforts, allows coordination with other agency activities (such as sagegrouse studies) and addresses stakeholder concerns.

- A schedule for site walk-downs and visual inspections in the WAG site areas will be developed to ensure that assumptions in the risk assessment are still applicable.

- Yearly sampling and analysis of site-specific flora and fauna for ecological contamination based on location or area-specific field sampling plans (approximately 10% of these samples will be taken from off-Site locations for background comparison and to monitor off-Site migration of contamination by ecological receptors).

- Contaminated media such as sample residue, sampling equipment, and personnel protective equipment generated as a result of these activities will be appropriately characterized, assessed, and dispositioned in accordance with regulatory requirements.

- An annual status report will be provided to the agencies. These annual reports will support the 5-year review.

- Selected research studies will be performed to support the development and understanding of long-term trends in the INEEL's ecology (such as measuring effects to INEEL populations or individual species).

12. ADDITIONAL COMPONENTS OF THE SELECTED REMEDY FOR OPERABLE UNITS 6-05 AND 10-04

In addition to the remediation that will be applied to specific sites, several activities will be implemented within WAGs 6 and 10 to complete the selected remedy. These activities, including disposition of stored and investigation-derived waste and groundwater monitoring, are discussed below.

12.1 Disposition of Stored Waste and Investigation and Remediation-Derived Waste

Contaminated media such as soil, debris, liquids, sample residue, sampling equipment, and personal protective equipment, not identified by the INEEL FFA/CO or in this comprehensive investigation, may be generated as a result of RD/RA activities at OU 10-04 sites. Procedures to address the remediation-derived waste will be documented in the remedial action work plan. In addition, waste that has been generated as a result of previous sampling activities at WAG 6 or 10 sites will be appropriately characterized, assessed, and dispositioned in accordance with regulatory requirements to achieve remediation goals consistent with remedies selected for the sites in this ROD.

12.2 Groundwater Monitoring

The risk estimates for groundwater for the WAG 6 and 10 sites of concern are presented in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). For the TNT/RDX sites, the risk from groundwater use exceeded 1E-04 at the NODA site (1E-02) and the hazard indices were greater than 1.0 at 3 ordnance areas: NODA, NOAA, and Land Mine Fuze Burn Area (hazard indices were 100, 6, and 8 respectively) (DOE/ID 2001). These risk estimates were based on results from the GWSCREEN fate and transport model and not on actual well samples. The primary contaminants of concern contributing risk through the groundwater pathway include RDX and TNT.

Results of the GWSCREEN modeling are conservative in that the source of contamination is assumed to be evenly distributed across the top of the site, which increases the mass of contamination considered. Infiltration is assumed to occur through all contaminated areas, and all contamination is assumed to contribute to groundwater contamination (for further information on the GWSCREEN model see Appendix D of the OU 10-04 RI/FS [DOE-ID 2001]). In addition, the human health risk assessment assumes a future resident lives at the site adjacent to a groundwater well and is constantly exposed to the modeled exposure point concentrations. The peak exposure times for TNT and RDX occur after the 100-year period of institutional control, thus coinciding with the future residential risk scenario. Risk from ingestion of groundwater was calculated using the maximum contaminant concentrations generated from modeling. The risks to human health from groundwater ingestion at the Land Mine Fuze Area, NOAA, and NODA are discussed in Sections 9.3.3.1, 9.4.3.1, and 9.5.3.1 respectively.

The selected remedy for the TNT/RDX sites (Removal, Treatment of TNT/RDX Fragments, Disposal of Soil, and Institutional Controls), discussed in Section 9.9, will reduce the risk through the groundwater pathway. Based on the nature of the contamination it was not anticipated that these contaminants had migrated to the groundwater and subsequently INEEL and USGS wells have not yet been sampled for secondary explosive compounds or degradation products (nitroaromatic and nitramine compounds). Groundwater sampling for nitroaromatics and nitramines will be conducted at groundwater wells downgradient of the TNT/RDX sites. The monitoring wells and specific analytes will be specified in the OU 10-04 scope of work, which will be submitted to the agencies within 21 days after this ROD is signed. Monitoring from the indicator wells will continue if nitroaromatic or nitramine compounds are detected in any groundwater sample, at least until the first periodic remedy review or statutory 5-year review to verify the assumption that nitroaromatic or nitramine contamination has not reached the aquifer. Groundwater remediation will be considered if contaminant concentration levels in ground water exceed the EPA drinking water advisory levels at 1E-04 cancer risk for nitroaromatics and nitramines (EPA 2002a), which are as follows:

- TNT 100 ug/L
- RDX 30 ug/L
- 2,4-DNT 5 ug/L
- 2,6-DNT 5 ug/L

If sampling results indicate groundwater contamination is at or above any of these concentrations, an assessment will be performed to determine the extent of contamination and the associated risk. If the risk is determined to be unacceptable, remedial alternatives will be developed and evaluated; a preferred remedy will be selected, and this ROD will be amended to implement the preferred remedial action.

If monitoring is required, a determination will be made during a remedy or statutory 5-year review to continue or discontinue monitoring for nitroaromatics and nitramines. Costs for monitoring the full suite of groundwater analytes are included in the estimate for 5 years of groundwater monitoring provided in Table 36. Any groundwater monitoring required for OU 10-04 will be conducted under OU 10-08 (DOE/ID 2002).

Table 36. Estimated costs for groundwater monitoring at WAGs 6 and 10.

Operations	Planned Activity	Cost (Fiscal Year 2001 dollars)
	Field sampling plan	14,000
	Annual sampling for 5 years	387,000
	5-Year reviews	278,000
OPERATIONS AND MAINTENANCE COST SUBTOTAL		679,000
	Contingency @ 30%	204,000
TOTAL OPERATIONS AND MAINTENANCE COST IN FISCAL YEAR 2001 DOLLARS		883,000
TOTAL OPERATIONS AND MAINTENANCE COST IN NET PRESENT VALUE		550,000
TOTAL PROJECT COST IN NET PRESENT VALUE		550,000

Risk estimates for the groundwater at the STF-02 Gun Range were not calculated. Lead concentrations potentially attributable to INEEL operations at STF-02 that have been detected in groundwater monitoring wells at STF fall below the EPA action level and Idaho groundwater quality standard for lead of 15 µg/L (EPA 1996 and IDAPA 58.01.11.200). This site will be remediated because the surface soil lead concentrations at this site significantly exceed the EPA screening level of 400 mg/kg (EPA 1994). The selected remedy for the STF Gun Range will address potential contamination of groundwater from lead.

13. DOCUMENTATION OF SIGNIFICANT CHANGES

Several issues relative to the components of the selected remedy for WAGs 6 and 10 were either not presented in the OU 10-04 Proposed Plan (DOE-ID 2002) or were modified after the Proposed Plan was published. These differences from the Proposed Plan are discussed below.

13.1 Modification to Alternatives for the STF Gun Range

The proposed plan describes the STF-02 Gun Range as being within the boundary of the Naval Gun Range Ordnance Area and states that the remedy selected for UXO will also apply at this site. This is inaccurate; although the STF-02 Gun Range is near the southeast edge of the Naval Gun Range, it is not in the direction of fire, hence the presence of UXO is unlikely. Additionally, heavy equipment was previously used at the site to construct the berms at the Gun Range. Therefore, a survey for UXO is not required for implementation of the selected remedy.

The Proposed Plan identified the railroad ties as being a nonhazardous waste, which is incorrect. The railroad ties contain many bullet fragments and are considered RCRA hazardous for lead. The railroad ties will be treated by encapsulation to meet RCRA disposal criteria for hazardous debris and disposed in an approved RCRA hazardous waste landfill.

13.2 Cost Estimate Revisions for the Ordnance Areas and TNT/RDX Contaminated Sites

During development of this ROD, it was determined that deed restriction reviews during the 100-year period of institutional control at the INEEL for the Ordnance Areas and the TNT/RDX sites were not required. Therefore, the cost element for deed restriction reviews was deleted from the cost estimates presented in this ROD for all alternatives for the Ordnance Areas and the TNT/RDX sites with the exception of the no action alternative, which did not include a cost element for deed restriction reviews. This reduced the cost estimates by approximately $450,000, which is the cost for the deed restriction reviews with 30% contingency.

14. REFERENCES

10 CFR 20, Title 10 "Energy," Part 20, "Standards for Protection Against Radiation," *Code of Federal Regulations*.

10 CFR 835, Title 10, "Energy," Part 835, "Occupational Radiation Protection," *Code of Federal Regulations*.

40 CFR 61, Title 40, "Protection of the Environment," Part 61, "National Emission Standards for Hazardous Air Pollutants," *Code of Federal Regulations*.

40 CFR 141, Title 40, "Protection of the Environment," Part 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations*.

40 CFR 143, Title 40, "Protection of the Environment," Part 143, "National Secondary Drinking Water Regulations," *Code of Federal Regulations*.

40 CFR 261, Subpart D, Title 40, "Protection of the Environment," Part 261, "Identification and Listing of Hazardous Waste," Subpart D, "Lists of Hazardous Wastes," *Code of Federal Regulations*.

40 CFR 261.24, Title 40, "Protection of the Environment," Part 261, "Identification and Listing of Hazardous Waste," Subpart .24, "Toxicity Characteristic," *Code of Federal Regulations.*

40 CFR 268.45, Title 40, "Protection of Environment," Part 268, "Land Disposal Restrictions," Subpart .45, "Treatment Standards for Hazardous Debris." *Code of Federal Regulations*.

40 CFR 300, Title 40, "Protection of Environment," Part 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*,

40 CFR 761, Title 40, "Protection of Environment," Part 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions," *Code of Federal Regulations.*

41 CFR 101, Title 41, "Public Contracts or Property Management," Part 101, "Federal Property Management Regulations," *Code of Federal Regulations*.

43 CFR 2372.1, Title 43, "Public Lands Interior," Part 2732, "Procedures," Subpart .1, "Notice of intention to relinquish action by holding agency," *Code of Federal Regulations*.

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Part 3: Responsiveness Summary

STAKEHOLDER COMMENTS AND DEPARTMENT OF ENERGY RESPONSES

The public comment period for the OU 10-04 Proposed Plan (DOE-ID 2002) began January 28 and ended March 29 for the receipt of written and oral comments. Public meetings on the OU 10-04 Proposed Plan were conducted in Boise on February 7 and Idaho Falls on February 12, 2002. Oral comments were submitted by those attending the meetings. The written comments and the meeting transcripts are available in three INEEL information repositories in the Administrative Record for the OU 10-04 Comprehensive RI/FS. The information repositories are located in the INEEL Technical Library in Idaho Falls, the Albertson Library on the campus of Boise State University, and the University of Idaho Library in Moscow.

Typically, comments received from stakeholders pertaining to a proposed plan are compiled and comments that are similar in meaning are summarized and consolidated. However, because only 29 comments were submitted, each comment is presented below in its entirety. The oral comments are reproduced with minimal editing for clarity. The written comments, with the exception of corrected spelling and punctuation and extremely rare instances of editing for clarity, are presented verbatim. In addition, letters within brackets have been added to some comments to indicate multiple parts. A complete response to each comment is provided. An index to the comments on the OU 10-04 Proposed Plan is provided in Table 37 below.

Table 37. Oral and written comments on the OU 10-04 Proposed Plan.

Name	Affiliation	Comment No.
Oral		
John C. Commander	Concerned Citizen Idaho Falls, Idaho	1
Maxine Dakins	University of Idaho Idaho Falls, Idaho	2
Written		
John Tanner	Coalition 21 Idaho Falls, Idaho	1
John C. Commander	Concerned Citizen Idaho Falls, Idaho	2
Clay Atwood	Concerned Citizen Pocatello, Idaho	3
Maxine Dakins	U of I Engineering and Environmental Dept. Idaho Falls, Idaho	4, 5, 6, 7 and 8

Table 37. (continued).

Name	Affiliation	Comment No.
Wendy Green Lowe	CAB, Environmental Restoration Committee Idaho Falls, Idaho (This group of comments regarding the Proposed Plan was submitted by the CAB for information prior to their official written comment (see comment 19)	9, 10, 11, 12, 13, 14 and 15
Bruce W. Ferguson	President and CEO; Edenspace Dulles, Virginia	16
P. D. Eastman	Concerned Citizen	17
J. C.	Concerned Citizen Pocatello, Idaho	18
T. L. Moran and Friends	Concerned Citizens	19, 20, 21, 22, 23, 24 and 25
Diana K. Yupe	Tribal/DOE AIP Program Blackfoot, Idaho	26
Stanley Hobson	Chair, INEEL Citizens Advisory Board Idaho Falls, Idaho	*

* Comments from Citizens Advisory Board are contained in letter from S. Hobson to K. E. Hain, "Recommendation #92 – Proposed Plan for Operable Unit 10-04: Waste Area Groups 6 and 10," dated March 20, 2002. Responses are contained in INEEL – WAGs 6 and 10 – Operable Unit 10-04 – Response to INEEL Citizens Advisory Board Submittal of "Recommendation #92" (EM-ER-02-057).

Oral Comments Presented at the Public Meetings and DOE Reponses

Idaho Falls Public Meeting

Comment 1: I have been a site employee for pretty close to 40 years. I'm aware that the site has been surveyed for unexploded ordnance on at least four different occasions. And that was during the period from 1993 to 1997. And it appears to me that spending another 16.5 million to find additional UXO doesn't make cost-effective sense. The money would be better spent cleaning up land mines in many countries where death and maiming occur from the land mines on a daily occurrence. We haven't had a death site since the — there has not been one death from the site from unexploded ordnance since the site was started in 1949. Spending 4.3 million TNT and RDX remediation is not necessary. Both of these items are biodegradable. Over a period of 100 years there won't be any trace of those materials. Spending 3.5 million for salt, lead, and copper removal is not cost effective. Solid lead is not easily assimilated by any receptors.

We would be better off to spend that money in the many cities in Idaho that have lead that is ingested and inhaled by the population because it's disposed there as very easily absorbed aerosols from various operations such as smelting and that kind of thing. Let's spend the money where it could be more effectively used rather than where it's not necessary.

Response to comment 1: We agree that many countries have a more serious problem with landmines than we at the INEEL have with UXO. Still, the problem at the INEEL is serious. Although previous removal activities have cleared some surface UXO from a few INEEL areas, the extent of remaining UXO, especially buried UXO, has not been fully characterized and the extent may be considerable. The technology for geophysical surveys, presently the best way to detect buried UXO, is constantly improving. It is anticipated that improved technologies will become available in the future to better define the nature and extent of contamination and locate previously unidentified UXO areas. Since the INEEL will be under government control for many years, geophysical survey over the bombing ranges and the Naval Proving Ground will be postponed until a more cost effective, demonstrated technology becomes available. In addition, a phased approach to remediation for UXO will be developed during detailed planning for remediation. By postponing the large-scale UXO survey and phasing remediation, costs can be reduced.

Biodegradation of TNT and RDX is occurring too slowly to protect human health and the environment. Large fragments of TNT and RDX still exist after more than 50 years of weathering and high TNT and RDX concentrations exist in the soil around the fragments. Failure to take remedial action could result in unacceptable risk to human health and the environment and contamination of the Snake River Plain Aquifer. In addition, the TNT and RDX contamination exists in the flood plain of the Big Lost River. In the event of flooding, significant surface water contamination could occur from contact of flood water with the TNT and RDX contamination at these sites.

The lead at STF-02 can dissolve with exposure to precipitation and eventually leach through the soil to the aquifer. However, this is a very slow process and the soil at the INEEL tends to hold onto metal ions; hence, high concentrations of lead left in place can always present a toxicity problem. Over 60 tons of lead are expected to be recovered from the STF-02 site. Also, with this much lead present in the soil, use of the land for residential, industrial, or agricultural use will be prohibited.

