Draft Final Record of Decision
Operable Unit 1
Former Nebraska Ordnance Plant Site
Mead, Nebraska

U.S. Environmental Protection Agency
Region VII
Kansas City, Kansas

Department of the Army
U.S. Army Engineer District
Kansas City Corps of Engineers
Kansas City, Missouri

April 19, 1995

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LIST OF ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations, latest revision
CWA	Clean Water Act
DNB	Dinitrobenzene
DNT	Dinitrotoluene
FS	Feasibility Study
HA	Health Advisory
HI	Hazard Index
HQ	Hazard Quotient
HMX	High Melt Explosive or Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IAG	Interagency Agreement
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	Not Detected
NDEQ	Nebraska Department of Environmental Quality
NOP	Nebraska Ordnance Plant
NPL	National Priorities List
NPDES	National Pollutant Discharge Elimination System
NRD	Natural Resources District
NT	Nitrotoluene
O&M	Operation and Maintenance
OU	Operable Unit
PCBs	Polychlorinated Biphenyls

LIST OF ACRONYMS
(Continued)

RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
RDX	Research Department Explosive or Hexahydro-1,3,5-trinitro-1,3,5-triazine
RfD	Reference Dose
RGs	Remediation Goals
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
SARA	Superfund Amendments and Reauthorization Act
SWDA	Solid Waste Disposal Act
TCLP	Toxicity Characteristic Leaching Procedure
tetryl	2,4,6-tetranitro-n-methylaniline
TNB	Trinitrobenzene
TNT	Trinitrotoluene
USACE	U.S. Army Corps of Engineers
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USEPA	U.S. Environmental Protection Agency
UXO	Unexploded Ordnance
VOCs	Volatile Organic Compounds

1.0 DECLARATION

Site Name and Location

Former Nebraska Ordnance Plant
Mead, Nebraska
Operable Unit 1: Upper 4 feet of Soil

Statement of Basis and Purpose

This decision document presents the selected remedial action for the former Nebraska Ordnance Plant (NOP) site, in Mead, Nebraska, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the administrative record file for this site and has been made by the U.S. Environmental Protection Agency (USEPA), in consultation with the Nebraska Department of Environmental Quality (NDEQ), and the U.S. Army Corps of Engineers (USACE).

Assessment of the Site

Actual or threatened releases of contaminants from this site, if not addressed by implementing the remedial action selected in this Record of Decision (ROD), may present a current or potential threat to public health, welfare, or the environment.

Description of the Selected Remedial Action

The former NOP site was used as an ordnance loading, assembly, and packing facility. Operations at the NOP resulted in contamination of soil with explosive compounds. Most of this contamination is confined to discrete areas associated with drainage ditches. The site has been divided into three operable units. Operable Unit (OU) 1 encompasses the upper 4 feet of soil contaminated with explosive compounds. OU 2 includes explosives-contaminated soil which could act as a source of groundwater explosives contamination, soil contaminated with volatile organic compounds (VOCs), and contaminated groundwater. A former on-site landfill and areas of waste not previously identified are included in OU 3.

The remedial action for OU 1 addresses one of the principal threats at the site, explosives-contaminated soil, by thermally treating the contaminated soil on-site. The major components of the selected remedy include:

- Excavate contaminated soil and debris.

- Sample to verify excavation to cleanup goals.

- Blend soil to reduce any reactive levels of explosives compounds.

- Conduct a risk assessment based on USEPA's combustion strategy.

- Conduct a trial burn to test the performance and emission controls of the incinerator.

- Treat explosives-contaminated soil using on-site rotary kiln incineration and test the soil to verify the degree of treatment.

- Test treated soil and residuals to verify that they are not hazardous due to the toxicity characteristic (TCLP) for metals. If treatment residual fails TCLP for metals, it will be disposed of at an appropriate off-site facility.

- Blend treated soil and solid treatment residuals, backfill on-site in excavations, and cover with clean soil, as necessary or appropriate, to sustain vegetation.

- Dispose of oversized material and debris in an authorized off-site landfill.

Statutory Determinations

The selected remedial action is protective of human health and the environment, complies with Federal and State laws and regulations that are applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedial action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfies the statutory preference for a remedial action that employs treatment that reduces toxicity, mobility, or volume as a principal element. Because this remedial action will not result in hazardous substances remaining on-site above health-based levels for direct contact, the 5-year review to ensure that the remedial action continues to provide adequate protection from direct contact of explosives-contaminated soil will not be required.

LEAD AND SUPPORT AGENCY ACCEPTANCE
OF THE RECORD OF DECISION
FORMER NEBRASKA ORDNANCE PLANT SITE
OPERABLE UNIT 1

Signature sheet for the following Record of Decision for Operable Unit 1; upper 4 feet of explosives-contaminated soil, final action at the Former Nebraska Ordnance Plant site between U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency. A letter from the State of Nebraska Department of Environmental Quality (NDEQ) regarding concurrence with the selected remedial action for this site is attached.

Assistant Administrator/Regional Administrator — Date

**LEAD AND SUPPORT AGENCY ACCEPTANCE
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______________________________	______________
Deputy Assistant Secretary of the Army [Environment, Safety and Occupational Health]	Date

2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

The former Nebraska Ordnance Plant (NOP) site occupies approximately 17,250 acres located one-half mile south of the town of Mead, Saunders County, Nebraska (Figure 1). During World War II and the Korean Conflict, bombs, shells, and rockets were assembled at the site. The site includes four load lines, where bombs, shells, and rockets were assembled; the Burning/Proving Grounds, where fuses were tested and materials were destroyed by burning; a Bomb Booster Assembly Area, where boosters that amplify the effect of the detonators and assure the complete detonation of the main explosive were assembled; and an Administrative Area, which included offices, residences, and a laundry (see Figure 2). According to reports, wastewater from both the load line plant operations and the laundry was washed into a series of sumps, ditches, and underground pipes.

The former NOP site is situated on unconsolidated deposits that are up to 180 feet thick. Fine grained materials (silts and clays) comprise the uppermost deposit, which is up to 30 feet thick. Below this fine grained soil are sand and gravel deposits. The sand and gravel deposits are underlain by shale and sandstone. The majority of residences, farms, industries, and municipalities in eastern Nebraska derive water supply from the sand and gravel deposits or from the sandstone. Irrigation consumes the largest volume of extracted groundwater. The general trend of groundwater flow in the area is southeast, toward the Platte River.

The site is nearly flat, with a few gentle slopes. Surface water drainage in the eastern portion of the site is generally to the southeast, toward Johnson Creek and the Natural Resources District (NRD) Impoundment. In the western portion of the site, surface water drains to the southwest, toward Silver Creek.

According to the draft National Wetlands Inventory Map for Mead Quadrangle, several wetland types may be located at or near the site. Based on the Soil Conservation Service (SCS) delineation, on-site wetlands are not located near areas of contamination at the site and will not be impacted by the OU 1 remedial action. No other sensitive ecosystems or endangered species are known to exist in the area.

Most of the site is owned by the University of Nebraska, which operates an agricultural experiment station on the premises. Crop, hog, dairy, and cattle research take place on site. Other portions are owned by the Nebraska National Guard, United States Air Force and Army Reserves. Some private pasture and crop productions also take place on site, and some private light industry exists near the northern end of the site. Adjacent land use is primarily agricultural, except for the town of Mead which is located north of the site.

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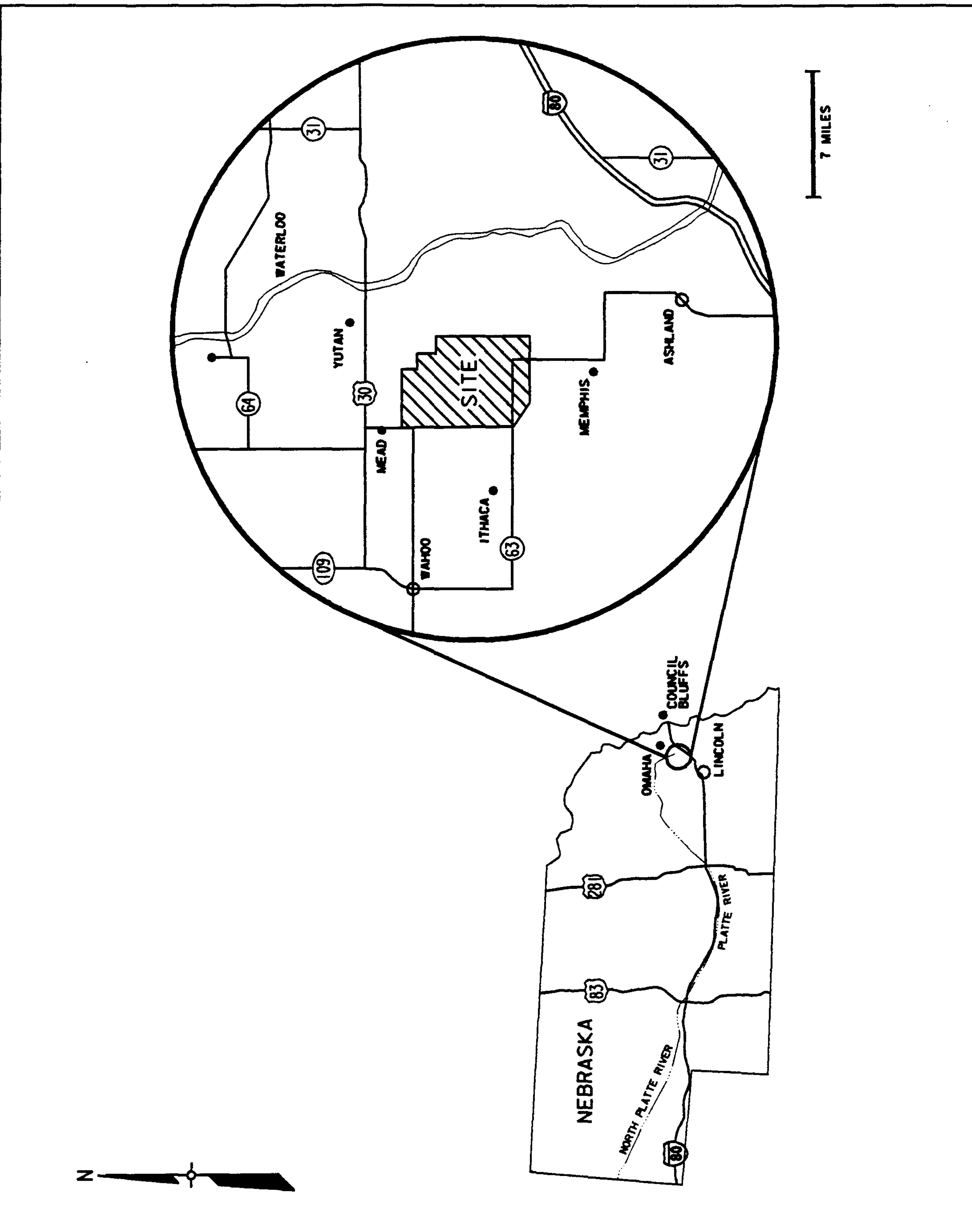