While unacceptable harm from exposure to UXO, TNT/RDX, and lead at the INEEL has not occurred while the site has been under government control, the threat from these remaining contaminants cannot be underestimated. Strict government control at the INEEL since 1949 has successfully prevented unacceptable public exposure to these hazards. Without remediation and administrative controls to limit exposure and contamination of the environment, including the Snake River Plain Aquifer, unacceptable risk to human health and the environment would result and regulatory requirements would not be met.

Comment 2: [a] I have a couple of comments and most of my concerns came up in the question period. But I guess I share concern about the money that it will cost, and especially related to putting material in the CFA landfill. I can't quite bend my mind around why we would spend $4 million to pick up the soil and dump it in an industrial landfill that is not a hazardous waste landfill. It doesn't have leachate collection. It doesn't eco-protection. To me, that doesn't pass the test. If we're going to dig it up and if it is hazardous, then put it in the ICDF. If we have to wait until the ICDF is ready, then let's wait until the ICDF is ready. If it's not hazardous, why will we spend $4 million to clean it up? I'm also concerned — because the history of environmental regulations is that they get tighter and tighter. We often have to go back and redo things. I am concerned that we might have to go back and dig up the CFA landfill because we dumped stuff in it that we thought was okay today but it might not be okay 10 to 20 years from now.

[b] My concern about the flowchart is a more general concern about ecological work, general at the site. I think that it's been given short shrift at the INEEL for many years that the human-health risks have been really focused on and the ecological risks have been sort of pushed aside. I was on the Citizens' Advisory Board for several years. I was vice chair for one year. I was actually on the CAB when we reviewed these proposed plans that said, "We will defer that site to WAG-10. We will handle that in WAG-10." As I read through this, there are two sites that pose ecological risks that are not due to be touched according to this proposed plan because they don't pose ecological risk. They will be ignored. I look at the flowcharts. I don't see cleanup in there for ecological damage. Human health risk assessments are often criticized, sometimes rightly so, for having human-threat scenarios in the future. Hypothetically, someone is going to live there in 100 years. While I have done risk assessment myself, it is hypothetical, but ecological risks are less hypothetical. There are receptors there now and those risks are there today. So, if you want to get away from hypothetical, look at ecological risk. I guess it's not acceptable to me to toss those off and say we will not clean up just because it's ecological. I will also submit comments in writing.

Response to comment 2 [a]: The ICDF is also considered a viable disposal unit, and preference for disposal in this facility will be given if available when remediation is performed. Disposal in the CFA landfill is also considered acceptable for this waste. While the TNT/RDX soil contamination may be unacceptable from human health and ecological perspectives, the average concentration of all soil that will be removed is expected to be well below levels that require disposal as RCRA regulated hazardous waste. Rather, the average concentration of TNT and RDX in soil to be excavated is expected to meet criteria as nonhazardous industrial waste, and hence would be acceptable for disposal in the CFA landfill. Conditions in the landfill would also be likely to promote biodegradation of the TNT and RDX (i.e., high carbon concentration, higher temperatures from on-going microbial degradation activity, and higher moisture content).

After treatment of soil at the STF-02 site, much of the lead-contaminated soil is expected to be below levels that require management as RCRA regulated waste. All soil will be sampled after treatment and prior to disposal for hazardous waste determination. If the soil is determined to be RCRA regulated for lead then it will be treated and disposed of in an approved landfill, such as the ICDF. If the lead concentration exceeds the final remediation goal, but is not RCRA regulated as hazardous waste, then it may be disposed of without treatment in the CFA landfill. Disposal in the CFA landfill would effectively isolate the contaminants from direct exposure. Migration from the landfill is not expected since factors promoting migration will be reduced.

[b] No significant risk to the environment was indicated by the results of the INEEL-wide ERA. However, because of the amount of uncertainty in the ecological assessment, we are implementing long-term ecological monitoring to ensure protectiveness. The flow chart on page 31 of the Proposed Plan presents the phased approach to ecological risk assessment at the INEEL. The bottommost descriptive box on page 31 (Remedial Risk Assessment) is part of the fourth phase and would be performed if the baseline INEEL-wide baseline had significant risks. This graphic was developed very early in the ERA process. To simplify this graphic, the term "remedial risk assessment" in this context was used to indicate the development and refinement of remediation goals to be achieved, the identification of the contaminant to be eliminated, the delineation of areas to be isolated and removed, and the evaluation of possible damage to the environment possible from the implementation of a remedial action. However, this simplification lost the true meaning, and the INEEL was not intending to ignore any significant risk that may have been shown through the baseline.

Written Comments and DOE Reponses

Comment 1: We of Coalition-21 believe that DOE's efforts to find and remove leftover ordnance in the cleanup of WAG 10 have passed the point of diminishing returns. Few, if any, of the remaining items are in a condition such that they could explode; otherwise they would have been detonated by large animals. The risks of toxic effect from the small amount of explosives, lead, or other ordnance materials, in an area, which will be very lightly used for the foreseeable future, are too small to justify the cost of hunting them down and disposing of them. Costs per unit of the most recently discovered materials disposed of were already too high. The money could be better spent in cleanup elsewhere.

We recommend the no action alternative.

Response to comment 1: Although previous removal activities have cleared surface UXO from a few INEEL areas, the extent of remaining UXO, especially buried UXO, has not been fully characterized, the extent may be considerable, and the risk is considered serious. Any intact UXO present at the INEEL poses a potentially serious physical hazard to humans. Animals are not considered at risk since even large animals typically can not impart sufficient force on UXO at the surface to result in detonation, and buried UXO is not accessible to large animals. Previous removal efforts were focused exclusively on the areas where explosives testing was performed and the metal debris and explosive chemical remnants are visibly obvious. No effort has yet been performed to define the full extent of the boundaries of the impacts from the explosives testing areas or to determine the extent and nature of UXO that may be present from the bombing activities or the Naval gun firing. The technology for geophysical surveys, presently the best way to detect buried UXO, is constantly improving. It is anticipated that improved and cost effective technologies will be available in the future, and that by postponing wide-scale UXO survey and performing remediation in phases over several years, total costs for remediation will be reduced.

Although the use of these sites in the near term may be light, direct exposure to high concentrations of explosive materials, such as TNT and RDX, could still present an unacceptable risk. Leaving the residual TNT and RDX at the site could also result in contamination of the Snake River Plain Aquifer, which would be in violation of Idaho State laws. Additionally, the TNT and RDX contamination is with the flood plain of the Big Lost River, and in the event of flooding, significant surface water contamination could occur.

The lead contaminated soil has been characterized, and the amount of lead contaminated soil is extensive in the berms and surrounding soil at the STF Gun Range (STF-02). The lead at STF-02 can dissolve with exposure to precipitation, leach through the soil, and contaminate the aquifer. However, this is a slow process and the soil at the INEEL tends to hold onto metal ions; hence, high concentrations of lead left in place can always present a toxicity problem. Over 60 tons of lead are expected to be recovered from the STF-02 site. Also, with this much lead present in the soil, use of the land for residential, industrial, or agricultural use will be prohibited.

The no action alternative would not meet the threshold criteria for protection of human health and the environment and compliance with laws. Thus, to ensure adequate protection of human health and to prevent contamination of groundwater and surface water, action is required at the UXO, STF-02, and TNT/RDX sites.

Comment 2: The INEEL site has been scavenged for unexploded ordnance (UXO) on at least four occasions in the past ten years. Spending $16.5M to try to find additional UXO doesn't seem cost effective. The money would be better spent cleaning up landmines in countries where death and maiming due to landmines is a daily occurrence.

Spending $4.3M for TNT/RDX remediation is not necessary, as both of these items are biodegradable. Solid Lead and copper in soil is not a great hazard; not any worse than natural occurring lead and copper. Spending $3.5M is not cost effective. It would be better to address powdered lead from other sources such as smelting and coal fired power plants. The INEEL has been contaminated by artillery and ordnance testing during the 1940s. The site was developed from 1949 to the present and site workers and members of the public (visitors) have not been harmed by exposure to residual ordnance, TNT/RDX or lead from firing range activities. There are many sites in the State of Idaho where $24.3M could be spent more cost effectively to remediate hazardous lead contamination and other dangerous chemical contamination. My recommendation is Alternative 1, No Action.

Response to comment 2: We agree that many countries have a more serious problem with landmines than we at the INEEL have with UXO. Still, the problem at the INEEL is serious. Although previous removal activities have cleared surface UXO from a few INEEL areas, the extent of remaining UXO, especially buried UXO, has not been fully characterized. The extent may be considerable, and the risk is considered serious. Previous removal efforts were focused exclusively on the areas where explosives testing was performed and the metal debris and explosive chemical remnants are visibly obvious. No effort has yet been performed to define the full extent of the boundaries of the impacts from the explosives testing areas or to determine the extent and nature of UXO that may be present from the bombing activities or the Naval gun firing. The technology for geophysical surveys, presently the best way to detect buried UXO, is constantly improving. It is anticipated that improved and cost effective technologies will be available in the future, and that by postponing wide-scale UXO survey and performing remediation in phases over several years, total costs for remediation will be reduced.

Biodegradation of TNT and RDX is occurring too slowly to protect human health and the environment. Large fragments of TNT and RDX still exist after more than 50 years of weathering, and high TNT and RDX concentrations exist in the soil around the fragments. Failure to take remedial action could result in unacceptable risk to human health and the environment and contamination of the Snake River Plain Aquifer. Additionally, the TNT and RDX contamination is with the flood plain of the Big Lost River, and in the event of flooding, significant surface water contamination could occur.

The lead at STF-02 can dissolve with exposure to precipitation, leach through the soil, and contaminate the aquifer. However, this is a very slow process and the soil at the INEEL tends to hold onto metal ions; hence, left in high concentrations the lead can always present a toxicity problem. Over 60 tons of lead are expected to be recovered from the STF-02 site. Also, with this much lead present in the soil, use of the land for residential, industrial, or agricultural use will be prohibited.

While unacceptable harm from exposure to UXO, TNT/RDX, and lead at the INEEL has not occurred while the site has been under government control, the threat from these remaining contaminants is a concern. Certainly government control of the INEEL since 1949 has prevented unacceptable public exposure to these hazards. However, without remediation and administrative controls to limit exposure and contamination of the environment, including the Snake River Plain Aquifer, unacceptable risk to human health and the environment would result and regulatory requirements would not be met.

Comment 3: Sites not requiring Institutional Controls or 5-year reviews: EBR-15: EBR-1 Radionuclide Soil Contamination. What is the contamination, and how bad is it?
BORAX-04: BORAX TRASH Dump. I think all trash dumps not meeting new EPA guidelines should be cleaned up and put into approved trash sites.

Response to comment 3: The EBR-15, EBR-1 Radionuclide Soil Contamination, site was remediated during the OU 10-06 Non-Time Critical Removal Action (NTCRA) in 1995. This activity included excavation of radionuclide-contaminated soil from all detectable sources within the EBR-I perimeter fence. All radionuclide-contaminated soil removed from the EBR-15 excavation was placed in covered dump trucks and delivered to the Test Reactor Area (TRA) Warm Waste Pond. Cleanup was based on preliminary remediation goal (PRG) concentrations calculated in the Engineering Evaluation/Cost Analysis for OU 10-06. Verification samples collected after the excavation was complete showed only residual Cs-137. All concentrations were less than the Cs-137 PRG of 16.7 pCi/g (the highest detected concentration was 11.3 pCi/g).

The BORAX-04, BORAX Trash Dump, was a trash dump; however, D&D removed all the waste in 1985. As part of the Track 1 decision document, project managers proposed that No Action was appropriate for the site because residual contaminant levels were low.

Comment 4: The use of the CFA landfill for TNT/RDX and lead contaminated soils makes no sense. If these materials warrant the expenditure of millions of dollars to remove them, then they should be placed in a hazardous waste landfill such as ICDF or they should be treated prior to disposal. The use of the CFA landfill for hazardous materials may result in a future cleanup action of that site if regulations change.

Response to comment 4: The ICDF is also considered a viable disposal unit, and preference for disposal in this facility will be given if available when remediation is performed. Disposal in the CFA landfill is also considered acceptable for this waste. While the TNT/RDX soil contamination may be unacceptable from human health and ecological perspectives, the average concentration of all soil that will be removed is expected to be well below levels that require disposal as RCRA regulated hazardous waste. Rather, the average concentration of TNT and RDX in soil to be excavated is expected to meet criteria as nonhazardous industrial waste and, hence, would be acceptable for disposal in the CFA landfill. Conditions in the landfill would also be likely to promote biodegradation of the TNT and RDX (i.e., high carbon concentration, higher temperatures from on-going microbial degradation activity, and higher moisture content).

After treatment of soil at the STF-02 site, much of the lead-contaminated soil is expected to be below levels that require management as RCRA regulated waste. All soil will be sampled after treatment and prior to disposal for hazardous waste determination. If the soil is determined to be RCRA regulated for lead then it will be treated and disposed of in an approved landfill, such as the ICDF. If the lead concentration exceeds the final remediation goal, but is not RCRA regulated as hazardous waste, then it may be disposed of without treatment in the CFA landfill or the ICDF. Disposal in the CFA landfill or the ICDF would effectively isolate the contaminants from direct exposure. Migration from the landfill is not expected since factors promoting migration will be reduced.

Comment 5: Alternative 4b appears attractive for the TNT/RDX soils and costs about the same. It also could result in technology development for the INEEL.

Response to comment 5: Alternative 4b – composting, is a treatment method that is very cost-effective for very highly contaminated soils (>10,000 ppm TNT) when direct disposal is not an acceptable alternative. Very highly contaminated TNT/RDX soils typically result from manufacture of TNT and

RDX, not from periodic detonation experiments such as occurred at the INEEL. On the average, soil to be removed during remediation of the TNT/RDX sites at the INEEL is expected to be within 400 to 600 ppm, which is well below direct disposal criteria of 100,000 ppm. Composting of TNT/RDX contaminated soil under 4b is a very conventional, established, and proven technology. Additional technology development would not be required to treat the INEEL TNT/RDX contaminated soil.

Comment 6: A number of non-conservative assumptions were made in the Sitewide ecological risk assessment, for example areas that pose substantial ecological risks were excluded: specifically WAG 7 and the Tank Farm soils.

Assumptions listed on page 31:

1. "assumed that contamination from past activities at the WAGs would be fairly confined to within the fencelines of the WAGs." But the ANIMALS MOVE.

2. "recent CERCLA cleanup activities have or will remove and/or stabilize most of the contamination within the WAG sites." Except at 28 sites that are being ignored plus the areas that were excluded like WAG 7 and the Tank Farm.

3. "Assumed that no sensitive species were present at the site and that a population model would be adequate." This is inconsistent with the sidebar on page 10. Population modeling is not sufficient for the species listed there.

Response to comment 6: [a] To delineate an area for the spatial analysis in the INEEL-wide ERA, the assumption was made that the contamination had not moved beyond the WAG fences. Initially, the boundary was set wider as discussed in the Guidance Manual (VanHorn et al. 1995). The size of this area was set conservatively large for initial assessments at the WAGs and was subsequently reduced for the INEEL-wide ERA based primarily on the following rationale based on sampling and modeling.

First, assessments, as presented in Appendix H4 (DOE-ID 2001) and discussed in *The Guidance Manual for Conducting Screening Level Ecological Risk Assessments at the INEL* (VanHorn et al. 1995), indicate that radionuclides have been present in animals outside the WAG fences. Primarily, these studies have been conducted at the INEEL by the INEL Radioecology and Ecology Program, established in 1974 (Appendix C, VanHorn et al. 1995). The majority of these studies evaluated exposure to radionuclides at SL-1, TRA Warm Waste Ponds, Idaho Nuclear Technology and Engineering Center (INTEC), and Subsurface Disposal Area (SDA) during the 70s and 80s. The Warm Waste Pond and SL-1 were remediated in the mid 1990s, and the addition of soil and recontouring at the SDA eliminated exposure to ecological receptors. At INTEC the concern was for the plume from nuclear fuel reprocessing. but this activity is being phased out. To determine if further contamination is occurring, DOE sampled animals road-killed on- and off-Site for radionuclides in 2001. All detections were within historical values and can be attributed to worldwide fallout (ESER 2002). Additionally, OU 10-04 sampling at INTEC during 1997 (Appendix D1 of the OU 10-04 Work Plan [DOE-ID 1999]) and BORAX during 2000 (Appendix H3 [DOE-ID 2001]), although limited, did not indicate movement of contaminants from the sites.

Second, Appendix H5 (DOE-ID 2001) containing the Modeling Deposition of Contaminants Resuspended During TRA Warm Waste Pond Remediation, evaluated the possibility that contaminants were moved by the wind during the remediation of the Pond. This assessment indicated that very limited movement may have occurred, primarily during the remediation of the TRA Warm Waste Pond. This evaluation was considered a worst case scenario for all other WAGs across the INEEL.

Based on this information, it was determined that the extent of contamination spread from the WAG areas was limited and the resulting spatial areas could be reduced. Also, an important consideration is that the area evaluated would have to increase greatly based on the overall size of the INEEL before it would significantly contribute to the assessment. However, it is recognized that this assumption has a significant amount of uncertainty and that the risk assessment has taken a somewhat simplistic view of the possible movement of contaminants in the system. Therefore, long-term ecological monitoring is planned to address this uncertainty and other uncertainties in the assessment.

[b] It is important to remember that of the 596 potential release sites identified at the INEEL over 70% have been subjected to cleanup or determined not to require cleanup (February 2002 presentation on Progress to Cleanup [cleanuphttp://www.inel.gov/information/publicbudgetbriefing2_13_02.pdf]). It is agreed that some sites have not been subjected to cleanup that may have hazard quotients that indicate risk to ecological receptors.

The statement in the Proposed Plan is, "It also assumed that recent CERCLA cleanup activities have removed or will remove and/or stabilize most of the contamination within the WAG sites eliminating exposures detected by past radiological biotic studies." This refers to the sites discussed in the response to comment 6a above and the associated studies. As stated previously, the majority of these studies evaluated exposure to radionuclides at SL-1, TRA Warm Waste Ponds, INTEC, and Subsurface Disposal Area (SDA) during the 70s and 80s. Most of these study sites have since been subjected to cleanup or stabilized. The Warm Waste Pond and SL-1 were remediated in the mid 1990s, and the addition of soil and recontouring at SDA eliminated exposure to ecological receptors. At INTEC the concern was for the plume from nuclear fuel reprocessing. but this activity is being phased out.

The Proposed Plan stated that HQs are greater than 10 at 68 sites evaluated in the INEEL-wide ERA. At 28 of the 68 sites, remediation is in progress or complete. Many of the remaining sites have localized or low levels of contamination. These sites are not being "ignored." They were summarized in the OU 10-04 ERA (Appendices in H [DOE-ID 2001]) and will be used (with other site information, such as location of sensitive species – Appendix H7 [DOE-ID 2001]) to determine the contaminants and locations for long-term ecological monitoring and sampling. WAG 7 and the Tank Farm are being assessed separately. When their assessments are finalized and the final remediation is selected, the results will be integrated into the long-term ecological monitoring as appropriate.

[c] A list of species that are potentially present at the INEEL and identified on federal, state, BLM and USFS lists were summarized in the sidebar of the Proposed Plan. This list is a summary taken from Table F-2 of Appendix F (DOE-ID 2001). Since their ranges overlap the INEEL, these species were included as possibilities to be considered for field surveys and for evaluation in the risk assessment. However, based on the discussion below and as documented in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001), it was felt that a population model would be adequate to assess the risk to species at the INEEL.

Federal status is the only driver for evaluating risk to individual animals or plants versus the population. Of the 11 plants listed in the Proposed Plan, only Ute ladies' -tresses have federal status as Listed Threatened (LT). It was not evaluated further since there is no documented siting on the INEEL. Ute ladies' -tresses is a wetland forb in the orchid family, found in areas that are seasonally flooded. Current populations are reported for stream terraces, islands in rivers, and edges of lakes and ponds. Desirable habitat for this plant does not exist in any of the WAG areas.

Of the 20 birds listed in the Proposed Plan, only the bald eagle is listed threatened (LT). A migratory species, the bald eagle is not present year round at the facility, but winters on the INEEL in small numbers and is then regularly seen at the northern and western edges of the INEEL. However, bald eagle exposure is bounded by the assessment performed on the ferruginous hawk, whose exposure is greater since it is present at the site for a longer duration and is known to nest on the INEEL.

Of the mammals listed in the Proposed Plan, only the wolf is federally listed as an endangered/experimental population (LE/XN). Anecdotal evidence indicates that isolated wolves may occur on the INEEL. However, no information exists to substantiate that wolves hunt or breed on-Site (Morris 1998). Currently, the wolf is under consideration for delisting.

Of the 3 reptiles and amphibians, 1 insect, and 1 fish discussed in the report, none are federally listed.

Biological surveys identified WAG areas and sites of concern where these species may be present or there is habitat to support these species. Appendix H7 (DOE-ID 2001) contains the biological field survey results for the 20 most common species of concern including the bald eagle, burrowing owl, peregrine falcon, trumpeter swan, black tern, white-faced ibis, ferruginous hawk, northern goshawk, loggerhead shrike, gray wolf, Merriam's shrew, Townsend's western big-eared bat, long-eared myotis, small-footed myotis, northern sagebrush lizard, Lemhi milkvetch, plains milkvetch, winged-seed evening primrose, and spreading gilia. This is summarized in the report, "Potential Use by Sensitive Species of Habitats Within and Surrounding Facilities at the INEEL," and is also contained in Appendix H7 (DOE-ID 2001).

The presence of these species and known habitat will be taken into account during activities at the facilities and during development of a long-term ecological monitoring plan.

Comment 7: The flow chart on page 31 shows an endless loop from monitoring to risk assessment with no path toward remediation. This is one more piece of evidence that the INEEL intends to do no remediation for ecological risks.

Response to comment 7: No significant risk to the environment was indicated by the results of the INEEL-wide ERA. However, due to the amount of uncertainty in the ecological assessment, we are implementing long-term ecological monitoring to ensure protectiveness. The flow chart on page 31 of the Proposed Plan presents the phased approach to ecological risk assessment at the INEEL. The bottommost descriptive box on page 31 (Remedial Risk Assessment) is part of the fourth phase and would be performed if the baseline INEEL-wide baseline had significant risks. This graphic was developed very early in the ERA process. To simplify this graphic, the term "remedial risk assessment" in this context was used to indicate the development and refinement of remediation goals to be achieved, the identification of the contaminant to be eliminated, the delineation of areas to be isolated and removed, and the evaluation of possible damage to the environment possible from the implementation of a remedial action. However, this simplification lost the true meaning, and the INEEL was not intending to ignore any significant risk that may have been shown through the baseline.

Comment 8: If my reading of this is correct, 28 sites still have significant ecological risks attached to them that will not be cleaned up. That is unacceptable.

> Human health risk assessments are often criticized as being hypothetical and based on future scenarios. Ecological risks are more real in the sense that the receptors are there now and that real pathways exist.
>
> Both your own studies and the tribal analysis show species to be in decline across the Great Basin. This is an opportunity to address this, at least in this area.
>
> Be proactive in managing the habitat that exists at the INEEL. Cleanup contaminated areas. Address habitat concerns where possible. Search for funding outside of EM if necessary.

Response to comment 8: Comment noted. DOE is concerned about the environment at the INEEL and is actively protecting this important resource. Understanding that this is an important habitat and that the uncertainty associated with the ecological risk assessment process may be significant, DOE is implementing long-term ecological monitoring.

Comment 9: Page 8 explains the cancer risks associated at the TNT/RDX Contamination Sites but does not discuss the risks associated with a possible explosion. What is the probability of an explosion associated with residual unexploded ordnance and what would be the impacts or such an explosion?

Response to comment 9: It is unlikely that the TNT/RDX contamination in the soil or fragments of TNT and RDX will pose an explosive hazard. The major concern is that TNT is a possible human carcinogen. The document, *Testing to Determine Relationship Between Explosive-Contaminated Sludge Components and Reactivity*, AMXTH-TE-CR-86096, U.S. Army Toxic and Hazardous Materials Agency, January 1987, documented testing performed by the army of soil/sediment containing varying concentrations of RDX and TNT. It concluded that explosives contaminated soil/sediment containing 12% explosives or less will not propagate a detonation or explode when heated under confinement. The highest detection at the site has been approximately 25,000 mg/kg, which is approximately 2.5 % by weight. The fragments of pure TNT and RDX could possibly be made to explode given a robust initiating event such as heat (as in a range fire), physical shock (as in being placed on an anvil and struck with a hammer), or high speed penetration (as in being shot with a rifle bullet), but it is very unlikely for the fragments to spontaneously explode while laying on the ground or being handled casually.

Comment 10: Page 14 explains that all of the Waste Area Group (WAG) 6 sites and a majority of WAG 10 sites fall within an area of the INEEL that has already been designated for continued industrial use. Why then were the risk assessments conducted assuming residential end-states (i.e., ingestion of homegrown produce)?

Response to comment 10: Land-use projections incorporate the assumption that the INEEL will remain under government management and control for at least the next 100 years and will be designated for continued industrial use. However, management and control becomes increasingly uncertain over this time period. Therefore, as agreed upon with the DOE-ID, EPA, and IDEQ, the baseline risk assessment uses a hypothetical residential scenario beginning in 100 years to ensure a conservative approach. The risk assessment was conducted using the residential scenario because this approach is considered the most conservative. The residential scenario is considered bounding of all other scenarios of concern including a recreational scenario and potential Native American issues (i.e., ingestion of native foods from the site).

Comment 11: Page 18 compares the alternative cleanup approaches for the ordnance areas. It appears that Alternative 3 would have a much higher cost than Alternative 2. Why would the costs for Alternative 3 be higher than those for Alternative 2? It is not clear why Alternative 3 would be more costly, based on the text.

Response to comment 11: Alternative 2 includes only institutional controls. No action will be taken to remove UXO contamination; actions will be taken only to limit access and restrict human activities at the sites. Under Alternative 3, geophysical surveys will be conducted throughout the Naval Proving Ground (gun range) and the two bombing ranges in order to define the extent of the UXO contamination and remove all detected UXO.

Comment 12: Page 22 states that the explosive materials at the TNT/RDX sites would be removed by hand. What measures would be taken to protect the workers involved in this excavation? How could it be that no personal protective equipment would be needed?

Response to comment 12: The phrase "removed by hand" only means typical excavation machinery would not be used to remove the soil, but that it could be removed with hand held excavation tools such as shovels. Personal protective equipment would be required for this type of excavation work and protective measures will be taken to protect the workers. This form of excavation (removal by hand) would reduce the environmental impacts.

Comment 13: Page 25 compares alternatives for the TNT/RDX Contamination Areas. Why is Alternate 3a, on-site soil disposal, preferred over Alternate 3b, off-site soil disposal? If the costs of the two alternatives are basically the same (given the error factors associated with cost estimates), it makes no sense to prefer on-site to off-site disposal over a sole source aquifer.

Response to comment 13: The cost estimate is based on an assumption that only 800 yd^3 of soils require removal from the sites. It is possible the amount of soil to be removed may greatly exceed this estimate, in which case the cost difference between on- and off-Site disposal will be much greater. Use of a facility on the INEEL is also consistent with DOE preference for use of on-Site disposal facilities where available. Results of soil sampling and analysis also indicates the average concentration of TNT and RDX in soils to be removed and disposed of will be about 400 ppm to 600 ppm, which is significantly lower than the 100,000 ppm limit for disposal as nonhazardous waste. TNT and RDX at these concentrations are readily biodegradable in an anaerobic environment, such as exists in the CFA Landfill; hence, they are not expected to permanently remain in the landfill soil after disposal.

Comment 14: Page 34; Table 9 lists sites requiring institutional controls and 5-year reviews. What is the predicted timeframe when the risks associated with these sites would diminish sufficiently that institutional controls would no longer be needed?

Response to comment 14: Sites listed in Table 9 will be reviewed during each 5-year review to evaluate the need to continue institutional controls. Many of these sites containing buried radioactive waste such as BORAX –02 may require institutional controls far into the future. The responsibility of DOE for these types of areas is currently being discussed under their long-term stewardship plans and will be addressed at the INEEL by a site-wide institutional plan to be developed under OU 10-04.

Comment 15: Why is it felt that excavation is needed in the gun range? Why would the entire berm need to be removed, as the debris is likely only in half of the berm?

Response to comment 15: Excavation is needed to remove the lead fragments and lead contaminated soil from all areas impacted by the firing activities, which includes the berms, surrounding soil, and pond.

The entire berms will be processed for removal of lead and contaminated soil since the back half of the berms also contain lead contamination. In addition, machinery to be used will be capable of moving and processing very large volumes of material; the configuration of the berms makes it impractical to only remove the front face and top half without spreading contamination to other portions of the remaining soil such precision is not possible with the machinery that will be used.

The size of this gun range is also small compared to gun ranges at Department of Defense facilities and gun ranges used by the police departments of large cities such as New York, Chicago, and Las Angeles. The selected remedy for SFT-02 is the same as used to periodically cleanup gun ranges at these other facilities where much larger volumes of soil are removed, processed, and replaced or disposed of.

Comment 16: The Proposed Plan for Operable Unit 10-04 indicates that the preferred alternative for the Gun Range (STF-02) is Alternative 3a: “Removal, Treatment, and Disposal” in reasons set forth below, Edenspace Systems Corporation believes that new technologies may substantially reduce the cost of Alternative 3b: "Removal, Treatment and Return" In addressing cleanup requirements at the Gun Range. Accordingly, Edenspace respectfully requests that evaluation of these new technologies be conducted before final selection and implementation of a cleanup alternative for the Gun Range.

Edenspace is a commercial leader in the use of living plants to remove heavy metals from soil and water, a process called phytoremediation. After the plans take up and concentrate metals in their leaves and stems, they are harvested and removed for disposal.

The enclosed list of field activities illustrates the range and depth of Edenspace's experience with this technology. The company has achieved average lead uptake in the field at rates approaching 4,000 mg/kg, and bioconcentration ratios (the ratio of plant lead concentration to soil lead concentration) higher than 10. We believe that under optimum growing conditions up to 100 mg/kg of soil lead per year can be removed using this *in situ* technique.

By concentrating lead in the plants at levels higher than in the soil, the technique offers two possibilities for reducing costs. First, the technique reduces the total mass of material that must be disposed of in a landfill. The mass of plants, in other words, is less than the mass of contaminated soil. In addition, the lead recovered from the plants can be recycled. Since the Proposed Plan indicates that metal recycling facilities are available, this option may prove an attractive means of reducing the amount of lead that remains on the site in the CFA landfill after treatment is completed.

The contemplated advantages of the technique at the Gun Range include lower cost, lower or zero volume of material sent to the CFA landfill, lower or zero amounts of lead sent to the CFA landfill, no use of hazardous materials, and preservation of topsoil.

Edenspace has conducted demonstrations on firing ranges in the past, and has integrated its techniques with physical sorting to remove metal fragments including bullets and casings. It is recommended that the sorting take place first, to reduce the volume of soil that must be phytoremediated.