RUST ENVIRONMENT & INFRASTRUCTURE

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FIGURE 1
SITE LOCATION MAP

DRAFT FINAL RECORD OF DECISION - OPERABLE UNIT 1
FORMER NEBRASKA ORDNANCE PLANT
MEAD, NEBRASKA

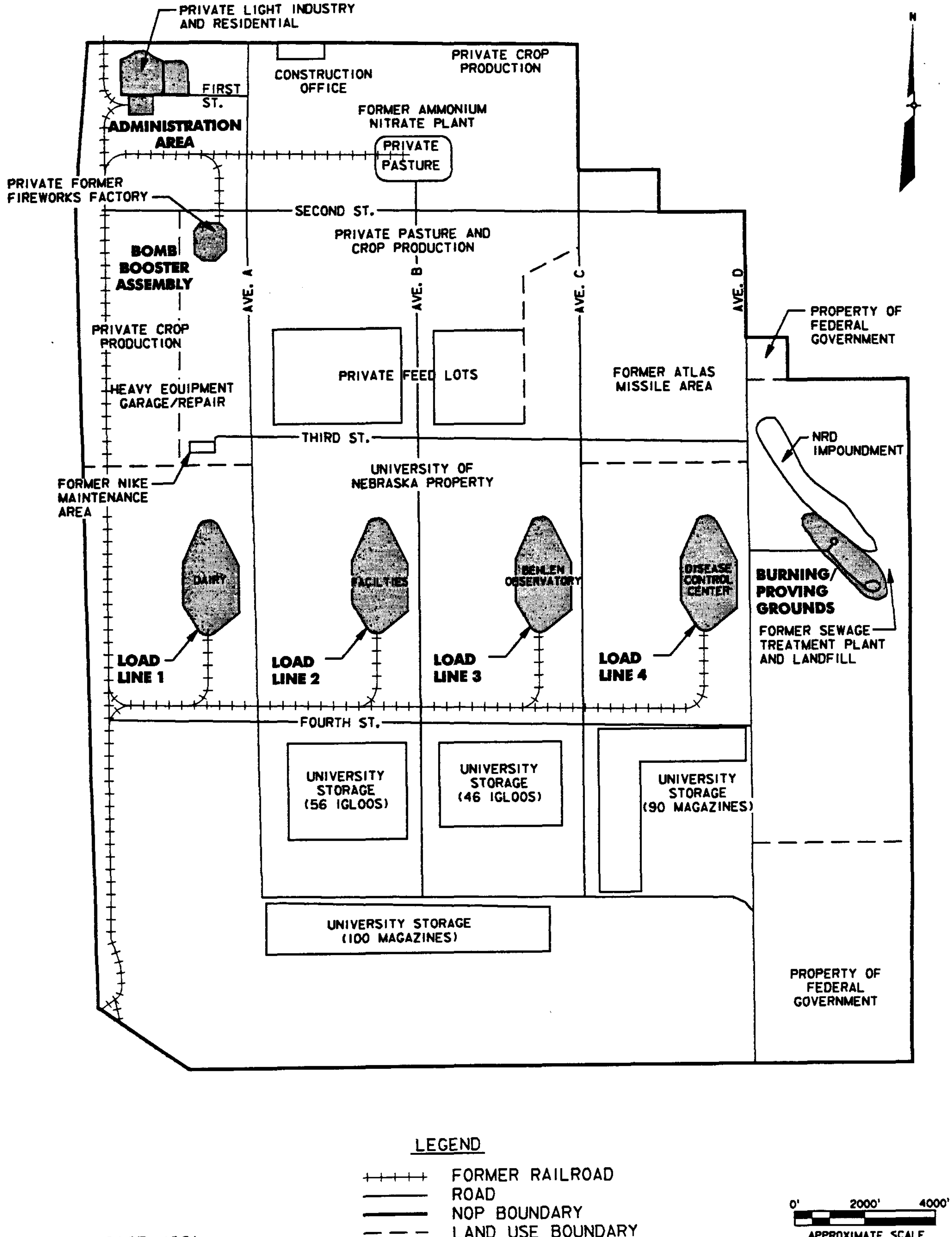

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FIGURE 2
SITE MAP

DRAFT FINAL RECORD OF DECISION - OPERABLE UNIT 1
FORMER NEBRASKA ORDNANCE PLANT
MEAD, NEBRASKA

2.2 SITE HISTORY AND PREVIOUS INVESTIGATIONS

2.2.1 Site History

The former NOP site was a load, assemble, and pack facility which produced bombs, boosters, and shells. The NOP included four bomb load lines (LL1 through LL4), a Bomb Booster Assembly plant, an ammonium nitrate plant, two explosives burning areas, a proving range, a landfill, a wastewater treatment plant, analytical laboratories, and storage and administration facilities. Most of the raw materials used to manufacture the weapons were produced at other locations and shipped to the NOP facility for assembly. However, ammonium nitrate was produced at the Ammonium Nitrate Plant during the first months of operation. Finished munitions, bulk explosives, and related ordnance materials and components were stored and demilitarized at the site.

Routine plant operations included washout of explosive materials prior to bomb loading and assembly, and bomb washing following assembly. Wash water was discharged to sumps and in open ditches.

The production facilities were active during both World War II and the Korean Conflict. Nebraska Defense Corporation operated the NOP site for the Army from 1942 until 1945 and produced boosters and 90-pound to 22,000-pound bombs at the four load lines. These munitions were loaded with trinitrotoluene (TNT), amatol (TNT and ammonium nitrate), tritonal (TNT and aluminum), and Composition B (hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) and TNT). Tetryl boosters were assembled for bombs in the Bomb Booster Assembly Area. In 1945, ordnance production operations were terminated, and the facilities and operations were placed on inactive status.

During the interim period (1945 through 1949), the NOP was decontaminated and used primarily for storage and disposal of bulk explosives and munitions, and production of ammonium nitrate for use as fertilizer. Decontamination consisted of flushing and sweeping buildings that were not being used for storage. Explosives processing surfaces were scraped and brushed by hand. Internal roofs and trusses were flushed with high pressure water, and equipment was cleaned with steam. After flushing and steaming operations were completed, explosives residues in the sumps, settling basins, leadoff pipelines leading to the drainage ditches, and an unspecified quantity of contaminated soil and sludge from the drainage ditches were removed and reportedly taken to the Burning/Proving Grounds. In some instances, portions of the tile pipe composing the drainage system from the sump to the open ditches were removed and disposed. Wooden sidewalks and settling basin covers were also removed and burned in the Burning/Proving Grounds. The outside roofs of the explosives screening, melt, pour, and cooling buildings on the load lines, and the Bomb Booster Assembly Area tetryl screening and blending, pelleting, rest house, and magazine buildings were flushed.

In 1950, the plant was temporarily reactivated and produced an assortment of weapons for use in the Korean Conflict. Munitions assembled included bombs, shells, rockets, warheads, block cast TNT, supplementary charges, and boosters. NOP was placed on standby status in 1956, and declared excess to Army needs in 1959.

Neither the reactivation procedures for the Korean Conflict effort nor the decontamination records after final plant shutdown could be located, although recommended decontamination procedures were reviewed. Recommendations included decontamination with hot water and steam. Although recommendations to decontaminate were made in 1959, later records indicate that at least some of the buildings and lands in the load lines and Bomb Booster Assembly Area were not decontaminated prior to accessing (McMaster, 1983).

After the NOP was declared excess in 1959, it was transferred to the General Services Administration for disposition. Approximately 1,000 acres were retained by the Army for National Guard and Army Reserve training, 12 acres were retained by the Army for use as a Nike Missile maintenance area, 2,000 acres were transferred to the U.S. Air Force to build the Offutt Air Force Base Atlas Missile Site, and 40 acres were transferred to the Department of Commerce. Some trichloroethene (TCE) contamination of soil and groundwater may have resulted from these military activities that followed the excess declaration in 1959. This potential contamination is not located in the areas contaminated with explosives due to activities prior to 1959 and is being investigated as part of OU 2. In 1962, approximately 9,600 acres of the former NOP site were purchased by the University of Nebraska for use as an agricultural research farm, and an additional 600 acres were obtained in 1964. The remaining 5,250 acres were eventually purchased by private individuals and corporations.

Since NOP closure, the property has been used primarily for agricultural production and research. In addition to these land uses, several commercial operations were conducted on former NOP property. Apollo Fireworks operated for a period of approximately 20 years in the Bomb Booster Assembly Area. Production at Apollo was terminated in 1989. At the former administration buildings, two commercial enterprises were in operation at various times. These included insulation board manufacturing and styrofoam packing material processing. Property was leased for these purposes by private individuals.

Several environmental investigations (discussed below) resulted in the listing of the former NOP site on the National Priorities List (NPL) under Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) on August 30, 1990. In September 1991, USACE, USEPA, and NDEQ entered into an Interagency Agreement (IAG) under Section 120 of CERCLA to investigate and control environmental contamination at the former NOP site.

2.2.2. Previous Investigations

Previous investigations include an archives search for the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA, now called Army Environmental Center) in 1983; Polychlorinated Biphenyl (PCB) investigations by the University of Nebraska in 1984 and 1985, USEPA in 1988, and USACE in 1993; a soil, sediment, surface water, and groundwater investigation by USACE in 1989; a shallow soil gas investigation in 1990; a soil investigation by the USACE in 1991; an unexploded ordnance (UXO) survey and soil investigation by USACE in 1991; a preliminary health assessment by the Agency of Toxic Substances and Disease Registry (ATSDR) in 1991; and a Supplemental Soil Remedial Investigation (RI) for OU 1 by USACE in 1991.