Edenspace is currently conducting research with New Mexico State University on arid country phytoremediation of depleted uranium. Many of the techniques being demonstrated — using native plants and drip irrigation, for example — should be applicable to the Gun range.

We would be pleased to meet with you, or with other stakeholders in the proposed cleanup, to answer questions about our techniques. I've enclosed a copy of the company statement of qualifications. Additional information on Edenspace may be found at our web site, www.edenspace.com.

Response to comment 16: The application of phytoremediation for OU 10-04 sites was evaluated in the feasibility study and determined to be not applicable. The lead contamination at the STF-02 Gun Range is primarily in particulate form (i.e., bullet fragments from firing range use), which is not available for uptake by plants. Ionic forms of lead, which are available for plant uptake, are usually deposited when metal-bearing propellants, ammunitions, and powders are burned at explosive disposal sites or when metal-bearing particulate in the soil are dissolved and converted into the ionic forms. Since propellants and powders were not burned at the STF-02 Gun Range, the only source of ionic lead would be from dissolution of the particulate lead. In alkaline soils at the INEEL, the dissolution process will be very slow, and the extent of ionic lead concentrations is likely to be very low compared to the concentration of particulate lead. Therefore, treatment to remove particulate lead was selected for the preferred alternative.

Comment 17: In looking through the proposed plan, I saw the list of sites "not requiring cleanup." The telecommunications Cable stood out both because it had no site code and because I was involved years ago with laying cable in Mississippi. Because I am familiar with cables I knew that some are possibly oil filled and that the oil in some of the older cables contains PCBs. I got onto the public area of the INEEL web site and looked up the information about the "Telecommunication Cable." According to the report I read, this cable is just the type of cable that might have PCBs in the "asphalt-like" substance that was described in the report. The report I looked at, a Track 1 Guidance Report, however, made no mention of PCBs, but only lead, which was sampled (although what was actually sampled for lead was unclear). I wonder why you consider the lead at the STF Gun Range a problem, but not the lead in 30 miles of cable. In addition, I cannot help but think that the omission of PCBs has been an oversight.

I have printed this letter on the back of an article I printed from http://www.tci-pcb.com/article.htm. Please correct this oversight.

I agree with the plan otherwise.

Response to comment 17: The "telecommunication cable" was installed by U.S. West Communications in the early 1950s. This cable measures 36.5 miles in length and is buried approximately 3 to 4 feet below the ground surface. The cable was cut and rendered useless in the spring of 1990. In 1994, a Track 1 was conducted to determine whether the telecommunication cable was a hazardous waste and needed to be removed or a non-hazardous waste and could be left in place. Several soil samples were taken around and beneath the buried cable. The results of these samples indicated that detectable lead concentrations were comparable to background levels. These results revealed that the lead contained within the cable was not migrating to or contaminating the surrounding soil. This is unlike the STF-02 Gun Range where lead concentrations were significantly over the levels of concern, and lead is on the surface and located in a small area. Therefore for lead contamination the STF-02 Gun Range is considered a concern.

Of greater concern is the lack of sampling for PCBs. The article that you cited indicates that paper-insulated lead-covered (PILC) cable—widely used in urban underground network systems—is constructed of copper conductors wrapped with paper, impregnated with dielectric fluid. The cable is jacketed with a lead covering to keep out moisture, and may also have a plastic or rubber outer jacket. It also states that the PCBs may have migrated from PCB-filled transformers. Other causes include improper maintenance, use of PCB-contaminated equipment in handling the oil, or even use of PCB oil in the manufacture of the cable. This article goes on to state that in most instances, PCB concentrations are not evenly distributed along a length of cable. Unlike transformer dielectric fluid, where PCB concentrations are evenly distributed within the closed confines of the tank, PCB concentrations are seldom homogeneous throughout a section of cable. To determine conclusively if a section of PILC cable is contaminated, it must be tested in 30- to 50-ft increments. In some cases, significant levels of PCBs have been found evenly distributed along the cable. If this is the case, it can generally be assumed that the cable was contaminated at the manufacturing stage.

The PILC cable lead jacket that keeps out moisture will also keep any oil that is present in the cable paper from leaching out. Because the cable is buried 3 to 4 feet below the ground surface, the depth of the cable limits the accessibility for exposure. Also, because the location of the cable is known, disturbance of the area would be limited. Currently, the site does not present an unacceptable risk, and the anticipated costs required to remediate or remove the cable would outweigh the environmental benefits to the site.

Comment 18: [a] It is evident that DOE desires to limit cleanup of its radioactive contamination at the WAG 6 and 10 Site properties as much as possible. According to the 10-04 RIFS, radioactive soil contamination remains at the EBR-I tourist park. DOE, however, has "shopped for a risk number" in writing this site off that is really accessible to the public. DOE obviously hope the community will accept a very limited cleanup of the radioactively contaminated properties in WAG 6 and 10 based on their existing limited use. This doesn't hold true at EBR-I, where the public can walk around and get contaminated. It should be cleaned up for unrestricted use and not written off with risk assessment voodoo numbers.

[b] Other sites that DOE doesn't want to clean up include the Borax area sites. The Leach Pond, the Buried Borax I reactor, the soil contamination around Borax, the buried reactors at the Borax 2 and 5 reactors. These should all be cleaned up for unrestricted use and not left for long term control.

[c] The OMRE reactor area is still contaminated with radioactive compounds. DOE used dozens of pages of rationalization to write this one off. Previous document in the WAG 10 area say contamination in the ORME Leach Pond was left in place by D&D at levels up to 1,000 pCi/g, yet the DOE risk assessment did not use those levels in it's calculations. It is probably on it's way to the aquifer. The high levels found in the soil more recently (up to 240 pCi/g ON THE SURFACE!), the DOE took dozens of pages in the RIFS to write off as "outliers" I guess. Why leave another obviously radioactive site out there that will need years of monitoring and control, when it could be dug up and put in the new contaminated soil dump?

With the indefinite duration of the radioactive hazard (what, 500 years for the 1,000 pCi/g?), the expectation of danger to continued workers in the area and hopes to re-use the properties, and the availability of much better physical sties (ICDF) where the long-term isolation of the radioactive wastes is both better assured and more cost-effective, I believe the goal of cleanup for unrestricted use makes sense and is essential if we are to adequately protect many future generations of site users (future residents even?) from elevated rates of radiation-induced death and injury.

Response to comment 18: [a] A non-time-critical removal action was conducted in 1995 to remove radionuclide-contaminated soil from a fenced area at EBR-I to which the public did not and does not have access. The total volume of soil removed was approximately 1,280 yd^3. However, in one location on a basalt outcrop, the backhoe was not able to remove all the residual radionuclide-contaminated soil from basalt cracks and around an adjacent concrete fence-post foundation. A hand-crew made several reasonable efforts to remove the soil, but a small volume (<1 yd^3) of residual radionuclide-contaminated soil still remains around the fence-post foundation and in the basalt cracks. This small area, posted as a soil contamination area, is secured from public access. It is surveyed every six months by radiological control technicians to ensure that conditions are not changing. This site was assessed in the OU 10-04 RI/FS using standard risk assessment methodologies, and neither the large area where contamination was removed nor the small area where residual contamination remains was found to present a risk to human or ecological receptors.

[b] All the BORAX sites have gone through some type of action to address risk to human health. The record of decision for Operable Unit 5-05 and 6-01 addressed the BORAX-02, BORAX-I Burial Ground. The remedial action prescribed by the record of decision consisted of consolidating the contaminated soil over the former reactor site and capping the soil with an engineered barrier. The remedy was implemented in 1996. Although the remedy reduced the risk values to below acceptable levels, this site will require institutional controls to enforce land use restrictions and prohibit intrusion into the cap.

D&D activities occurred at BORAX-01, BORAX II through V Leach Pond, in 1984 and again in 1991 through 1992. In 1984, the leach pond was backfilled with approximately 305 m^3 of clean soil, graded, and reseeded to inhibit erosion. The associated piping was not addressed in 1984, but was left in place until 1992, when it was removed. Other than a small volume of contaminated soil removed from under rusted pipe sections in 1992, no other contaminated soil was excavated from the leach pond area as part of the D&D operations. This site was evaluated in the OU 10-04 RI/FS and the human health risk values fell within the 1E-04 to 1E-6 risk range. Therefore, no further remediation is required at this site.

A non-time-critical removal action (NTCRA) was conducted at the BORAX-08, BORAX V Ditch, in 1995. During this removal action approximately 900 m^3 of radionuclide contaminated soil was removed from this site. Following the NTCRA, verification sampling indicated that the preliminary remediation goals had been met. This site was evaluated in the OU 10-04 RI/FS and the human health risk values fell within the 1E-04 to 1E-06 risk range. Therefore, no further remediation is required at this site.

A D&D removal and containment action was conducted at BORAX-09, BORAX II through V Reactor Building, in 1996 through 1997. The objective of these activities was to reduce the predicted radiation exposure risk to future workers and residents to well below the National Contingency Plan (NCP) target risk range. This was accomplished by removing all remaining aboveground structures and systems and entombing the subfloor levels of the reactor building. No radiological health and safety hazard to the public or INEEL workers remain on the surface of the facility. Although the remedy reduced the risk values to below acceptable levels this site will require institutional controls to enforce land use restrictions and prohibit intrusion into the entombed facility.

These four BORAX sites no longer pose a threat to human health and further remedial efforts would cost more than the environmental benefit.

[c] A portion of the OMRE Leach Pond was remediated in 1979 to remove radionuclide-contaminated soil. The chief contaminant was Cs-137 and the cleanup goal was 1,000 pCi/g. Contaminated soil up to this limit may have been left in place; however, no verification data were identified. The pond was backfilled in 1980 and the entire area was revegetated with grass (section 12 of the OU 10-04 RI/FS). The Cs-137 contamination left in place in 1979 is now 3 to 8 feet below ground.

Extensive sampling was conducted at this site in 1997. Sampling included a passive soil-gas survey to detect semi-volatile organic compounds (SVOCs) and volatile organic compounds (VOCs) in the subsurface, and collection of soil samples for radionuclide and metals analyses from several depth increments in nine boreholes that were hand augered down to the basalt bedrock. In addition, hand-held radiation detection and global positioning system (GPS) instruments, were used to locate and record the coordinates of the radioactive hotspots in the surface soil. The Environmental Monitoring Program, which had conducted annual radiation surveys of OMRE for several years prior to 1997, indicated that all the surficial radiological hotspots had been previously identified and none had generally exceeded 1 mrem/hr. In 1999, additional sampling beneath the former pond was completed in the basalt bedrock, in 2 sedimentary interbeds, and in the aquifer. The aquifer sampling was continued quarterly for 2 years. None of the samples collected below the soil/basalt interface, including groundwater samples, contained Cs-137 at any concentration.

In short, the 1,000 pCi/g concentration was not used in the risk assessment because the recently collected data show that no concentrations approach that level. Direct radiation measurements over the soil cap show only background readings. The highest concentration observed in the former pond soil was approximately 156 pCi/g at the 3- to 6-ft depth. The half-life of Cs-137 is approximately 30 years. If 1,000 pCi/g had been left in the subsurface in 1979, the concentration today (after 23 years) would be approximately 590 pCi/g. During the time (100 years) this site remains under institutional control, the 590 pCi/g of Cs-137, if it exists, would decay to approximately 60 pCi/g. The 156 pCi/g that was actually measured in the subsurface will decay to approximately 16 pCi/g.

The human health risk assessment was conducted using all available data. However, prior to the risk calculations, it was important to identify “hotspots” for some of the exposure pathways because an area weight average is used to estimate the extent of contamination. These areas or “hotspots” would skew the exposure point concentrations (far too conservatively) and present unrealistic risk levels. Therefore, these “hotspots” were evaluated separately in the risk assessment and were not written off as “outliers.”

The maximum detected concentration of Cs-137 was 240 pCi/g in a localized hotspot in the surface soil, and the concentration reduced to 2.18 pCi/g six feet below ground. The hotspots with the highest concentrations were evaluated for external exposure using RESRAD 6.0 under two scenarios: current worker and future resident (in 100 years). The results of this assessment indicated that risk levels were not high enough to warrant cleanup. In 100 years, the 240 pCi/g will decay to approximately 24 pCi/g.

The results of the human health risk assessment had risk values in the 1E-04 to 1E-6 risk range. Therefore, because this site does not pose an immediate health threat it will be mitigated under institutional controls.

Comment 19: [a] Thank you for inviting comments on the OU 10-04 proposed plan (Jan 2002).

The INEEL seems to have forgotten most of what the CAB said when the incomprehensible WAG 1 proposed plan (first version) was reviewed. The present document has reverted to type in its excess length, redundancies, punctuation and grammatical errors, inconsistencies, undefined terms, jargon, and general unwillingness to tell plain truth in plain English.

[b] A sampling of such: "the INEEL sights new construction within the areas" (p. 17), "here after referred to" (2), general signs of hasty or unskilled writing throughout. Examples: both "UXO" and "unexploded ordnance" used, as though no one could agree; MDA vs. Mass Detonation Area, similarly. "See Figure 2 on page 15," is on page 15; and "see Figure 2 on page 15" on page 2, although it has Figure 1 right there, that shows the information forwardly referenced — in violation of all clear writing rules. Sagebrush Steppe Ecosystem Reserve is described on page 32, but not mapped on the facing figure — mapped instead on pp. 15 and 2, but no reference to those Figures on page 32. Pp. 7, 9, and 16 give three largely redundant, yet still inconsistent, versions of animal risk from UXO. The Implementability of Alternative 3 for the Ordnance Areas is called "high" in the alternative evaluation, but then called "moderate," and "lower" than that of Alt. 2 later on the same page. Which is it? Why is inconsistent information being presented as justification for spending 16 million plus? Could the INEEL have spent some of that outrageous amount writing a document that works for the public, instead of against it?

Did the project engineers refuse to involve experienced, professional writers and editors in this document, or not give them time, or what?

[c] Does the INEEL have among its many "mission statements" one that reminds its employees that the public — not the INEEL — is the arbiter of intelligibility? If so, please quote it for the record. If not, why not? Just because someone thinks "site forwarding," "commonalities," and "fuze," are clever, or because a cubicled bureaucrat is cozy with "waste stream treatment," "geophysical surveys," "sagebrush steppe ecosystem," "sociocultural preservation" (is that a museum?) and "dermal contact" (what's wrong with "skin"?) does not mean the other 99% of the English-speaking (and tax-paying) country is not entitled to a document that uses normal words where possible, and defines those that are not. The Ordnance Area section, in particular, was contributed by an individual with no interest in communication: "airborne magnetic, multispectral, pre-dawn thermal infrared, firing fan," etc. are undefined -- so tell me, are these twenty-dollar words included as a put-down to the reader (whose degree may be in medicine or law, and who may be plenty smart enough to know verbiage when he sees it)? Or are they intended to persuade the reader that an agency that knows big words is qualified to spend big sums of public money? Please place definitions of these terms, and illustrations as necessary, in the Response to Public Comments to comply with the legal requirement for clarity.

Response to comment 19: [a] The CAB reviewed a draft Operable Unit 10-04 proposed plan and their comments were incorporated into the final version that was distributed to the public for review and comment. At their March meeting, the CAB drafted a recommendation on the OU 10-04 proposed plan, recognizing the document as easy to read and user-friendly.

[b] All Environmental Restoration Program documents are reviewed by technical writer/editors for format, content, and punctuation. It is the goal of the project managers who prepare the documents and the writer/editors who ultimately review the documents to make all ER materials clear and concise. We will correct all errors brought to our attention.

[c] Although it is sometimes necessary to introduce readers to new and sometimes technical terms that are commonly used at CERCLA cleanup sites, greater attention will be given defining technical terms in the future.