Based on the PCB investigations, PCB-contaminated soil was identified in locations associated with former transformer pads and subsequently removed by the University in 1985 and USACE in 1994. Investigation of remaining PCB-contamination is ongoing and is expected to be completed by the end of 1995. TCE-contaminated soil gas and groundwater was identified in the north part of Load Line 1 and is being addressed with explosives-contaminated groundwater under OU 2. UXO has not been found on-site, but some internal components of ordnance (booster adapters, fuses, propellants, and bulk TNT) were found and disposed. Investigation of UXO is ongoing at the site and is expected to be completed by the end of 1995. Information from previous investigations pertinent to other operable units and remedial actions is summarized in the Supplemental RI Report for OU 1. All documents related to the site are available for review in the information repository at the Ashland Public Library. Investigations pertinent to OU 1 are summarized below.

The 1983 archives search was conducted to assess the potential for contamination at the NOP site from Army operations. Findings of the Archive Search Report were based primarily on the U.S. Army Ordnance Ammunition Command's 1959 Survey of Explosives Contamination. Areas recognized in the Archives Search Report as having the greatest potential for explosives-contamination were the four load lines, the Bomb Booster Assembly Area, and the Burning/Proving Grounds.

In 1989, USACE conducted a confirmation study to determine if past Army activities at the NOP site resulted in environmental contamination. A geophysical survey was conducted to screen boring locations and locate buried materials. The study concluded that explosive residues are present in soil around three of the load lines.

In 1991, USACE identified and assessed potential sources of explosives contamination and UXO. USACE performed a records review and site inspection which included excavation of two test pits and collection of 18 soil samples. Locations potentially requiring remedial action were identified as those where solid pieces of TNT were visibly present or where TNT was found in soil at greater than 2 percent by weight. The areas identified based on these criteria were areas of three of the load lines and parts of the Burning/Proving Grounds.

The Agency for Toxic Substances and Disease Registry (ATSDR) completed its Preliminary Health Assessment in 1991. ATSDR concluded that potential human exposure to hazardous substances at the former NOP may result in adverse health effects. It was concluded that the public could be exposed to the explosive compounds RDX and TNT, via skin contact or soil ingestion.

2.2.3 Summary of OU 1 RI Results

In 1991 and 1992, USACE conducted an OU 1 RI to evaluate the extent (area and depth) of explosives-contaminated soil at the former NOP site. Subsurface borings and surface samples were obtained in the load lines, the Bomb Booster Assembly Area, the Burning/Proving Grounds, the former Administrative Area, and the area surrounding the load lines and the Burning/Proving Grounds which is designated as the Primary Area. Most sampling was based on historical washwater disposal practices during the ordnance production process. Explosives compounds were detected in soil in all four load lines, the Bomb Booster Assembly Area, and the Burning/Proving Grounds. No live ordnance was found on-site.

Sampling results indicate that contamination in the load lines is primarily associated with washwater sumps and drainage ditches from the ordnance production process. The majority of the explosives contamination was detected in shallow soil. At some locations, however, explosives compounds were detected at depths of approximately 30 feet below the surface. Explosives contaminant concentrations in the ditches generally decreased downstream from collection sumps. Concentrations of explosive contaminants in site investigation soil samples range from not detected (ND) to the maximum shown for each area in Table 1. There are relatively few areas where contamination detected in the load lines was not associated with the washwater drainage system.

Explosives contaminants detected include:

- 2,4,6-Trinitrotoluene (TNT)
- Hexahydro-1,3,5-trinitro-1, 3, 5-triazine research department explosive (or RDX)
- 1,3-dinitrobenzene (DNB)
- 2,4- and 2,6-dinitrotoluene (DNT)
- 1,3,5-trinitrobenzene (TNB)
- Octahydro-1,3,5,7-tetramitro-1,3,5,7-tetrazine (high melt explosive or HMX)
- 2,4,6-tetranitro-n-methylaniline (tetryl)
- o-nitrotoluene (o-NT)
- m-nitrotoluene (m-NT)

TNT, RDX, and TNB were the explosives contaminants most often detected.

2.3 COMMUNITY PARTICIPATION

Community participation activities provide the public with an opportunity to express their views on the preferred remedial action. USEPA, NDEQ, and USACE consider public input from the community participation activities in selecting the remedial alternative to be used for the site.

Community participation was provided in accordance with CERCLA, as amended by SARA. Community participation highlights include the availability of several key documents in the administrative record, a public comment period and a public hearing.

A Community Relations Plan for the site was prepared by USACE, and approved by USEPA and NDEQ in May, 1992. This document lists contacts and interested parties throughout government and the local community. It also establishes communication pathways to ensure timely dissemination of pertinent information.

A Technical Review Committee (TRC) was established to insure that the cleanup of the NOP site would be carried out in the best interests of the communities involved. The committee reviews and

TABLE 1

RANGE OF EXPLOSIVE CONCENTRATIONS DETECTED IN SOIL
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

Compound	Load Line 1	Load Line 2	Load Line 3	Load Line 4	Bomb Booster Assembly Area	Burning/Proving Grounds	Administration Area	Primary Area
RDX	ND-39.6	ND-23,270	ND-40.4	ND-22.7	ND	ND-1,700	ND	ND
HMX	ND-0.25	ND-2,020	ND-2.8	ND-4.9	ND	ND-207	ND	ND
tetryl	ND-56.7	ND-0.84	ND-1.03	ND	ND-52,000	ND-223	ND	ND
TNT	ND-133,000	ND-176,000	ND-29,700	ND-131	ND-7.0	ND-313	ND-0.314	ND-0.45
TNB	ND-338	ND-430	ND-95.3	ND-6.0	ND-3.6	ND-35.3	ND	ND
DNT	ND-28.9	ND-119.3	ND-14.8	ND-17.6	ND	ND-1.25	ND	ND
DNB	ND-4.8	ND-1.9	ND-0.57	ND-0.7	ND-1.81	ND-0.87	ND	ND
oNT	ND	ND	ND-1.35	ND-7.9	ND-160	ND	ND	ND
mNT	ND	ND	ND-0.26	ND	ND	ND	ND	ND

NOTES:

All units in mg/kg.
ND = Not Detected.
Source: Remedial Investigation Report.

comments on all official plans and documents, and advises the appropriate agencies before a final decision is made by USACE. The TRC meets periodically to review issues associated with OU 1.

A public meeting was held at the University of Nebraska Field Lab in Mead in July 1989 and in June 1990 to discuss the progress of the ongoing study at the site and to give the community a chance to voice their concerns and offer comments.

USACE and USEPA released the Proposed Plan for the site on May 25, 1994, and have made it available for public review and comment. The information repository for the site has been established at the Ashland Public Library, 207 North 15th Street, Ashland, Nebraska. The information repository contains the RI report, Baseline Risk Assessment, Feasibility Study (FS) Report, the Proposed Plan, and other documents relevant to the site. This information was made available to the public to facilitate public input concerning the investigation, remediation evaluation process, and preferred alternative identification.

Legal notice of the Proposed Plan and the Public Meeting was included in advertisements in the Wahoo Newspaper and the Ashland Gazette on June 9, 1994. Press releases announcing the release of the Proposed Plan and the Public Meeting were provided to the Wahoo Newspaper, the Ashland Gazette, the Lincoln Journal, and the Omaha World Herald on June 7, 1994. A public comment period on the Proposed Plan was held from June 14, 1994, to July 14, 1994. As a result of comments received during that period, the deadline for submitting comments on the Proposed Plan was extended to August 22, 1994. The Proposed Plan was presented at a Public Meeting held on June 23, 1994, at the University of Nebraska-Lincoln Agricultural Research and Development Center at the site. At this meeting, representatives of USACE, USEPA, and NDEQ answered questions from the public about the site and the remedial alternatives under consideration.

USEPA and USACE held a Public Availability Session on February 22, 1995 at the Mead Jr. High/High School. The purpose of the Public Availability Session was to give the public an opportunity to ask questions and discuss issues associated with the proposed remedial action on a less formal basis. Written comments were also accepted from the public between February 22, and March 8, 1995. Although verbal comments at the Public Availability Session were used by USEPA, USACE, and NDEQ to gauge the support of the proposed remedial action, only written comments were included as part of the public record.

All comments received by USACE during the public comment period, including those expressed at the public meeting are addressed in the Responsiveness Summary, which is attached to this document.

This decision document presents the selected remedial action for the OU 1 at former NOP site in Mead, Nebraska, chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the National Contingency Plan. The decision for this site is based on the administrative record.

2.4 SCOPE AND ROLE OF OPERABLE UNIT 1 REMEDIAL ACTION WITHIN SITE STRATEGY

Early site characterization activities identified some sources of contamination that could be addressed before full characterization activities were complete for other sources. USACE, in consultation with NDEQ and USEPA, organized the remediation into three OUs. These are as follows:

- Operable Unit 1: Control and remediation of the upper 4 feet of soil contaminated with explosives compounds.

- Operable Unit 2: Control and remediation of contaminated groundwater, soil contaminated with VOCs, and soil deeper than 4 feet contaminated with explosives.

- Operable Unit 3: Control and remediation of an on-site landfill and other disposal areas not identified at the signing of the IAG.

Investigations and remediation feasibility evaluations are conducted in accordance with the OU designations. The objective of the OU 1 remediation is to reduce potential risks from direct contact exposure to explosive compounds in soil to target risk level concentrations which are protective of human health and the environment.

The selected alternative includes the following processes to meet the objective identified above:

- Excavate contaminated soil and debris.

- Sample to verify excavation to cleanup goals.

- Blend soil to reduce any reactive levels of explosives compounds.

- Conduct a risk assessment based on USEPA's combustion strategy.

- Conduct a trial burn to test the performance and emission controls of the incinerator.

- Treat explosives-contaminated soil using on-site rotary kiln incineration and test the soil to verify the degree of treatment.

- Test treated soil and treatment residuals using the Toxicity Characteristic Leading Procedure (TCLP) to verify that they are not hazardous due to the toxicity characteristic for metals. If treatment residual fails the TCLP for metals, it will be disposed of at an appropriate off-site facility.

- Blend soil and solid treatment residuals with clean soil, as necessary or appropriate, to improve its ability to sustain vegetation and backfill treated soil on-site.

- Dispose of oversized material and debris in an authorized off-site landfill.

This alternative will protect both human health and the environment. Thermal treatment of excavated soil is expected to destroy the explosive compounds, therefore, the risk posed by the upper 4 feet of source area soil will be eliminated.

2.5 SUMMARY OF SITE CHARACTERISTICS

Results of the OU 1 RI indicate that soil in the load lines, Bomb Booster Assembly Area, and Burning/Proving Grounds are contaminated with explosive compounds. In the four load lines, explosives contamination in soil is primarily associated with drainage ditches and sumps. In the Burning/Proving Grounds, contamination appears to have originated from disposal, burning, and testing activities. In the Bomb Booster Assembly Area contamination appears to be generally limited to isolated areas of high concentration. As part of the OU 3 investigation, explosives-contaminated sediment was identified in an Administration Area Sump and will subsequently be treated under OU 1. Estimated areas of soil contamination are shown on Figures 3 through 9.