Comment 20: Graphics: Figure 1 on page 2 has text less than 2 mm high. This is unacceptable to AP and any mass-market publisher. Maybe an INEEL technology transfer could be magnifying glasses for these plans, with built-in dictionaries. But seriously, do the Agencies hope that unhelpful formats like this map will dissuade people from the effort of finding out what the INEEL is up to? Does the Agencies realize that this tends to exclude readers over 50 from review of these public documents in a way that seems discriminatory?

In a previous series of relatively well-designed proposed plans, the "Preferred Alternative" was labeled in the text. This plan forces readers to flip back and forth to discover the rest of the story. Stupid oversight, or more design-by-engineering-team? Please, make a commitment to continue communication methods that the public has demonstrated its clear preference for.

We have more confusion than usual between sites (nine to remediate) vs. areas (three of the sites are areas-- see p. 6); fuzes (military jargon) vs. fuses (normal English), and so forth and so on: when will INEEL realize that the public is not interested in engineering argot, INEEL-insider dialect, or the generally self-important and arrogant attitude that INEEL -- a tax-supported enterprise -- communicates by allowing jargon and vague language to run amok? These documents are supposed to serve the public, not offend it. The Agencies owe the public a frank apology for spending public money on an inadequately reviewed document.

Response to comment 20: In the future, text this small will not be used in figures and greater effort will be directed toward improving quality of public documents.

The commenter is correct in stating the term "Preferred Alternative" was used in the text of previous proposed plans to clearly highlight the agencies' preferred choice of alternatives. Not highlighting the preferred alternative in the text of the OU 10-04 proposed plan was an oversight.

Comment 21: Ordnance Areas. **[a]** In several places (ex. pp. 7, 16), it is stated that the risk from the UXO areas is from physical danger. Yet, the No Action Alternative is rejected in part because "contaminated soil would remain." Is this statement a careless mistake, or is there some kind of contamination that would remain, and if so, what sort and how much?

[b] If widespread ground surface survey for UXO is carried out, what provisions will be made for environmental protection, including avoidance of noise stress to fauna? Will areas of significance to Native Americans be protected from further demolition, drive-overs, and other damage, or will only "arrowheads" count in the Anglo definition of elements to be protected?

[c] DoD has an excellent, long-existing, and widely tested knowledge of UXO remediation. Why is it not used? Is the DOE averse to proven technologies? Wouldn't it be more cost-efficient to do that, rather than vaguely promising "research" to find out what's available?

[d] Will the "revegetation" of any of these sites involve crested wheatgrass, a non-native, invasive species?

[e] The preferred alternative for the Ordnance Areas is three to eight times the cost of the others, but offers little more other than vague promises. Alt 3 admits that UXO will remain, because the technologies available do not provide assured complete detection, and this document identifies no new technology that will. Does "verification" (p.18) mean some kind of treatability studies will be done? If so, why is that not stated, and the costs specified? How can a Total Cost be presented for an unknown amount of "research" into "evolving" technologies, followed by "selected areas" testing? What, exactly, does this 16.5 million include? What will be the cost for the "additional" surveys and removals that are clearly anticipated (p.19)? What does it mean (p. 18)... ordnance will be cleared "as appropriate"? Please describe the circumstances under which ordnance removal would be "inappropriate," and indicate what proportion of the time that will occur.

We are not in favor of Alternative 3 for the Ordnance Areas. It promises the highest cost, and one that remains open-ended and unjustified, for what is admitted to likely be incomplete removal, unless an as-yet undeveloped (and in this plan, undefined) technology suddenly breaks over the horizon. It promises to spend an indefinite amount of time and money on "research," before initiating action. It doesn't even hint at what the non-detection rate might be, making this look (especially given previous removals) like a blank check for future work, or perhaps just future futility, if large areas can't really be "cleared." Finally, it fails to discuss currently existing DoD UXO knowledge, an omission so extraordinary as to suggest that the INEEL team did not do the basic research that should have preceded release of this proposed plan. (As well, is the INEEL aware that several effective DoD UXO removal programs are staffed by, Native Americans? If not, why not?) The Agencies cannot even agree on whether the implementability of Alternative 3 is "high," "moderate," or "lower than Alt. 2" (all on p. 19). Shouldn't these agree?

Suggestion: The Agencies should withdraw this incomplete effort for the UXO areas and reissue it when they have a reliable technology available, can agree on its ranking, and have its costs figured out. Right now, the Agencies are asking the public to "comment" on a plan that is fuzzy to the point of fantasy, and issue 16 M for "research." Would this become similar to the Pit 9 "research" and "verification" of technology? Nowhere in this plan is there any assurance it wouldn't. The Agencies should consult the Army and agencies elsewhere in the world — this is probably a standard problem — and present more specific alternatives with accurate and justified costs. Meanwhile, go with Alt. 2 as an interim solution — it's worked for 50 years (less an herbivore or two?) and that's better than most of DOE solutions.

Response to comment 21: [a] The “contaminated soil” was in reference to UXO being left at the site. The statement was misleading and should have been worded better. The risk from UXO within the UXO areas is from physical danger only.

[b] Currently, the use of airborne methods to detect and map UXO is considered preferable, as this is the only method presently available that can survey such a large area in a reasonable amount of time and still preserve all natural vegetation and habitat. Surveys would not be conducted over sensitive environmental areas during critical periods, such as nesting season.

[c] A comprehensive evaluation of UXO detection methods developed and utilized by the Department of Defense was presented in the OU 10-04 feasibility study. The intent is to use proven technologies for the detection and mapping of UXO. Efforts will continue to evaluate new technologies as they are developed for application at the INEEL. Actual research to be conducted at the INEEL to develop new technologies for UXO detection and mapping is not proposed or planned.

[d] Crested wheatgrass is no longer used to revegetate sites following remedial actions at the INEEL.

[e] While it is the intent of the selected alternative to perform surveys to fully define the extent, density, nature, and accessibility of the UXO at the INEEL, the surveys will be postponed until more accurate and cost effective technology is available. Any technology considered for use in performing such a wide-scale survey will be tested under site specific conditions to verify UXO detection, accuracy, and reliability. The cost for performing such testing was considered in the development of the alternatives and presented in the feasibility study. Until the full extent of UXO contamination at the INEEL is known, the risks posed by the UXO are understood, and the technical issues for identifying and removing all UXO are assessed, it is not possible to predict with accuracy the cost or success of the removal of the UXO hazard. Therefore, remediation for UXO will be performed in a phased approach to address areas determined to pose the greatest risk first. Activities to be performed in implementing the selected remedy will include the following:

- Perform a geophysical survey over the gun range and bombing ranges
- Use the survey results to identify and define the boundaries of UXO contaminated areas
- Intrusively investigate selected UXO targets identified during the survey to determine the ordnance density, explosive characteristics of the UXO, and ordnance accessibility
- Use results of the survey and intrusive investigations to determine the relative risks of land use and ascertain the extent of UXO removal required to meet land use objectives
- Remove UXO and/or dispose by detonation
- Establish institutional controls consistent with land use objectives after UXO removal where necessary.

The OU 10-04 Feasibility Study describes this alternative in detail. This approach to remediation of the UXO sites is based on the evaluation and remediation of the UXO areas at Adak Island, Alaska, which are being performed under CERCLA authority. The feasibility study also identifies, describes in detail, and evaluates the proven geophysical methods to detect the type of UXO present at the INEEL.

Due to the large area to be surveyed, an aerial method of UXO detection is considered preferable at this time. Aerial methods would also avoid impact to the vegetation. A recently proven helicopter-based UXO detection and mapping system is considered one of the most appropriate methods to survey the site. The cost estimate for the survey is based on use of this helicopter-based system at various Department of Defense sites. However, before any aerial UXO detection method would be considered for full-scale survey, a demonstration would be performed over a specifically designed test area and over a known high-impact area for ordnance testing to demonstrate effectiveness under site specific conditions; this is the verification mentioned in the proposed plan. The cost estimate also assumes several small-scale demonstrations of aerial UXO detection methods would be conducted before a commitment was made to use a technology to survey the entire UXO area.

The cost of performing a geophysical survey over such a large area is high. Based on current experience at Department of Defense sites, it would cost $8M to survey all the UXO areas at the INEEL using the helicopter-based UXO detection system, and it would take nearly three years to complete. However, it would be much more expensive and take significantly longer to perform UXO detection using ground based systems such as towed arrays of magnetometers or hand-held manual methods. Over

400 acres can be surveyed in one day using aerial methods, while less than 20 acres per day can be surveyed by a mechanical ground-based system, and only a few acres per day can be surveyed manually.

Research to develop remote detection and imaging technologies is not a part of the preferred alternative. Rather, efforts will be made to evaluate new UXO detection systems as they are developed and demonstrated.

Comment 22: TNT/RDX Sites. **[a]** Is "MDA" on p 23 the "Mass Detonation Area," also on p. 23? Why is it identified in Figure 6 as a "location of contamination," but not included in the OU 10-04 remediation? If the MDA will be cleaned up later, it must be contaminated now, yes or no? If it isn't contaminated now, does it become a CERCLA site when it gets used to clean them up? If the explosives at the TNT/RDX sites must be removed to MDA as part of cleanup, where will the explosives at MDA be removed to as part of its cleanup?

[b] Piling up unremediated soil in an INEEL dump (Alt. 3a) cannot possibly be as good a long-term solution as the complete destruction of all contamination through composting (4b), which results in the kind of environmental rehabilitation that should always be preferred. Future land use at the INEEL will eventually require remediation of this relocated problem. Why not solve it now, and for only one charge to the public? Doesn't CERCLA have a preference for permanent and on-site solutions? If so, 4b is the only logical choice. It would be better to try it, at least, because if for some reason it wasn't complete, the amount of contaminated material that would then require disposing would be much smaller.

As to "implementability," the DOD has reliably developed cost-effective composting methods for this purpose. Given that the potential organic amendments include manure and potato waste, both abundantly available here, why doesn't INEEL use this opportunity to work cooperatively with companies in this region to mutually solve two or three waste problems simultaneously?

I would like the Agencies to select Alt. 4b. It has higher rankings than their preferred, old-fashioned dumping alternative, its cost difference is certainly not one the INEEL has ever balked at, it would destroy the contamination instead of just relocating it to be a problem forever more, and it would be an innovative and community-minded approach.

Response to comment 22: [a] The MDA does not have soil contamination requiring remediation. It is within the UXO areas and may contain UXO. The MDA will be used for destruction of the TNT and RDX fragments and UXO. After remediation of the TNT/RDX soil sites and the UXO areas is considered complete, the MDA will be investigated to determine if unacceptable soil contamination resulted from these disposal activities. If the soil contamination exceeds risk based levels, remediation will be performed. Remediation would most likely involve removal, treatment, and disposal at an approved facility on or off the INEEL.

[b] Alternative 4b – composting, is a treatment method that is very cost-effective for very highly contaminated soils (>10,000 ppm TNT) when direct disposal is not an acceptable alternative. Very highly contaminated TNT/RDX soils are most often created as a result of the manufacture of TNT and RDX, not from periodic detonation experiments such as occurred at the INEEL. The soil to be removed during remediation of the TNT/RDX sites at the INEEL is expected to be within 400 to 600 ppm, which is well below direct disposal criteria of 100,000 ppm.

Comment 23: Gun Range. We find the Agencies' preferred alternative acceptable.

Response to comment 23: Comment noted.

Comment 24: Sitewide Ecological Risk

[a] The Sagebrush Steppe Reserve is described as significant for protecting some of the last bits of this important, threatened ecosystem. Yet the ecological risk assessment does not describe what risks threaten it. Nor does the sitewide ERA adequately evaluate the impact to T&E species, much less share even those data-challenged conclusions with the public in this document. Why?

[b] The ERA data are admitted to be scanty, but monitoring is all that is recommended. If there is no ecological risk, why is monitoring going to be carried out? The diagram on page 31 indicates that monitoring would be the response to a finding of no risk. Does this mean that the monitoring for this possible risk will be as perfunctory as if it was considered unnecessary? Or is "monitoring" is a code word for "finish collecting the data"? Why has adequate data not been acquired in the 10 years since the FFA/CO signing? Please state what kinds of data collection efforts are going to suddenly commence under the ROD for this action, that will differ from and move beyond the depauperate results of the last decade. What is this monitoring going to cost? When will it be done? What are the other alternatives, and where is the evaluation and ranking? What kinds of monitoring data will trigger more decisive action? What kind of monitoring data might cause it to be discontinued?

[c] About 50% of the Sagebrush-Steppe Reserve is within the Ordnance Areas to be searched (if Alt. 3 is selected) for UXO. How, specifically would this survey and removal avoid habitat destruction in this area and noise and other stressors to local fauna, particularly sage grouse. In fact, what is the INEEL doing with the SSR, besides noting (as though its some sort of achievement) that is going downhill less quickly than the rest of this devastated Basin ecosystem?

[d] The "human" health risk assessment operates under a conservative and precautionary principle. It appears that the eco-risk and Native American (non-"human"?) risk assessments proceed from the opposite direction: don't do anything until mass death occurs. A sort of "permissive" principle. What is the Agencies' actual theoretical basis for this distinction? Have the Agencies identified an ethical justification for this difference? Please provide references to such documents. (There can be no "scientific" basis for it, unless the Agencies have admitted that their science is not "value-neutral" and includes personal preferences.)

The ERA appears also unaware that plant, animal, and even soil and landscape resources are used very differently by Native Americans than by Anglos or their cows. The specific dangers that bioaccumulation or contamination of culturally significant areas pose to Native Americans have not been addressed AT ALL in either the human health RA or the ERA. Native Americans have been demonstrated to be differentially affected through their participation in the subsistence lifestyles that numerous treaties reserve. For instance, an EPA study released results in Feb 2002 confirming that Columbia River first peoples are 50 times more likely to get cancer than non-indian peoples, due to nearly 100 chemicals allowed to contaminate the riverine salmon that treaty rights are supposed to be protecting. In 1999, the CTUIR provided data to the DOE itself (the Hanford Reservation), showing that the "average white person" models used as the base map for "future/current worker" and "future resident" scenarios are grossly inadequate to protect the health of Native Americans.

Why is the INEEL so unaware of the kind, quantity, and content of relevant research on contamination and remediation relative to Native American rights and concerns?

[e] What was the value of the Shoshone-Bannock contract to assess Native American risk across this very large area? What was — in contrast — the amount expended by the INEEL on personnel time and analytical and statistical procedures to construct the white health risk scenario? Why were Native American subsistence activities not included in the (white) human health risk scenario?

Was a Native American liaison integrated into RI/FS work to help the INEEL's engineers understand a cultural universe they are unfamiliar with? Did the team include any trained social sciences professionals? Or does the INEEL believe that any "science" degree — say, in chemistry — confers qualifications for all research topics, even though the methodologies required in human sciences must account for far more complexity than laboratory tubes and trays ever can?

Another gap in the sitewide ERA probably stems, as suggested for the project team above, from disciplinary (if not actual ethnic) segregation: while T&E species are at least acknowledged as inadequately studied, plant and animal species important to the Shoshone-Bannock are not even mentioned. Traditional Great Basin peoples used several hundred species for tools, food, medicine, etc. The distribution of surviving populations of these species, and an assessment of specific risks to them from INEEL facilities, contamination, and intra-facility activities should be carried out. If it has been, where are the results and why aren't they included in this plan?

Suggestion: Withdraw this portion of the Plan until an adequately funded, comprehensive study of Native American exposure pathways can be carried out. Ensure that the study takes account of current knowledge and methods. Fully acknowledge its results through incorporation into INEEL exposure models, rather than relegating it to the unread and unused appendices.