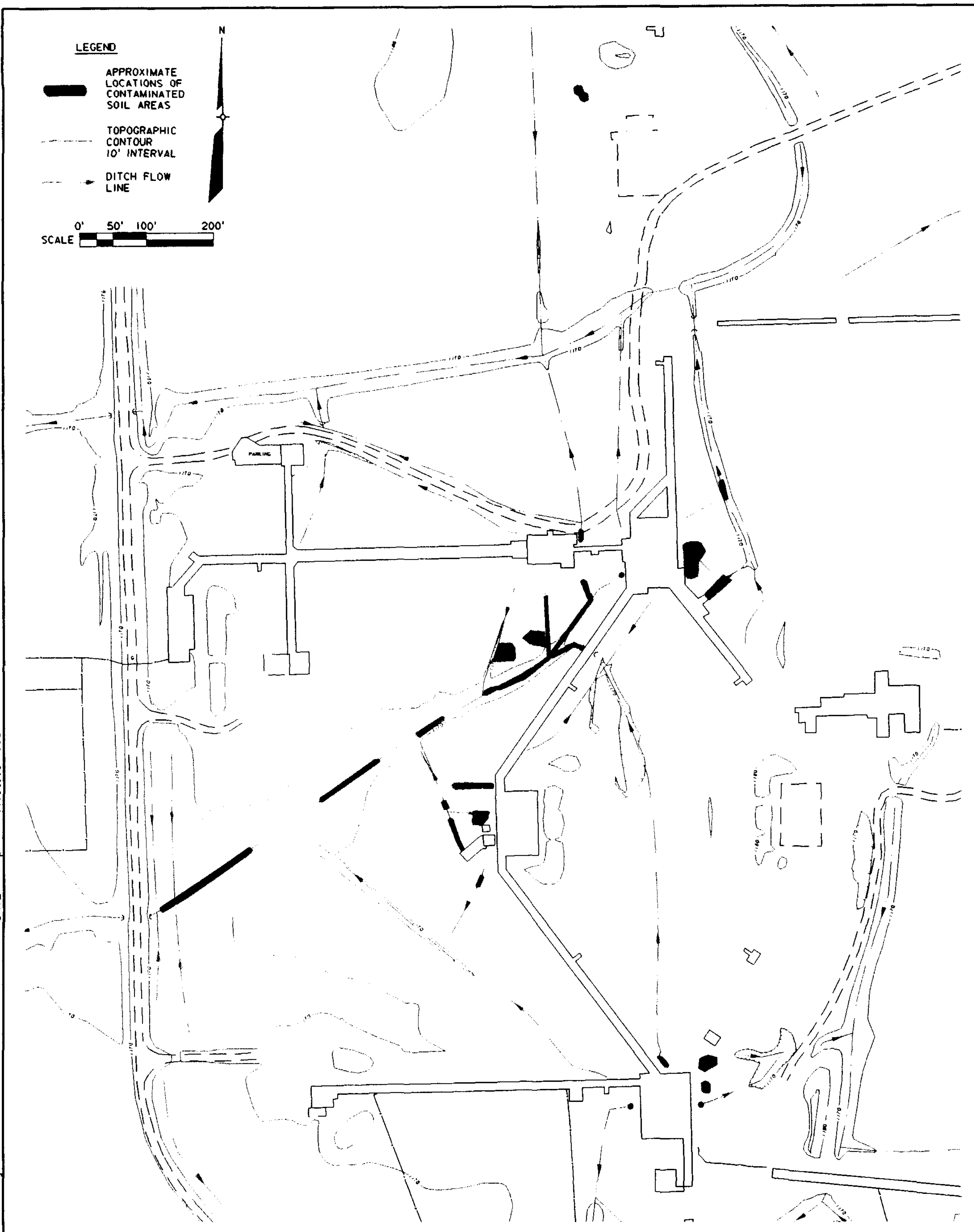
As described in Section 2.2.3, most of the contaminated soil is found within 4 feet of the ground surface but the maximum depth of contamination detected is approximately 30 feet. Contaminants detected and their concentration ranges are shown in Table 1. Of these contaminants, three are classified as possible or probable human carcinogens, and six may cause noncancer health effects. Potential risk from ingestion of these compounds in soil at the site is discussed in more detail in Section 2.7, Summary of Site Risks.

The fate and transport of the explosive compounds at the former NOP site are affected primarily by adsorption , biodegradation, and photodegradation. Some biotransformation of TNT, RDX, DNT, and tetryl may occur. Biodegradation will probably not be significant, however, unless supplemental nutrients and adapted microbial populations are available. Photolysis will be potentially significant only in surface waters. The compounds at the NOP site, therefore, will likely persist in surface soil and slowly leach into the groundwater. Soil sample results under OU 1 and recent groundwater data from OU 2 are consistent with these conclusions.

The estimated soil remediation volume is 8,400 cubic yards based on the remediation goals (RGs) developed by USEPA. RGs are described further in Section 2.8. The total surface area of contaminated soil is approximately 56,000 square feet. The remediation area and volume will also be defined in more detail during the remedial design. Additional detail on the procedures used to estimate the remediation area and volume can be found in the FS Report.

2.6 REMOVAL ACTIONS

Three removal actions have been conducted to address potential risk from explosives-contaminated soil greater than 10 percent explosives, explosives contamination in drinking water, and PCB-contaminated soil. Two isolated soil areas on the site, in Load Lines 1 and 2, contain explosives concentrations significantly higher than other areas. The removal action consisted of fencing the two



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RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 3

LOAD LINE 1 - CONTAMINATED SOIL

DRAFT FINAL RECORD OF DECISION - OPERABLE UNIT 1
FORMER NEBRASKA ORDNANCE PLANT
MEAD, NEBRASKA

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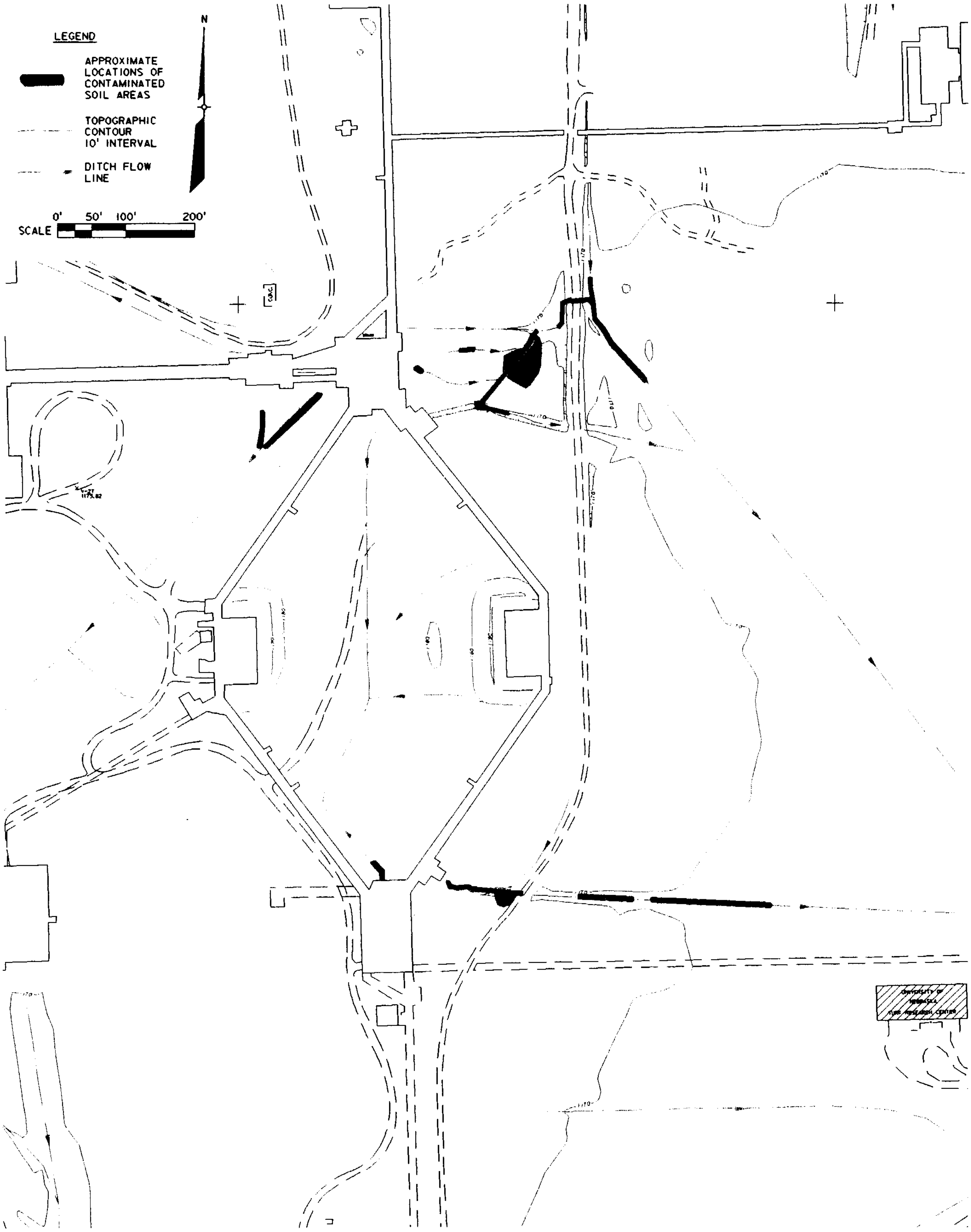