Response to comment 24: [a] The primary overall risk to the sagebrush steppe ecosystem is habitat fragmentation and loss to agriculture and overgrazing. These types of physical pressures are generally not the focus of a CERCLA based risk assessment, and since the INEEL has limited grazing and is relatively undisturbed it is considered an ecological reserve. The risk from contaminants may be of greater concern if the INEEL truly becomes one of the few areas representative of the sagebrush steppe ecosystem. The evaluation of risk from contamination is presented in considerable detail in Section 17 and Appendices H1-12 of the OU 10-04 Comprehensive RI/FS (DOE-ID2001) as well as in the OU 10-04 Work Plan (DOE-ID 1999) and the Guidance Manual (VanHorn, Hampton and Morris 1995).

The second part of this question concerns the evaluation of sensitive species. This was previously discussed in the response to comment 6c.

[b] See the response to comment 7 for a discussion of the flow chart presented on page 31 of the Proposed Plan.

An ecological risk assessment usually requires consideration of many more factors than does a human health risk assessment. More than 200 species of plants and animals are possibly found on the INEEL, either part or all of the year. These species interact in numerous and complex ways, such as predation, plant eating, and scavenging, which must be taken into account. As well, the ecological risk assessment must take into account wide variations in ranges including migration patterns, and must also account for the tendency for many contaminants to accumulate as they move up the food chain. Finally, since many plant and animal species on the INEEL have not been extensively studied in terms of their habitat requirements, life cycle, or tolerance to the range of contaminants released, the ERA is subject to a number of areas of uncertainty. These uncertainties were identified by the Agencies in 1997 through 1999 as part of the INEEL-wide ERA planning process. Uncertainty issues relevant to the INEEL-wide ERA are presented in Section 17 and Appendices F and H1-H12 of the OU 10-04 Comprehensive RI/FS (DOE-ID 2001). Based on the multiple uncertainties and assumptions, and the use of community (population) endpoints in the assessment, it was determined that ecological monitoring would be critical to ensure protection of this important ecosystem. If as is expected, species on the site (such as the sage grouse - *Centrocercus urophasianus*) become federally listed, then the assumptions in the risk assessment will have to be re-evaluated. The proposed monitoring will be directed at addressing some of the data gaps that will be more critical at that time.

Significant data has been collected at the site since the 1970s; however, the focus was not on ecological risk but on evaluating the movement of contamination (primarily radionuclide) into the human health food web. Limited effects data has also been collected. As discussed in the OU 10-04 Comprehensive RI/FS (DOE-ID 2001), the two primary sources of long-term changes in populations (for birds and vegetation) on the site have limitations.

The long-term ecological monitoring will be initiated by the development of a comprehensive surveillance and monitoring plan. This plan will be designed to eliminate much of the uncertainty and assumptions in the risk assessment, to coordinate with ongoing air, soil, surface water, groundwater, and vadose zone surveillance and monitoring efforts, and other agency activities (such as sage grouse studies), and to address stakeholder concerns. This plan will provide the cost and schedule for activities associated with the long-term monitoring. An annual status report will be provided to the agencies. These annual reports will support the 5-year review. Specific decision points will be established that support continuation, modification, or the elimination of the monitoring at set times during the process.

[c] Secretary Richardson signed the agreement in July 1999 with the Bureau of Land Management (BLM), the U.S. Fish and Wildlife Service, and the Idaho Fish and Game Department to establish the INEEL Sagebrush Steppe Ecosystem Reserve. The agreement charters the BLM to develop a management plan that will continue to protect this unique habitat. The plan will recognize existing grazing activities on part of the reserve. The Energy Department will continue to control custody of the property and be responsible for access controls. The agreement is consistent with DOE's long-term land use plan for the INEEL, which envisions this area in the north central portion of the 890-square mile site as a buffer zone for laboratory activities. The land use plan does not envision expansion of INEEL programs in the area designated for the preserve.

Any activities associated with the UXO surveys in this area will be evaluated for possible stress to this environment. This and the BLM’s management plan for the area will be used in the decision process at the time that a survey technique is selected.

[d] It is assumed that the Human Health and Ecological Risk analyses in combination do give some approximation of the potential risk to tribal members. Though admittedly not ideal, this approach is commensurate with the Shoshone-Bannock Tribal Risk Assessment Committee’s desire to avoid all quantitative analyses specific to tribal people at this time. This in no way suggests that Native American people are “non-human.”

The Shoshone-Bannock Tribes have been instrumental in helping the DOE to understand that tribal people value and use many types of resources on the INEEL in unique ways. DOE is also well aware of the kind, quantity, and content of similar research on contamination and remediation relative to other tribal people, including the analyses that have been completed at the Hanford site. In fact, the Hanford model was initially presented to the Shoshone-Bannock Tribes as an example of the kind of analysis that DOE wished to complete for the WAG-10 OU 10-04 RI/FS. However, the Tribal Risk Assessment Committee made it very clear from the beginning that they were not interested in completing a quantitative analysis of that type at the time. Instead, the Tribes expressed a preference for a qualitative analysis to be presented in its entirety in an appendix within the RI/FS and incorporated to some extent into the main RI/FS, as appropriate. At that time the Tribes also expressed an interest in completing all analyses associated with the project on their own with only minimal support from DOE. DOE complied with these requests.

[e] The Tribes were awarded a $50k contract to complete a unique tribal perspective for the WAG 10 RI/FS. The Tribal Risk Assessment Committee specifically requested that no quantitative analyses be conducted for tribal subsistence activities.

In addition to the direct support to the Tribes above, DOE also supported a multidisciplinary team to facilitate communication and coordination with the Tribes. The Team included an INEEL tribal liaison and Shoshone-Bannock Tribal member, a social scientist with previous experience in working cooperatively with the Shoshone-Bannock Tribes, an accomplished risk assessor with extensive knowledge of the INEEL, and an individual with extensive knowledge of contamination within WAG 10. The DOE tribal liaison, an individual who is tasked specifically with promoting tribal interests and sensitizing DOE personnel to tribal concerns and values, was also involved in the project. The goal of this team was to provide general support to the Shoshone-Bannock Risk Assessment Committee, coordinating tours and meetings, facilitating information transfers, and incorporating the tribal analyses into the RI/FS.

The DOE made a specific commitment to the Shoshone-Bannock Tribes to include the qualitative tribal analysis prepared by the tribal Risk Assessment Committee in the WAG 10 RI/FS.

Comment 25: Native American Issues

[a] Cultural resources legislation is part of ARARs, a threshold criterion that must be met. Cultural resources include significant landscapes, as well as "sites," which is a category defined by Anglos on the basis of technological remains. The Shoshone-Bannock report clearly identified the holistic health of their traditional "landscape" as a main concern.

INEEL has an Agreement-in-Principle with the Shoshone-Bannock that asserts the DOE intends to respect the Shoshone-Bannock's treaty rights to use of the area.

[b] The Shoshone-Bannock stated that the wholescale [*sic*] alteration of their traditional landscape by INEEL constitutes a cultural and societal threat. Yet, this proposed plan proposes nothing specific to remediate this longstanding and continuing impact. "The cultural concerns" of the Shoshone-Bannock, page 11 says, "were factored into" the RI/FS.

Examination of that document shows that their concerns were relegated to an appendix, its existence was cursorily noted in each site summary, and the Shoshone-Bannock's rights were thus dismissed with no remedy proposed.

Despite many documents in which INEEL and DOE express interest in (finally) working with the Native Americans whose land they are using, the RI/FS proposes no alternatives to address these valid concerns. INEEL's commitment "in principle" remains little more than that. The proposed plan goes beyond the RI/FS to suggest that "some Native

American concerns" will be addressed. Which, specifically? And how and when will their remaining concerns be addressed?

"These remedial actions," page 11 states, "will be selected" in the R.O.D. This is too vague to meet legal requirements for a CERCLA proposed plan. No alternatives have been identified, described, or evaluated. Where is the FS for this section of the cleanup plan?

[c] What was the INEEL's intention in asking for the Shoshone-Bannock statement? Was there ever any plan, CERCLA-related or otherwise, as to how to incorporate what could surely be expected to be qualitative data? The use of complex, qualitative data in linear, quantitative frameworks is admittedly problematic. The EPA and DOE have published more than one set of guidelines for valuation of what "heritage, nonuse, incommensurable, amenity, bequest, noncommodity, existence, intrinsic, legacy, etc." values. The EPA's NRDA in the Coeur d'Alene area has included a very substantial analysis of the traditional values of landscape (not just archaeology sites, which are point-type data, but the entire holistically conceived landscape). ("Landscape Traveled by Coyote and Crane," Rodney Frey, 2001, University of Washington). Not only does the Coeur d'Alene worldview presented bear strong similarities [*sic*] to the Shoshone-Bannock's approach, the EPA on that project believes its detailed analysis will contribute toward accurate and adequate restoration of the balance. Have the Agencies preparing this proposed plan, considered consulting the Coeur d'Alene project team for ideas on how to proceed toward a constructive and just answer to the Shoshone-Bannock concerns?

[d] Suggestion: Withdraw this portion of the action and complete the necessary research to define and select remedies for the extensive, culturally insensitive damage to significant landscapes, such as those cratered by artillery and bombs 50 years ago. Consult cross-culturally valid models previously developed for DOE and other agencies, such as that used by Grand Junction in the uranium tailings cleanup. Most importantly, ask the Shoshone-Bannock for their assistance in developing appropriate remedial approaches. It is possible that just as their traditional view of the world is different from the INEEL's, their traditional concept of healing this imbalance may be unlike anything the INEEL might suggest.

We strongly support the INEEL's efforts to both repair the environmental damages done over the past 60 years while moving forward with important research, and contributing significantly to eastern Idaho's community and economy. Our final question pertains to INEEL's and DOE's broadest, and perhaps most vital future mission: stewardship for future generations. DOE statements available on the internet indicate an awareness that this long-term planning will have to have local responsiveness, transparency, accountability, and high flexibility. The handling of several INEEL issues, particularly at this point the Shoshone-Bannock concerns, may be seen as a test of INEEL's ability and its commitment. How do the Agencies expect to frame the next 100 years of "monitoring" of 10-04 ecological receptors and culturally significant landscapes? How about the 1000 years after that? Do they plan to give the Shoshone-Bannock concerns the same serous attention now that may well be demanded in the future by other, more powerful, local "cultures," such as the grazing industry, recreationists, bird-watchers, hunters, etc.? What is the specific form of integration of short-term holding actions like "institutional controls" into LTS requirements like stakeholder participation and review?

Response to comment 25: [a] The commenter is correct, cultural resources legislation is part of ARARs, a threshold criterion that must be met. Ongoing interaction with the Shoshone-Bannock Tribes have helped DOE to understand that cultural resources include a wide variety of natural, traditional, historical, archaeological, and landscape features. The Agreement-in-Principle between DOE and the Tribes is designed to promote increased interaction, understanding, and cooperation on issues of mutual concern between the parties. The protection of cultural resources, as defined holistically by the Tribes, is of paramount importance in the Agreement and is incorporated to basic project review procedures at the INEEL. Direct communication and participation by tribal representatives are critical elements in the cultural resource compliance program at the INEEL. DOE also recognizes the existence of the Tribes' Treaty rights and through the Agreement-in-Principle, agrees to identify, assess, limit, and mitigate any impacts of INEEL activities on them.

[b] See response to comment #25 for details on Shoshone-Bannock Tribal wishes in regard to the format of the tribal input to the WAG 10 RI/FS. Above all, DOE understands that cooperation with the Tribes is contingent upon direct and meaningful communication with tribal people. Solutions imported from other tribal negotiations in other parts of the country will never be satisfactory.

DOE has been working directly with the Shoshone-Bannock Tribes and providing support for their participation since 1996 and under the Agreement-in-Principle is committed to future interaction. Through continued interaction, it is hoped that the Tribes will assist DOE in developing unique, tribally valid solutions to the qualitative concerns articulated by the tribal Risk Assessment Committee. Hence

DOE will pursue conservative remedial approaches developed within standard human health and ecological risk parameters to begin to address general tribal concerns about contamination and desires to return the land to a pre-INEEL state.

[c] DOE began the WAG 10 tribal risk assessment project with a genuine desire to obtain input on INEEL activities directly from the Shoshone-Bannock Tribes and remains committed to understanding their concerns. In the future, DOE and the Tribes may decide to seek advice from other tribes and working groups on the difficult task of incorporating complex qualitative data into standardized quantitative risk assessment frameworks at the INEEL. However, DOE will not impose these external analyses and approaches on the Shoshone-Bannock Tribes. Future work will be designed and implemented with direct Shoshone-Bannock Tribes involvement in all aspects.

[d] The DOE made a specific commitment to the Shoshone-Bannock Tribes to include the qualitative tribal analysis prepared by the tribal Risk Assessment Committee in the WAG 10 RI/FS.

DOE is committed to working directly with the Shoshone-Bannock Tribes to develop remedial approaches that address unique tribal concerns and will continue to support ongoing dialog about these important topics. For instance, support is being provided for direct tribal participation in the development and implementation of a plan for long term ecological monitoring and is also provided to the Tribes to engage in the ongoing development of tribally sensitive long-term stewardship approaches.

Comment 26: Letter with Proposed Plan Comments from the Shoshone-Bannock Tribes

March 26, 2002

Kathleen Hain
Environmental Restoration Program
DOE Idaho Operations Office, MS 3911
PO Box 1625
Idaho Falls, Idaho 83403-9987

RE: PROPOSED PLAN FOR OPERABLE UNIT 10-04—WAG 6 & 10

Ms. Hain,

The Shoshone Bannock Tribes' Tribal/DOE Agreement in Principle Program reviewed the Proposed Plan for Operable Unit 10-04 and is providing the following comments. The Tribes also appreciate and applaud the individuals who worked on the RI/FS and the Proposed Plan for 10-04 Summary.

The following comments are organized by general comments, Tribal/DOE AIP staff comments (air quality, environmental, and cultural resources) and each of the staff's sections provide comment to TNT/RDX, Ordnance, and Gun Range issues. Our general comments discuss treaty rights, transportation of contaminated materials, human health standards, CERCLA, and other issues regarding tribal interests.

General Comments:

The Shoshone-Bannock Tribes appreciates the opportunity to submit comments to this very important assessment. Several important issues affecting our tribes must be incorporated in any considering factors by DOE evaluators. These include affect to our Treaty Rights or abrogation of Congressional promises to our Tribes, long-term land management/stewardship by DOE or any other federal agency, land transfers and exchanges in subsequent decisions related to 10-04, specific description/definition of contamination clean-up standards, contamination affects on cultural resource/historic properties, application and compliance with federal law, and most importantly coordination efforts with our Tribes not only as a stake-holder but also as a sovereign government entity.

An important note that must be stated is that the DOE and Shoshone-Bannock Tribes' Agreement-In-Principle provides for more than cultural resource issues. The Proposed Plan for 10-04 continually suggests that our Agreement is coordination between DOE and the Tribes for cultural resources only. The Agencies need to fully understand the important point that our tribal interests are not specific to *cultural resources*, particularly as cultural resources is understood by a federal agency. Consideration of any decision should not be narrowly considered in respect to cultural resources as the only tribal interest. To fully understand this concept, the Agencies need coordination with the DOE American Indian Program Manager or the Shoshone-Bannock Tribes' AIP Program.

Transportation: The Tribes are concerned about transportation of contaminated materials, even on-site transportation. The potential for on-site accidents could affect pristine/non-contaminated areas that we consider our aboriginal territory. The summary document discusses the implications of contaminated material in situ, however there is a lack of discussion of transporting contaminated materials to various storage/repository locations.