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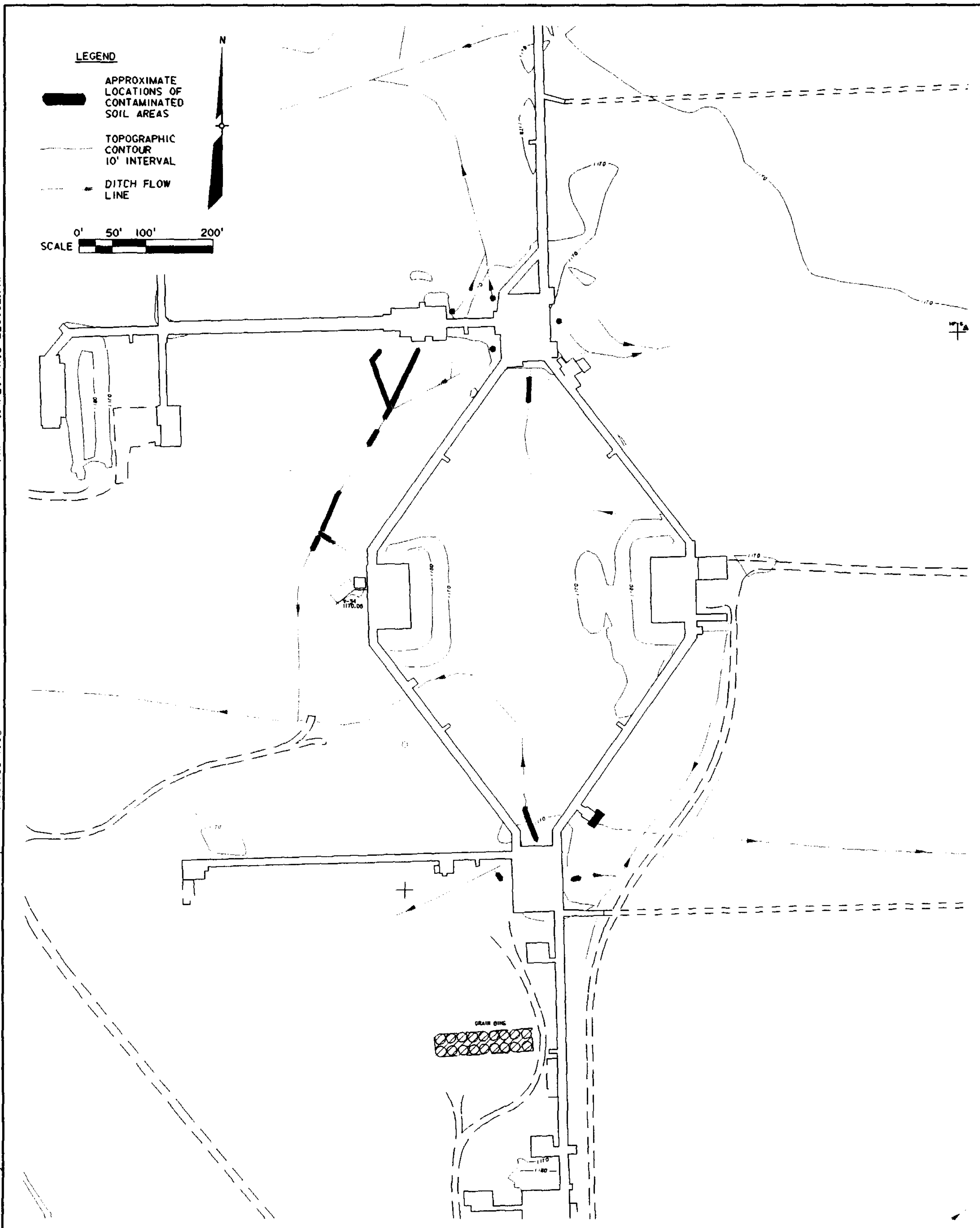
FIGURE 4
LOAD LINE 2 - CONTAMINATED SOIL
DRAFT FINAL RECORD OF DECISION - OPERABLE UNIT I
FORMER NEBRASKA ORDNANCE PLANT
MEAD, NEBRASKA



RUST ENVIRONMENT & INFRASTRUCTURE

APRIL 1995

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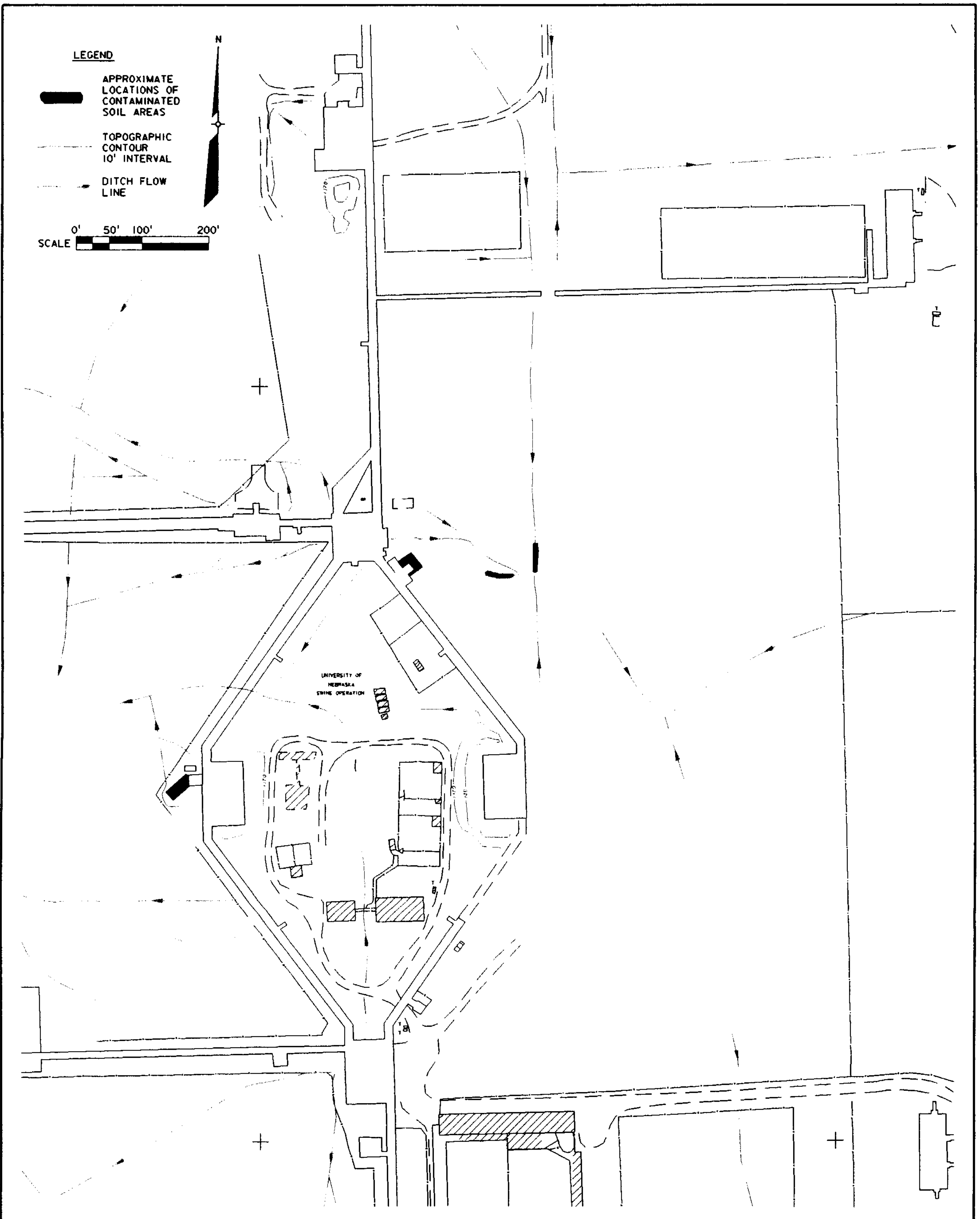
FIGURE 5
LOAD LINE 3 - CONTAMINATED SOIL
DRAFT FINAL RECORD OF DECISION - OPERABLE UNIT 1
FORMER NEBRASKA ORDNANCE PLANT
MEAD, NEBRASKA



APRIL 1995

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RUST ENVIRONMENT & INFRASTRUCTURE

FIGURE 6
LOAD LINE 4 - CONTAMINATED SOIL

DRAFT FINAL RECORD OF DECISION - OPERABLE UNIT 1
FORMER NEBRASKA ORDNANCE PLANT
MEAD, NEBRASKA

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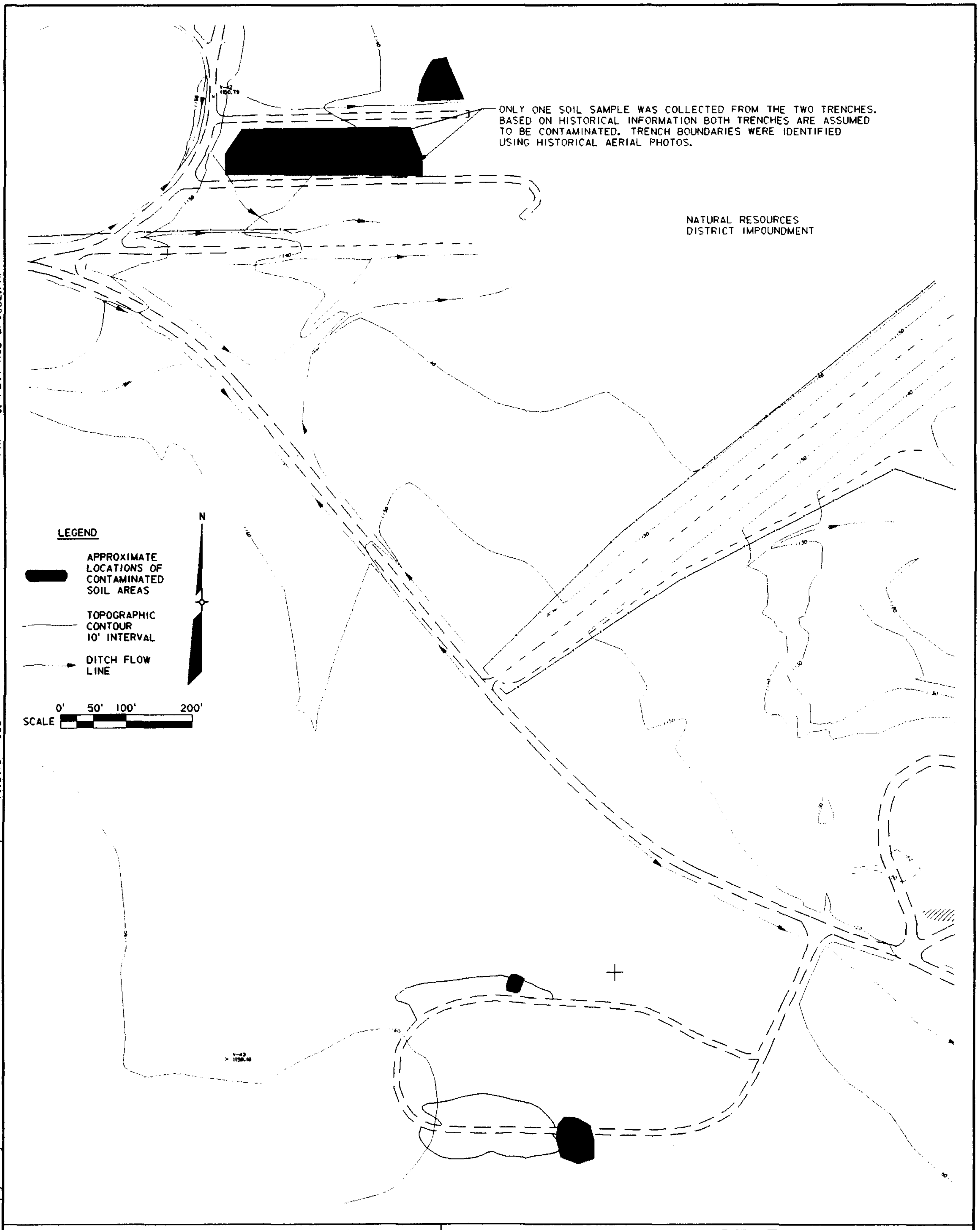

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FIGURE 7
BURNING / PROVING GROUNDS CONTAMINATED SOIL

DRAFT FINAL RECORD OF DECISION - OPERABLE UNIT 1
FORMER NEBRASKA ORDNANCE PLANT
MEAD, NEBRASKA

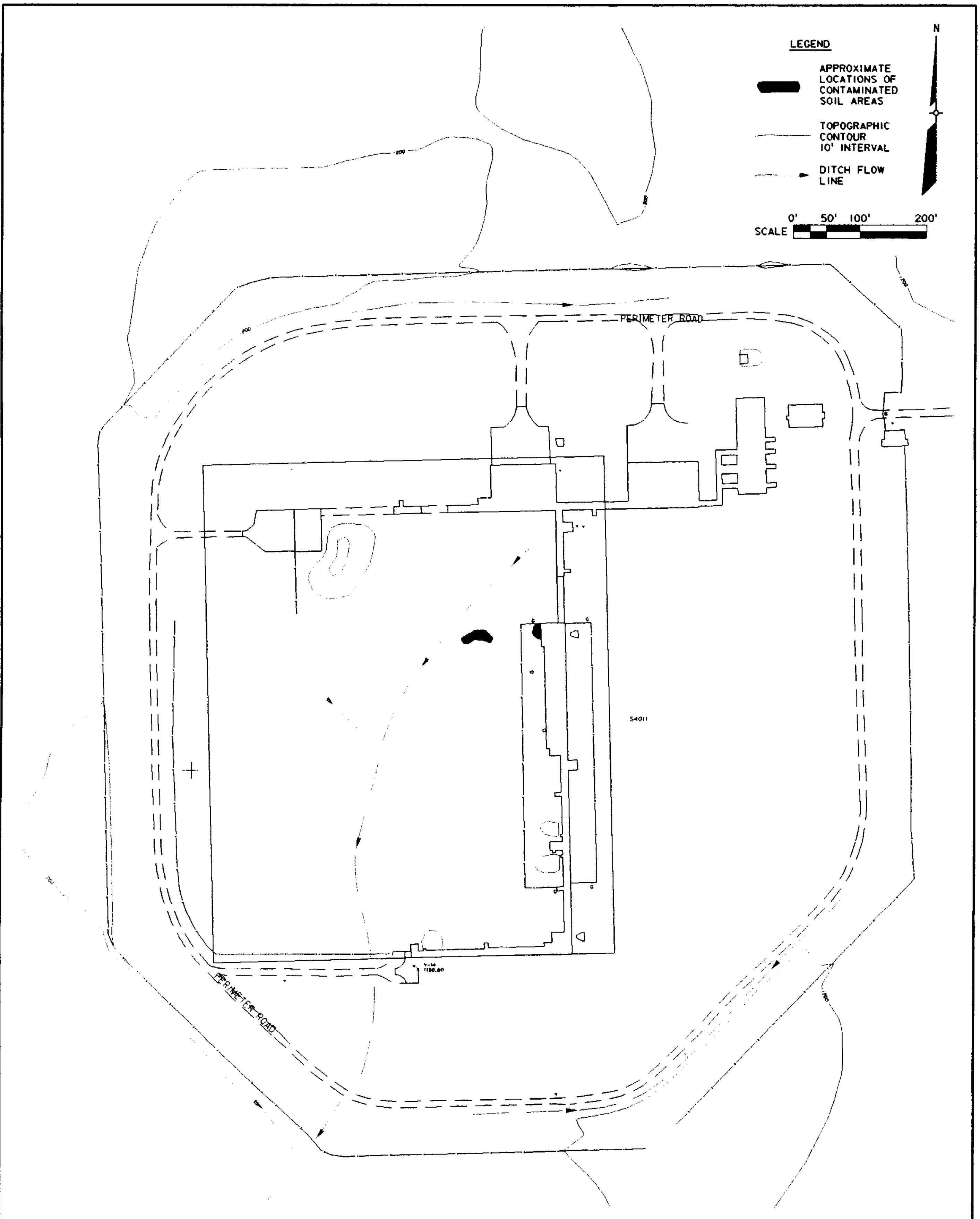

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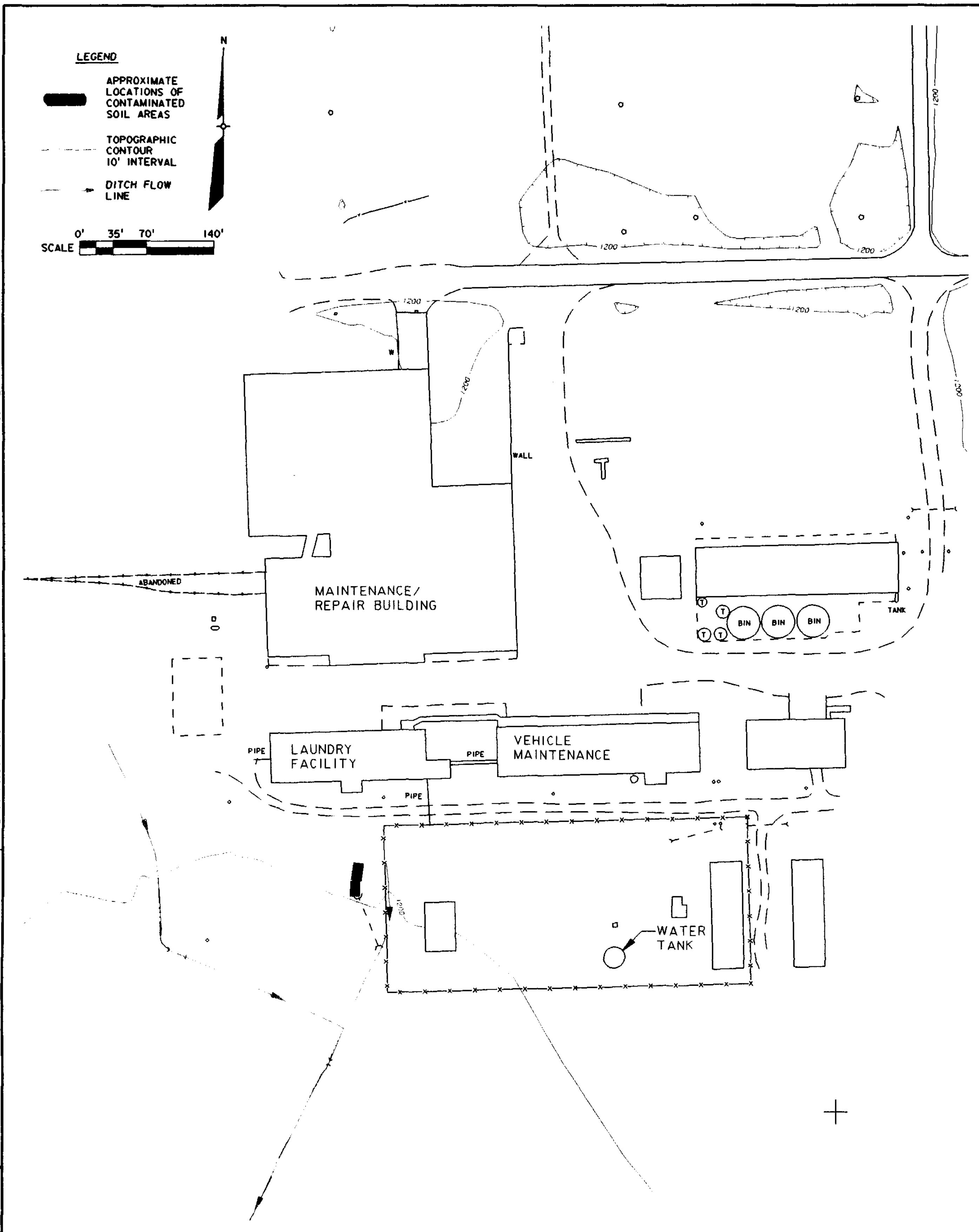
FIGURE 8
BOMB BOOSTER ASSEMBLY AREA CONTAMINATED SOIL

DRAFT FINAL RECORD OF DECISION - OPERABLE UNIT I
FORMER NEBRASKA ORDNANCE PLANT
MEAD, NEBRASKA



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RUST ENVIRONMENT & INFRASTRUCTURE

APRIL 1995

FIGURE 9

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ADMINISTRATION AREA CONTAMINATED SOIL

DRAFT FINAL RECORD OF DECISION - OPERABLE UNIT 1
FORMER NEBRASKA ORDNANCE PLANT
MEAD, NEBRASKA

locations to limit access. Alternate water supplies have been provided to residents with explosives above health advisories in their drinking water. PCB-contaminated soil surrounding former transformer pads was excavated and disposed at an off-site facility. Additional investigation of remaining PCB contamination is ongoing and is expected to be completed by the end of 1995.

2.7 SUMMARY OF SITE RISKS

CERCLA requires that human health and the environment be protected from risks due to current and potential future exposure to release of hazardous substances at or from a site. As part of the RI/FS for OU 1, a Baseline Risk Assessment was prepared. The Baseline Risk Assessment evaluates whether potential unacceptable health or environmental risk is posed in the absence of remedial action. Potential threats to human health were estimated based on assumptions about the manner, frequency, and concentration to which a person could be exposed to contaminants at the site. Environmental risk was qualitatively assessed.

2.7.1 Potential Human Health Risks

A detailed risk assessment was performed to characterize risks to current and hypothetical future populations. The risk assessment consisted of an exposure assessment, a toxicity assessment, a risk characterization, and an uncertainty evaluation.