Currently the Tribes are notified of transportation accidents involving contaminated wastes. The movement of contaminated materials on site is also a concern because the potential for accidents are a potential reality, similar to the transportation of materials off-site. It is recommended that our Tribes receive notification of transportation accidents similar to those notifications already in place.

<u>Human Health Standards</u>. Although the RI/FS summary document discusses sites that may not pose a potential hazard to humans, natural resources, and the environment, it's not clear what the contamination standards are that lead to this conclusion. Also what is not clear is if the evaluative considerations were concluding if future human health was determined based upon the levels/types of health conditions. Were the standards to evaluate the 100-year scenario based upon the possibility of a human being in perfect health versus a person experiencing less than perfect health conditions?

<u>CERCLA (see pg. 13 in PPO Unit 10-04)</u>. The CERCLA process discussed the CERCLA criteria and evaluates costs for each alternative. The paragraph assumes capital costs generated for facility construction towards completing the remedial action. Understandably, clean up may involve construction of facilities, but as WAG 6 and 10 evaluates environmentally pristine areas outside of WAG facilities, it's not clear if facility construction should be the only capital cost consideration.

The uncertainties described in RI/FS document also needs cost investment to fully determine contamination levels and effects on ecological receptors. Environmental studies also need capital costs if DOE is serious about determining organic, metal, and radionuclide contamination on all aspects of DOE activity on the INEEL relative to the WAG 6 and 10 PO 10-04 Project. Focus on constructing facilities, operation and maintenance, labor/maintenance, and other associated type costs fails to address all components of remedial actions for <u>all</u> receptors mentioned in WAG 6 and 10 efforts.

Air Quality Comments:

<u>TNT/RDX Contamination Sites</u>

The Shoshone-Bannock Tribes (Tribes) are very concerned about chemical and waste residuals located at the TNT/RDX sites. It was reported in the *Site Description* that a number of previous remedial actions have taken place, especially over the past 10 years. However, none of these past efforts have resulted in an adequate clean-up of this area, and the Tribes are concerned that DOE will select another sub-standard plan, where upon completion, the contaminants remain at levels which constitute such a risk that Tribal members continue to have restrictions on their access to this area.

The Tribes recommend that the DOE re-evaluate the risks (and alternatives) based on actual air sampling. Chemicals remaining from TNT and ordnance residuals may have dispersed to the soil at these sites, which create health risks from wind-borne fugitive dust. Consequently the Tribes, recommend that DOE not rely solely on modeling to predict air quality risks, but actually carry-out particulate air sampling in the area of the TNT/RDX sites, with the collected particulate matter analyzed for constituents such as lead, TNT, and other ordnance chemical-residuals. Also, if an alternative is eventually selected, where unexploded ordnance is detonated, has the air quality impacts of this activity been evaluated in the risk analysis?

Is the reason for clean up based on the premise of future inhabitants—human habitation? The Tribes object to the fact that there have not been other alternatives proposed when the sites may be restored to the extent that there are no land-based institutional controls in place. Furthermore, there is a lack of alternatives mentioned that after the DOE's mission is complete tribal members may return to these lands and exercise our treaty rights. To continue to propose institutional controls associated with all the proposed alternative (in spite of several past clean-up projects) is like an admission by DOE that none of the proposed alternatives will succeed, and the area will remain an unacceptable risk to the public even after the clean up is completed. This begs the question what is the point of partial clean up. It is recommended that after the abovementioned air quality analysis is complete, DOE revise the choice of alternatives to include a project that cleans the area up to the point where "institutional controls" do not apply, including the lack of restrictions for tribal future access and use.

Gun Range

Although the description indicates one of the principle risks at this location is from lead becoming air-borne there has not been any air quality data provided. It is recommended that air quality sampling be carried out in the Gun Range area to determine the risks associated from fugitive dust. The results could change the risk factors and change the alternative options. Reliance on modeling may underestimate the risks at this site.

Too little discussion has been provided to the reader regarding the proposed alternatives. For Example discussion under 3b, where the lead-containing soil would be acid-treated and sent to the CFA landfill poses several questions:

a. Has the solubility of the lead within this final end product been determined?

b. Has this treatment methodology been tested?

c. Does the CFA landfill have a double-liner with leachate detection system?

d. Would acidic constituents within the CFA landfill re-dissolve the lead in the cement?

e. What is the volume of soil to be disposed of at CFA versus the volume of acid wash to be disposed of at CFA?

f. Storage criteria's and possible failures for both the soil and the acid wash needs to be discussed.

These issues have not been adequately addressed in the draft clean-up plan; and not adequately presented to the Tribes or public to allow them to make an informed decision on recommending an alternative.

DOE needs to reevaluate the Gun Range, provide air quality sampling data, test sampling of the acid wash alternative, more information on the solubility of the lead-containing cement, and the specifications and characteristics of the CFA landfill. Then, this data should be provided to the Tribes, with appropriate alternatives for the Gun Range clean up plan.

Environmental Comments:

Ecological Risks

The INEEL-wide ecological risk assessment and the 10-04 ecological risk assessment conclude that uncertainties to ecological receptors are present for a variety of reasons. Additionally the RI/FS further states (Section 17, pg. 93) that assessment of organics and metals are not fully characterized and they may have a significant impact on ecological receptors. Because of the uncertainties to ecological receptors monitoring and environmental surveillance are needed factors. The Remedial Action Objectives, listed in the Proposed Plan 10-04 document, should propose a remedial action to address protective methods for the other natural resources, particularly those that pose significant uncertainties. Remedial actions for environmental protective goals are void in the Remedial Action Objectives. This void is of great concern to the Tribes for the preservation of protective methods for ecological receptors.

The present Remedial Action Objectives describe actions to prevent exposures to future inhabitants who may occupy the site for agricultural uses, monitoring hazard quotients, preventing exposures to lead contaminated soils, contact with unexploded ordnance, however a proposed action should be created to address ecological receptors where no data exists. This means that since there are many uncertainties, proposed remedial actions need to be identified and stated where a proposed expectation for clean up would consider the uncertainties.

Additionally, the RI/FS discusses ecological evaluations for species on the INEEL and there is concern about migratory animals that have the potential for carrying contamination off site. Again, the uncertainties are an issue. Evaluative assessments should be maintained to analyze migrations of animals and contaminants off site.

The holistic evaluation of the Tribal Risk Assessment Committee's position was to protect all ecological receptors. Because of the many uncertainties that exist in the ecological assessments, it would benefit those receptors to seriously consider the affects and dangers that each of the contaminated sites **may** have on each of the receptors identified at each site.

TNT/RDX Contamination

A number of remedial actions have already been taken at these sites, at great expense, without a conclusion. There are uncertainties if the removal, treatment, and disposal actions will result in a conclusion.

The reason for clean up is based on the premise of protecting future inhabitants. Does this mean that one the area is remediated it will be opened for development? A recommendation is to wait for a conclusive resolution to the overall TNT/RDX contamination and clean up should coincide with the projected usage for the area.

Gun Range

The description discusses remediation of the berms, kick out area, and the adjacent pond. However, Alternative 3a & 3b also discuss removal of the wooden building and asphalt pad. Will the building and pad be rebuilt or does this signal the end of a gun range at the INEEL? The level of contamination on the structure and the pad is not clearly defined. As a result a recommendation to not support removing the building and asphalt pad just so they can be rebuilt. A recommendation to support removing these items if there will no longer be a gun range anywhere on the INEEL or if protective measures are institutionalized to prevent future contamination. The alternative also says that recontouring and revegetation will be done on as needed bases, recontouring and revegetation should be required with any planning for contamination clean up.

Unexploded Ordnances

Locating, removing, and disposing of all possible unexploded ordnances is preferred. Alternative 3 states, "various standard survey methods could be used, including a magnetic detection system mounted on a helicopter." What are some of the other methods and what is there cost effectiveness? The Tribes would like to see a list of methods and the cost effectiveness of each. Consideration in the decision making process should include some of the following questions/concerns:

a. What is the success of the helicopter method and how does it compare to the success of other methods?

b. What is the risk associated with the ground crew?

c. What is the risk associated with the helicopter crew?

Alternative 3 also discusses access control measures such as installation or relocation of fences, warning signs, and personnel training. Where would the fences and signs be located? If the location of UXO's is known, with enough accuracy to fence them in, they should be removed, not fenced in. If an alternative is eventually selected, where UXO's are detonated, the air quality impacts need to be evaluated in the risk analyses.

It is understandable that some UXO's will be overlooked, because of that fact that surveys should be done every two years, not five. Also, when resurfacing UXO's are located, at anytime, they should be removed and disposed of immediately. It is very hard to endorse a $16.5 million project, that from the beginning states that some UXO's will remain and only plans to revisit the subject every five years in a review. That seems like a lot of money to throw at a project that will never be completed and won't even be revisited but once every five years.

Cultural Resources/Heritage Tribal Office (HeTO)

The risk synopsis submitted by the Tribes' Risk Assessment Committee and elders discussed the importance of association between natural resources and tribal groups who occupied the INEEL and the surrounding areas. The archaeological record supports this relationship and occupation at the INEEL. Contamination to those resources through direct contact or through the receptors, including the plants and animals, are of great concern. Contemporary cultural uses are still prevalent and fear of contamination in our cultural subsistence or medicinal gathering is a major concern. The effect of residual contamination may cause serious cultural effect to tribal usage and practices that are still alive in our culture. Protection of the tribal resources—cultural, traditional, and archaeological—are crucial to the Tribes.

The summary document (page 7, Summary of Site Risks for WAG 10 sites) uses the words, *within selected areas, and limited hunting:* This discussion assumes boundaries around tribal interests and concerns while suggesting unlimited determinations for other potential uses. Usage of the words, “selected” and “limited” appears to be boundary driven and suggests that the Tribes are limited to tribal uses based upon the Agencies assumptions/predictive modeling and decisions.

Page 11 of the same document states that the Agencies will select remedial actions for the Tribes without tribal input. Understandably the tribal risk assessment document is holistic in nature, however it will be advisable to include the Tribes in the decision making process in accordance with our interpretations and understandings and in accordance with the DOE Agreement-in-Principle. As stated earlier, it is important that the Tribes are included in discussions regarding this Proposed Plan in order that we can protect our rights guaranteed under our Treaty with the U.S. Government.

The 10-04 document continually states the alternatives, preferred or identified, complies with federal law, however the document fails to identify compliance to the National Historic Preservation Act, application of cultural resources in NEPA, and/or other federal cultural resource laws. It would be detrimental and/or cause delays for the implementation of the alternatives if the plans fail to comply with federal cultural resource laws.

Another unrelated concern is treatment of contaminated artifacts. The Proposed Plan discusses treatment of in situ issue but should also address the process when the clean up activities encounter or cause contamination of tribal, archaeological, or historic artifacts. Additionally it will be important to plan for disposition of the contaminated materials and to avoid traditional cultural places or historic view sheds or places (i.e. historic trails, historic buildings, tribal sacred/traditional cultural places). Advanced planning for the disposition of contaminated materials should also consider removal of undisturbed soil deposits to cover contaminated material discussed in the Proposed Plan 10-04 document.

Ordnance Area

The ordnances located on the INEEL have a significant historical/cultural resource importance for DOE. The National Historic Preservation Act (NHPA) and Section 106 regulations have to be considered in the undertaking actions for ordnance removal. Coordination with DOE’s contractor, Bechtel Cultural Resource Management Office will be a vital key that should not be missed in this process.

Another factor to consider is the affect to other cultural resource archaeological/historical properties when clean up of the ordnance area is planned. The shell casings may be archaeological artifacts of the defense period for the INEEL. UXO detonations should be assessed to determine impacts on other resources in the surrounding area. Additionally, removal and transportation of the UXO material may have detrimental consequences to the NHPA. These issues should be assessed and included in the decision making process by the identified Agencies.

As a preferred alternative, Alternative 3 conforms to clean up requirements although fails to address the historical context or mitigation of the historical significance. WWII was a significant historical event that INEEL and the Tribes have in common. Our tribal people were involved in WWII, the men as warriors and the Indian women worked in the factories in the development of the war’s weapons. The 10-04 document failed to address these important factions and the assessment should provide an archaeological and historic mitigation plan to comply with the NHPA for the removal of the ordnance and the clean up of historic places on the INEEL.

TNT/RDX Contamination Sites

It's not clear in the TNT/RDX section of historical recordation for the historic property being affected—WWII artifacts and historical context. Also not clear, in the preferred alternative, is DOE's plan to comply with NHPA with respect to removal of contaminated soil. The preferred alternative seems to be the logical alternative for clean up however the removal and transportation of the contaminated materials should be assessed again while seriously considering affects to cultural/historic resources.

Gun Range

Remedial efforts to remove the lead components at the gun range are also shared by the Tribes. As stated in the Ordnance section, historical considerations need to be taken in removal of properties associated to or identified with the Gun Range. If historical properties are identified compliance with NHPA and Section 106 should be initiated. The preferred alternative suggests removal of soil and removal of other properties in order to get access to the soil. Soil disposal is recommended for on or off site but it's unclear what off site facility will be used for this disposal. The transportation of the soil and other properties presents a question and concern of disturbance to cultural resources. Clarity should be made in the specific plans for such disposals and affects.

Thank you for considering our comments and we look forward to receiving responses in a timely fashion. We look forward to coordinating with DOE in the next evaluation 10-08, the aquifer and ground water. Should there be any questions or concerns, feel free to contact me at (208) 478-3706, 478-3707, or 478-3708.

Sincerely,

Diana K. Yupe, Director/Anthropologist
Tribal/DOE AIP Program

Cc: B. Edmo, FHBC Chairman
R. Pence, DOE AI Prgm. Mgr.
G. Nelson, DOE WAG 10
t.doe aip staff
d.wag10-04 comments

Response to comment 26:

General Comments

DOE is responsible for prudently managing the natural and cultural resources within its jurisdiction and to ensure that the health and safety of the Tribes and the public are protected from potential hazards associated with the activities on, at, or related to the INEEL. DOE strives to meet this responsibility through environmental restoration, waste management environmental surveillance, the environmental compliance program, long-term stewardship, and various other actions and programs. The Tribes are an important and necessary partner in this management process, and DOE appreciates tribal efforts, such as those of the Tribes' Risk Assessment Committee, to promote greater understanding of unique tribal concerns. The assistance of the Tribes' Agreement in Principle (AIP) program in understanding these unique concerns and helping to address them is also greatly appreciated and is critical for the ongoing success of the important relationship between DOE and the Tribes. DOE appreciates this feedback from the Tribes on the Proposed Plan for WAG 10 and is committed to ongoing communication and cooperation.

DOE acknowledges that the AIP provides for a variety of issues of mutual importance to DOE and the Tribes. Cultural resources are a very important part of the Agreement, but are not the only part. Tribal participation in the DOE Environmental Management program, including long-term stewardship, the National Environmental Policy Act program, Environmental Monitoring program, release reporting, and emergency management are also specified in the AIP. DOE is committed to ongoing coordination with the Shoshone-Bannock Tribes' AIP program and government to government consultation to ensure that all tribal interests are addressed at the INEEL. DOE also recognized tribal definitions of cultural resources are much broader than those typically addressed by federal agencies and appreciates the efforts of the Tribes' AIP program to educate DOE in this regard.

Transportation

In the AIP, DOE specifically commits to notifying the designated Tribal representatives immediately in the event of any release of a hazardous substance, pollutant, contaminant, or radioactive material; any transportation accident involving shipments of hazardous or radioactive substances to or from the INEEL, any substantial threat of release into the environment of any hazardous substance, pollutant, contaminant, or radioactive material; or any natural emergency/disaster that occurs on the INEEL that may present an imminent and substantial danger to the public health, welfare or environment of the Tribes. These reporting requirements are applicable to all projects on the INEEL site, including those completed for WAG 10.