Exposure Assessment

Resident farmers are not currently exposed to explosives-contaminated soil, because they do not reside within the contaminated areas. Farm workers may be potentially exposed to explosives-contaminated soil during tilling in the Burning/Proving Grounds. In the future, however, current occupational exposures on-site could be extended into other contaminated areas and land with explosives-contaminated soil could be sold to resident farmers. Therefore, the exposure assessment focused on hypothetical future resident populations. Exposure pathways which were assessed included: ingestion of contaminated soil; ingestion and dermal contact with contaminated groundwater; ingestion of contaminated home-grown vegetables and beef; and exposure by inhalation of particulate matter while tilling, planting, or harvesting in the contaminated areas.

The exposure assessment is based on the chemical dose (concentration per unit time), exposure duration and frequency, rate of contact, and other specific parameters. For each contaminant, a chemical intake or dose was calculated for each exposure route. An example of the equations used for these calculations is presented below. Other intake equations are outlined in the Human Health Assessment portion of the Baseline Risk Assessment.

For the ingestion of chemicals in soil, the following equation was used:

$$\text{Average Daily Intake} = C \times \frac{IRxEFxED}{BWxAT}$$

Where C = Average concentration of chemical at the exposure point (mg chemical/unit environmental medium):

IR = Intake rate (amount ingested/unit time).

EF = Exposure frequency (hr/day, day/yr, etc.).

ED = Exposure duration. This is the total length of time that exposure occurs within the time period of concern. The product of EF and ED gives the total number of days or events of exposure.

BW = Body weight of receptor.

AT = Averaging time. This is the time period over which the average dose is calculated (days).

Intakes were calculated for both expected average exposure conditions and reasonable maximum exposure (RME) conditions. Average exposure conditions are calculated using average values for the parameters shown above while RME uses a combination of average and upper bound factors in order to approximate an intake in the 95th percentile of the intake distribution curve. The NCP requires that the RME scenario be used for making risk management decisions.

The risks posed by ingestion of contaminated soil were calculated based on standard body weights, ingestion rates, and exposure durations. For an adult, a body weight of 70 kg was used to represent an average adult. An average child's body weight of 15 kg was assumed. Adults' average and RME soil ingestion rates were assumed to be 50 and 100 mg/day, respectively. Children were assumed to ingest 100 mg/day (average) and 200 mg/day (RME) of soil. Average and RME exposure durations for adult residents were 9 and 30 years, respectively. Children's exposure duration was assumed to be 6 years under both the average and RME scenarios. Other exposure assessment assumptions are outlined in Section 3 of the Baseline Risk Assessment.

Toxicity Assessment

Under current USEPA guidelines, the likelihood of cancer and noncancer effects due to exposure to site chemicals are considered separately. Current and potential future uses of the site and its surroundings were evaluated in order to identify potentially exposed populations and the pathways through which they could be exposed. Carcinogenic and noncarcinogenic risks posed by contaminants were evaluated for each potentially exposed population. Criteria for evaluating the potential of site chemicals to cause these two types of adverse effects are described below.

Criteria for Cancer Effects

USEPA uses a weight-of-evidence system to convey how likely a chemical is to be a human carcinogen based on epidemiological studies, animal studies, and other supportive data. The classification system for characterization of the overall weight of evidence for carcinogenicity includes: Group A: human carcinogen; Group B: probable human carcinogen; Group C: possible human carcinogen; Group D: not classifiable as to human carcinogenicity; and Group E: evidence of noncarcinogenicity for humans. Group B is subdivided into two groups: Group B1: limited human evidence for carcinogenicity and Group B2: sufficient data in animals but inadequate or no evidence in humans. The classifications of the carcinogenic explosive chemicals evaluated during the Baseline Risk Assessment are presented in Table 2. Some of the explosive compounds detected in OU 1 are not carcinogens.

For chemicals with cancer effects, the cancer risk associated with a given dose is calculated by multiplying the estimated dose from a given route of exposure by a cancer slope factor. Slope factors are derived from the upper 95 percent confidence limit of the slope of the chemical's extrapolated dose-response curve. A dose-response curve shows the relationship between a given dose and the associated tumor incidence. This conservative model assumes no toxicity threshold and, unlike the noncarcinogens evaluated using the Hazard Index (HI), these risks are assumed to be additive in nature (i.e., cancer is assumed to be systemic rather than target organ-specific). Slope factors used in the risk assessment are listed in Table 2.

A cancer risk is expressed as the likelihood for an individual to contract cancer as a result of an assumed lifetime of exposure to a specific chemical compound. The cancer risks for each compound are added together to produce the total risk from exposure to multiple compounds.

Criteria for Noncancer Effects

A reference dose (RfD) is the toxicity value used most often in evaluating noncancer health effects resulting from exposures to site contaminants. The RfDs used in the evaluation of noncancer health effects depend on the exposure route (oral, inhalation, dermal), the critical effect (developmental or other) and the length of exposure being evaluated (chronic, subchronic or single event). A chronic RfD is an estimate of the daily exposure level for the human population, including sensitive populations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. Chronic RfDs are developed to be protective for long-term exposure to a compound. Chronic RfDs are generally used to evaluate the potential noncarcinogenic effects associated with exposure periods between 7 years and lifetime. Subchronic RfDs are generally used for exposure periods between 2 weeks and 7 years. A summary of the RfDs used in the Baseline Risk Assessment are presented in Table 3.

The projected dose or intake developed in the exposure assessment is divided by the RfD value to compute the Hazard Quotient (HQ). HQs are additive either across pathways of exposure for single chemical, or across chemicals for one or more pathways of exposure to determine a HI. The HI was developed by USEPA to assess the overall potential for noncancer effects posed by chemical exposure. For simultaneous exposure to several chemicals, the HQs are additive only if the chemicals produce the same effect. The HI is not designed as a mathematical prediction of the severity of the noncarcinogenic effects, rather it is an indication of potential adverse effects in view of established RfD criteria for specific chemical compounds.

<u>Risk Characterization</u>

When the calculated cancer risk from lifetime exposure to site-related chemicals is estimated to be more than one additional (excess) cancer case in 10,000 people (1 in 10,000 or 1E-04), remedial action is generally required under the Superfund law. When the cancer risk is between one

TABLE 2

SUMMARY OF CANCER EFFECTS AND SLOPE FACTORS USED FOR THE BASELINE RISK ASSESSMENT
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

Chemical	Cancer Type/Route[a]	Weight-of-Evidence[b]	Slope Factor, $(mg/kg\text{-}day)^{-1}$[a]	
			Oral	Inhalation
DNT	Liver, mammary glands, kidney/Oral	B2	6.8E-01	--
RDX	Liver/Oral	C	1.1E-01	--
TNT	Urinary bladder/Oral	C	3.0E-02	--

NOTES:

(a) Information from the IRIS Database (USEPA 1992) or HEAST Annual 1991 (USEPA 1991) unless otherwise noted. Only chemicals with slope factors calculated by USEPA are included here.

(b) B2: Probable human carcinogen; sufficient data in animals, but inadequate or no evidence in humans.
C: Possible human carcinogen.

TABLE 3

SUMMARY OF NON-CANCER EFFECTS AND TOXICITY VALUES USED FOR THE BASELINE RISK ASSESSMENT
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

		Oral[a]		
Chemical	Effect/Route[a]	Subchronic RfD[b]	Chronic RfD[b]	Confidence Level
DNB	Increased spleen weight/Oral	1.0E-03	1.0E-04	Low
DNT	No information available[c]	--	--	--
HMX	Liver and kidney effects/Oral	5.0E-01[d]	5.0E-02	Low
RDX	Neurological and liver effects, prostate inflammation/Oral	3.0E-03	3.0E-03	High
Tetryl	Liver, kidney, and spleen effects/Oral	1.0E-01[e]	1.0E-02[e]	Low
TNB	Increased spleen weight, decreased hemoglobin levels, testicular atrophy/Oral	5.0E-04	5.0E-05	Low
TNT	Liver effects/Oral	5.0E-04	5.0E-04	Medium

NOTES:
(a) Information from the IRIS Database (USEPA 1992) or HEAST Summary Tables (1991b) unless otherwise noted.
(b) Units of the RfD are mg/kg-day.
(c) No information was available at the time the Baseline Risk Assessment was performed and approved. Values have since been derived by USEPA and are recorded in the HEAST database.
(d) Value calculated from the chronic RfD (without the uncertainty factor of 10 applied in calculating a chronic value from a subchronic study).
(e) Value from Health and Environmental Effects document for this chemical (USEPA 1990).

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additional cancer case in 10,000 and in 1,000,000 people (1 in 1,000,000 or 1E-06), action may or may not be necessary depending on such site-specific factors as location, environmental impact, and noncancer health effects. Excess risk from 1E-04 to 1E-06 is termed the target risk range by USEPA. If the risk is less than 1E-06, action is generally not required unless there are also environmental risks or noncancer health effects. When the total noncancer HI is equal to or less than one (1), it is assumed that there is no appreciable risk that noncancer effects may occur. If HI exceeds 1, there is some possibility that noncancer effects may occur and remedial action may be required.

Results of risks calculated for soil ingestion in the Baseline Risk Assessment are summarized in Tables 4 and 5. Table 4 presents potential cancer risks to adults for 21 exposure areas. These exposure areas represent an approximately 1-acre area in which a residential receptor could carry out the activities identified by the exposure assumptions (i.e., ingest soil, plant a garden, pasture a cow, till a field or install a domestic water supply well). Potential cancer risks above 1E-04 could exist for members of a future resident farm family. The potential risks to a future farm family are greater than those for the future worker, therefore, potential risks for the future worker are not included in Table 4. Results of risk calculations for the future worker are included in the Final OU 1 Baseline Risk Assessment.

Although the OU 1 Baseline Risk Assessment did include calculations that accounted for exposure to garden vegetables, risk from exposure to garden vegetables are not presented in this ROD because calculating risks from garden vegetables has a higher degree of uncertainty. This is because the amount and final deposition of contaminant uptake by plants, the amount of human home-grown vegetable consumption, and the final contaminant deposition within humans is not known. Additional evaluation of plant uptake of explosives will take place under OU 3. Potential risks from inhalation while tilling and ingestion of homegrown beef were found to be negligible. The chemicals found to contribute the majority of the cancer risk were TNT and RDX. Preliminary groundwater risk calculations were performed as part of the FS. Based on highly conservative assumptions, the calculations indicated risks may exceed 1E-04 for a future farm family. A more detailed evaluation of potential risks posed by groundwater contamination at the site was conducted as part of OU 2 and presented in the Final OU 2 Baseline Risk Assessment (Woodward-Clyde Consultants, September 1994).