Only modest amounts of contaminated material will be transported during the proposed remediation of OU 10-04. For the SFT-02 site, the soil will be processed onsite. Before transport, the processed soils will be stabilized and placed in suitable containers. Hence only a relatively small volume of containerized treated soil will be transported to the CFA landfill or the ICDF; thus, there will be minimal threat of contamination from transport. For the TNT/RDX sites, the amount of TNT/RDX fragments is also going to be small, approximately 25 gallons. All of the recovered fragments will be sealed in an appropriate container for transport. It is estimated that only 800 yd^3 of contaminated soil will be associated with the TNT/RDX cleanup. This relatively small volume of soil will be carefully contained so there would not be a threat of the spread of contamination, even in the event of an accident. For the UXO cleanup, only a small volume of UXO items will be transported in appropriate containers. The spread of contamination from these types of materials is highly unlikely, even under an accident scenario. Appropriate safety guidelines will also be followed to prevent any inadvertent explosion of these items.

Human Health Standards

The first source of information for toxicity values for human health risk assessment is the Integrated Risk Information System (IRIS). This electronic database, prepared and maintained by the EPA, contains information on human health effects that may result from exposure to various chemicals in the environment. IRIS was initially developed for EPA staff in response to a growing demand for consistent information on chemical substances for use in risk assessments, decision-making, and regulatory activities. The information in IRIS is designed to be conservative to support use by a non-toxicologist.

The information contained in IRIS is based on a consensus process that involves interpreting the scientific literature applicable to health effects of a chemical, and using established methodologies to develop values for oral reference dose, inhalation reference concentration, carcinogenic slope factor and unit risk. The EPA recognizes that certain contaminants have specific issues for sensitive sub-groups such as children (for example lead) and has adjusted their toxicity values and or approach accordingly. As new scientific information becomes available, EPA reviews it, as appropriate, and revises IRIS files accordingly. This includes information on sensitive subgroups. Updated information should be included in the 5-year review for completeness. The impact on sensitive subgroups that were not specifically modeled in the risk assessment is an uncertainty in the process. It is considered to have a low chance of making a large impact because of the conservatism of the values and modeling in the risk assessment.

CERCLA (see page 13 in PPO Unit 10-04)

Although not explicitly stated in the proposed plan, significant environmental sampling and monitoring efforts will be performed before, during, and after remediation to ensure the remedial action goals and objectives are met. The costs for sampling and monitoring are included in the total cost for the alternatives; details of the assumptions used to prepare the cost estimates are presented in the OU 10-04 Remedial Investigation/Feasibility Study.

The Tribes will continue to play an important role in assessing the impacts of proposed INEEL activities through the National Environmental Policy Act program. All activities described in the Proposed Plan will be subject to NEPA review before implementation.

Air Quality Comments:

TNT/RDX Contamination Sites

The goal of remediation is to remove all TNT and RDX contamination to a level that would permit unrestricted use of the site. Most of the chemical contamination at the TNT and RDX sites exists as solid fragments of TNT and RDX, which would not become airborne. Also, TNT and RDX are not volatile. While the amount of contamination that could contribute to wind-borne fugative dust will be very small, the need to perform air monitoring will be considered.

Gun Range

Although air monitoring for lead has not been performed at the site, the environmental and health hazards associated with lead in small-arms firing ranges such as the SFT-02 Gun Range are well known and documented. As indicated from the investigation and study of other small-arms firing ranges, the lead from spent bullets poses an unacceptable risk. The preferred alternative to remediate this site is consistent with efforts performed at other small-arms firing ranges across the country. The police forces in larger cities have gun ranges similar to the STF-02 Gun Range, which require periodic remediation. The

Department of Defense also has many gun ranges that are also periodically remediated to remove the lead contamination. Extensive investigation was performed during development of the feasibility study to identify and evaluate methods for remediation of lead contaminated soil at small-arms firing ranges. Based on this investigation, the most cost-effective means to remediate this site was selected as the preferred alternative.

Since the soil washing alternative was not the selected alternative, not as much detail was provided in the proposed plan as for the selected alternative. A detailed description of the soil-washing alternative is presented in the OU 10-04 Remedial Investigation/Feasibility Study. For the soil-washing alternative, the soil would first be processed by physical separation to remove the larger particulate fraction of lead. The soil would then be treated with acid to remove the very fine lead particulate as well as the ionic forms of lead attached to the soil. After such treatment, the soil would have to be conditioned by neutralization and organic additives before it could be returned to the site. The lead in the acid wash liquid would be removed for recycle, and the remaining liquid would then have to be neutralized and stabilized for disposal. Although this treatment technology has been tested and demonstrated at several sites, as described in the OU 10-04 Feasibility Study, the results can be variable and there is a possibility the remediation goals would not be met for the STF-02 Gun Range Site. Thus treatability studies would have to be conducted, which were assumed for estimating the cost of implementing this alternative.

After neutralization and stabilization of the acid wash liquid, the waste would not be toxic and would not be regulated as hazardous waste. Thus, disposal in a landfill with a double liner and leachate collection would not be required. Also, after treatment, there would be no acid constituents, since neutralization removes the acidic characteristic of the waste.

The volume of waste to be disposed of under Alternatives 3a and 3b cannot be accurately predicted until testing is performed. However, preliminary estimates indicate the volume of waste generated requiring disposal could be nearly the same. However, this assumes the acid washing process would be highly effective, and there is insufficient evidence to suggest the acid washing would be so effective, and thus the volume of waste requiring disposal under this alternative would greatly exceed that for 3a.

Environmental Comments:

Ecological Risks

The long-term ecological monitoring is not considered a remedial action and therefore does not have Remedial Action Objectives. The long-term monitoring is considered a limited action under the CERCLA process and has been included in the Record of Decision as such. The long-term monitoring was designed to address the issues that are raised. Specifically, the long-term ecological monitoring at the INEEL will include the following activities:

- Developing a comprehensive surveillance and monitoring plan that supports eliminating the uncertainty in the Site-wide ERA to allow coordination with ongoing air, soils, surface water, groundwater, and vadose zone surveillance and monitoring efforts, to allow coordination with other agency activities (such as sagegrouse studies), and to address stakeholder concerns.

- Developing a schedule for site walk-downs and visual inspections in the WAG site areas to ensure that assumptions in the risk assessment are still applicable.

- Performing yearly sampling and analysis of site-specific flora and fauna for ecological contamination based on location or area-specific field sampling plans. Approximately 10% of these samples will be taken from off-Site locations for background comparison and to monitor off-Site migration of contamination by ecological receptors.

- Providing an annual status report to the agencies to support the 5-year review.

- Performing selected research studies to support the development and understanding of long-term trends in the INEEL's ecology (such as measuring effects to INEEL populations or individual species).

TNT/RDX Contamination

For most of the TNT/RDX sites in question, little to no effort to-date has been made to remove the TNT/RDX contamination. Some remediation was performed at the NOAA site, but it was not completed; hence, this site still has contamination at levels requiring remediation.

The remediation goal is to remove all TNT and RDX to a level that will allow unrestricted use. However, since buried material may remain, routine investigations will be performed at the sites and any contamination detected will be removed. While the site will be under government control for 100 years, it is likely any undetected TNT and RDX remaining after the initial remediation will be removed during the required five-year assessment and review process.

Gun Range

The STF-02 Gun Range has been idle for many years (12) and all associated target practice has been transferred to the main INEEL Weapons Range located to the northwest of Central Facilities Area. There are no plans to reconstruct the STF-02 Gun Range. Removal of the asphalt pad and wooden building will be a final action, and there will be no effort to rebuild the building or construct another paved area. All demolitions on the INEEL are assessed for potential impact to the historic landscape, so this final action will also include an analysis of this type. After demolition and cleanup, the entire STF-02 area will be recontoured and revegetated with native plants in accordance with the most current procedures.

Unexploded Ordnance

The OU 10-04 feasibility study identifies, describes in detail, and evaluates the proven geophysical methods to detect the type of UXO present at the INEEL. Alternative methods considered for UXO detection and mapping included detection systems towed by land-based vehicles and hand-held instruments. Use of a towed system requires that all vegetation be removed, thus requiring vast amount of vegetation to be destroyed. Towed systems are also limited to covering about 50 acres/day as opposed to 200 – 500 acres/day by an airborne system. Use of hand-held UXO detection instruments is very slow and labor intensive, as only a few acres can be covered per day per technician. All methods can be performed safely although the safety requirements are highest for the airborne survey methods. The precise location and extent of fencing can only be determined after a full survey for UXO is made, an assessment of the amount and boundaries of the UXO contamination is established, and a decision is reached as to the magnitude of UXO present that can be practically removed.

Presently, the full extent of UXO contamination at the INEEL is not known. The cost estimates for fencing and access restrictions were based only on the known high-impact UXO areas. After a comprehensive survey is performed and the extent of potential UXO present is understood, a focused program to address the threat from UXO can be developed, which is planned as part of the preferred alternative. Therefore, remediation for UXO will be performed in a phased approach to address areas determined to pose the greatest risk first.

Cultural Resources/Heritage Tribal Office (HeTO)

DOE shares the expressed concerns for protection of all cultural resources on the INEEL, which is within the Tribes' aboriginal territories. This includes those resources that are crucial to the Tribes for cultural and traditional reasons. Under the AIP, DOE is committed to negotiating in good faith with the Tribes concerning tribal access to other undeveloped areas of the INEEL and in identifying, assessing, limiting, and mitigating any impacts of INEEL activities that affect areas covered by the Tribes' Treaty rights. Furthermore, although the INEEL is expected to remain under government control for 100 years, DOE will consider tribal input when developing any plans for future land use and management beyond this industrial period.

The Proposed Plan for OU 10-04 outlines activities that will reduce the overall level of contamination at the INEEL site and will thus reduce any effects of contamination to the Tribes, either directly through on-site visitation or indirectly through tribal usage of significant ecological receptors. Continued involvement of the Tribes in ecological monitoring and ongoing cleanup decisions at the INEEL will assist DOE in developing appropriate mitigation strategies for the cultural effects to tribal usage and practices that are still alive and important among Indian people today.

National Environmental Policy Act reviews, including activities to ensure compliance with the National Historic Preservation Act, will be conducted for all proposed actions in the OU 10-04 Plan. These evaluations will focus on all activities associated with the proposed cleanup, including those at the contaminated site and those associated with the cleanup but at some distance. Sources of fill for capping, access, egress, and utility upgrades, as necessary, are all included in this latter category. As provided in the Agreement in Principle and implemented through the INEEL Cultural Resources Working Group, the Tribes' AIP program is involved in all evaluations of this nature. At a minimum, this involvement will include opportunities for tribal AIP personnel to participate in cultural resources surveys, evaluations, assessment of effects, and mitigation as necessary. Tribal participation in these activities is critical to augment standard cultural resource procedures and ensure that tribal experts are involved to identify all pertinent tribal resources and concerns, including tribal sacred/traditional cultural places and /or viewsheds.

The nature of the contamination present within OU 10-04 (i.e. lead bullets, chunk TNT/RDX, UXO) is such that there is no likelihood that tribal, archaeological, or historic artifacts will be impacted directly. It is also unlikely that the proposed cleanup activities will change the nature of the contaminants to cause any contamination of these items. All ground disturbing projects at the INEEL contain strong provisions for stopping work in the event of discovery of sensitive cultural materials. Procedures for immediate notification of the Shoshone-Bannock Tribes are also in place for these situations. Contaminated cultural materials have never been discovered on the INEEL during surface surveys or inadvertently during project activities. If contaminated cultural materials are discovered, they will be evaluated on an individual basis and their disposition will be determined using the guidelines established in DOE's November 17, 1995, Guidance Memorandum, "Application of Order DOE 5400.5, Requirements for Release and Control of Property Containing Residual Radioactive Material," and the DOE ALARA (As Low As Reasonably Achievable) Standard.

<u>Ordnance Area</u>

All activities outlined in the OU 10-04 Proposed Plan will be preceded by NEPA analyses that will include National Historic Preservation Act Section 106 compliance. As provided in the AIP, the Tribes are involved in all such investigations completed at the INEEL. By law, DOE is also obligated to utilize the services of professionals in the fields of historic preservation, archaeology, and/or history in the INEEL cultural resource compliance program. Presently, the contractor through the INEEL Cultural

Resource Management Office provides these services. This participation will be important in all future analyses of the potential impacts of OU 10-04 activities on all cultural resources, including historic resources associated with the Ordnance Testing Period. These historic resources, including individual shell casings, will be evaluated within the historic contexts developed for the INEEL, and decisions regarding their protection will be made within a standard approach developed to assess their importance within the defined context. Should detonation of UXO in place be needed because of health and safety concerns, an assessment of potential effect to cultural resources would be completed and all resulting activities would be conducted within the bounds of safe practice.

DOE agrees that World War II was a significant historical event that INEEL and the Tribes have in common and acknowledges the important contributions made by Native Americans to the defense of our nation at that time and beyond. DOE recommends that the Tribes develop a historic context for this important history so that artifacts and sites significant to the Tribes associated with this period can be identified and protected. In the interim as this context is being developed, the DOE will continue to preserve the remnants of this period that are relevant to the importance of World War II, to the history of the INEEL, Idaho, and our nation.

TNT/RDX Contamination Sites

As stated above, National Environmental Policy Act reviews, including activities to ensure compliance with the National Historic Preservation Act, will be conducted for all proposed actions in the OU 10-04 Plan. These evaluations will focus on all activities associated with the proposed cleanup, including those at the contaminated site and those associated with the cleanup but at some distance. Sources of fill for capping, access, egress, and utility upgrades, as necessary, are all included in this latter category. As provided in the Agreement in Principle and implemented through the INEEL Cultural Resources Working Group, the Tribes' AIP program is involved in all evaluations of this nature. At a minimum, this involvement will include opportunities for tribal AIP personnel to participate in cultural resources surveys, evaluations, assessment of effects, and mitigation as necessary. Tribal participation in these activities is critical to augment standard cultural resource procedures and ensure that tribal experts are involved to identify all pertinent tribal resources and concerns, including tribal sacred/traditional cultural places and/or view sheds.

Gun Range

Again, as stated above, NEPA reviews, including activities to ensure compliance with the NHPA, will be conducted for all proposed actions in the OU 10-04 plan. No structures will be demolished without this review.

Technical and Legal Issues

All currently identified technical and legal issues associated with the WAG 6 and 10 selected remedies have been addressed as described in the Decision Summary (Part 2 of this ROD). If other issues are identified at a later time, such as during the development of the remedial design or the implementation of the remedial actions, resolution will be achieved through the process defined in the Federal Facility Agreement and Consent Order (DOE-ID 1991).

Responsiveness Summary References

DOE-ID, 1999a, "Work Plan for Waste Area Groups 6 and 10 Operable Unit 10-04," *Comprehensive Remedial Investigation/Feasibility Study*, DOE/ID-10554, April 1999a,

DOE-ID, 2000, *Agreement in Principle Between the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation and the Idaho Field Office of the United States Department of Energy,* September 27, 2000.

DOE-ID, 2001, *Comprehensive Remedial Investigation/Feasibility Study Assessment for Waste Area Groups 6 and 10 Operable Unit 10-04*, DOE/ID-10807.

ESER, 2002, *Idaho National Environmental and Engineering Laboratory Site Environmental Report,* CY 1999. DOE/ID-12082 (99).

VanHorn, R. L., N. L. Hampton, and R. C. Morris, 1995, *Guidance for Conducting Screening-Level Ecological Risk Assessment at the INEL*, INEL-95/0190, Rev. 1, Lockheed Martin Idaho Technologies Company, April 1995.