Noncancer HIs greater than one potentially exist for future resident farm family members. Table 5 presents a summary of potential noncancer effects due to soil ingestion. Noncancer risks due to ingestion of garden vegetables are not presented because of the increased uncertainty associated with these calculations. As with cancer risks, potential noncancer effects from inhalation while tilling and beef consumption were negligible. The majority of the potential noncancer risks are from exposure to TNT, Tetryl, RDX, and HMX.

Actual or threatened releases of contaminants at or from this site, if not addressed by implementing the remedial action selected in this ROD, may present an endangerment to the public health, public welfare or the environment.

TABLE 4

SUMMARY OF LIFETIME RME EXCESS CANCER RISK - SOIL PATHWAYS HYPOTHETICAL FUTURE RESIDENT POPULATIONS

Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

Exposure Area[1]	Risk
LL1A	2E-05
LL1B	1E-03
LL1C	1E-03
LL1D	6E-05
LL1E	2E-04
LL1F	6E-06
LL1G	5E-05
LL2A	1E-03
LL2B	2E-03
LL2C	3E-04
LL2D	1E-05
LL3A	8E-06
LL3B	3E-04
LL3C	1E-06
LL3D	2E-05
LL4A	2E-05
LL4B	2E-07
BPGA	1E-04
BPGB	3E-06
BPGC	7E-07
BBA	2E-07

NOTE: [1] Refer to the OU 1 Final Baseline Risk Assessment for the location of the exposure areas.

TABLE 5

SUMMARY OF RME NON-CANCER RISK - SOIL PATHWAYS
HYPOTHETICAL FUTURE RESIDENT POPULATIONS
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

Exposure Area[1]	Future Farm Family Adult[2]	Future Farm Family Child[3]
LL1A	2	5
LL1B	70	400
LL1C	60	400
LL1D	4	20
LL1E	10	70
LL1F	0.4	2
LL1G	3	20
LL2A	20	100
LL2B	100	600
LL2C	4	10
LL2D	0.06	0.3
LL3A	0.8	3
LL3B	20	100
LL3C	0.1	0.5
LL3D	2	8
LL4A	0.6	3
LL3B	0.02	0.07
BPGA	4	6
BPGB	0.07	0.4
BPGC	0.005	0.02
BBA	1	0.7

NOTES: [1] Refer to the OU 1 Baseline Risk Assessment for the location of the exposure areas.
[2]Valules are chronic hazard quotients.
[3]Values are subchronic hazard quotients.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemical sampling and analysis.
- exposure parameter estimation.
- toxicological data.
- garden vegetable pathway.

Uncertainties in environmental sampling and parameter measurement arise in part from non-uniform distribution of chemicals in the soil sampled. Consequently, there is uncertainty as to the actual quantities of soil containing unacceptable contaminant concentrations. Environmental chemical analysis errors can stem from several sources including the errors inherent in the analytical methods and characteristics of the soil being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals at the exposure point.

Uncertainties in the toxicity assessment are related to extrapolation from animals to humans and from high to low exposure doses, and from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters. As a result, the Baseline Risk Assessment provides upper bound estimates of the risks to populations near the former NOP site.

Dose estimates for the garden vegetable pathway are relatively uncertain. A very limited amount of scientific study has been performed on the uptake of explosives by plants. The uncertainty is due primarily to:

- The amount of explosives uptake by vegetables, represented by the bioaccumulation factor; these factors are often extrapolated across chemicals, are plant-type specific (garden-fruit, root vegetables, etc.), plant-part specific, and soil parameter specific.

- The estimated fraction of total vegetable intake that comes from home-grown sources is conservative.

- Risk calculations that assume the entire garden is planted in contaminated soil, and that the explosives concentrations are uniform across the garden.

- Metabolism of contaminants by plants is not accounted for in the risk calculations.

USACE plans to investigate plant uptake of explosives as part of OU 3.

2.7.2 Potential Environmental Risks

Potential risks to ecological resources at this site appear to be limited to the terrestrial environment in the vicinity of soil contaminated with significant levels of explosives. Plant populations exposed to high levels of TNT and RDX may be subject to growth inhibition and tissue damage. Plant uptake of explosives compounds will be further evaluated under OU 3. Animals that feed in these areas may be exposed to higher than average intakes from feeding on these plants. Little information exists regarding exposure through these pathways. Due to the localized nature of contaminated areas, it is unlikely that population or community effects will occur in the vicinity of elevated soil explosives contamination.

On-site wetlands are not located near areas of contamination at the site and will not be impacted by the OU 1 remedial action. No endangered species or other critical habitat are known to exist in the area.

2.8 SUMMARY OF ALTERNATIVES

Remedial Action Objectives

Remedial action objectives (RAOs) were developed to address the explosives-contaminated soil while considering the long-term goals of protecting human health and the environment and meeting applicable or relevant and appropriate requirements (ARARs) of Federal and State laws and regulations. The RAO for OU 1 at the former NOP site is to minimize risk to human health and the environment from direct contact with soil contaminated with explosives.

The risk management strategy for OU 1 remediation is to address the potential risk to the hypothetical future adult farm resident from ingestion of explosives-contaminated soil. Risk-based RGs are environmental concentrations that are protective of public health and meet RAOs. RGs are based on target risks, risk management strategy, and on assumptions developed by USEPA. RGs were derived using the same intake equations used to calculate risk. RGs governing the excavation and level of soil treatment were developed for target risks of HI=1 and 3E-06 excess cancer risks. These RGs are shown in Table 6.

To meet RAOs, remedial action will consist of excavating and remediating contaminated soil in the upper 4 feet that has explosives concentrations greater than RGs. A 4-foot maximum depth was selected by USEPA as the depth that would prevent direct contact with soil given normal surface activities and conditions. Remediation of additional soil that acts as a long-term source of explosives contamination to groundwater is being evaluated further under OU 2.

Alternative Descriptions

Seven preliminary remedial action alternatives were developed during the FS. These alternatives were designed to address the RAOs. Two of the alternatives were eliminated because they were

TABLE 6

RISK-BASED REMEDIATION GOALS
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

Chemical	Concentration (mg/kg)
HMX	1715.2
RDX	5.8
TNB	1.7
DNB	3.4
TNT	17.2
DNT (2,4- or 2,6-)	0.9
NT	343.0
Tetryl	343.0

determined to be ineffective. The remaining five alternatives were evaluated in detail in the FS Report. The following sections describe these five alternatives. The FS Report provides greater detail for each alternative.

2.8.1 Alternative 1 - No Action

This alternative was included in the FS Report as a NCP requirement to provide a baseline against which other alternatives are compared. The no-action alternative, by definition, involves no remedial action. Therefore, the potential for ingestion of contaminated soil persists and the potential risks are those identified in the Baseline Risk Assessment. On-site contaminated soil would continue to contribute a cancer risk greater than 1E-06 and a noncancer risk greater than HI=1. There are no costs associated with Alternative 1.

2.8.2 Alternative 2 - Biological Treatment

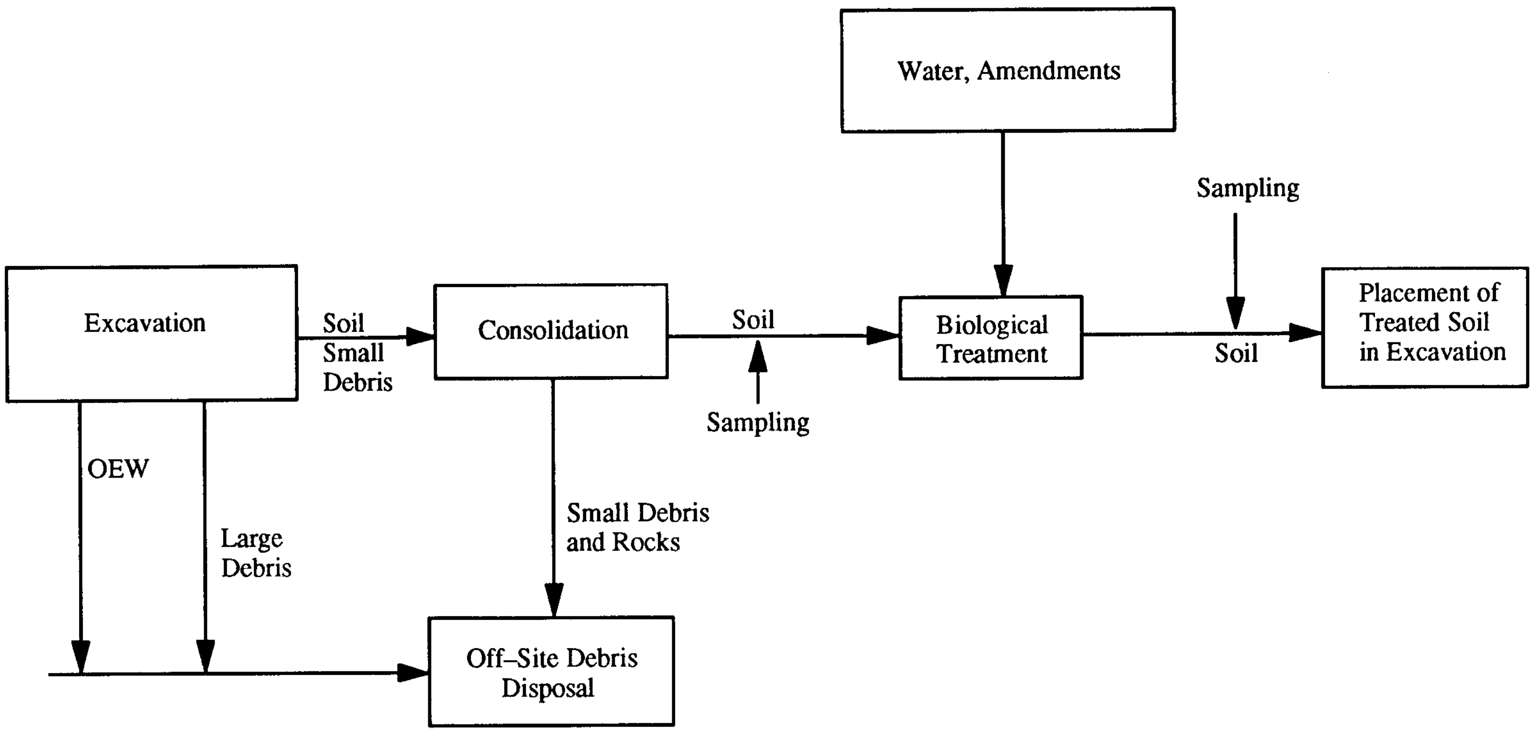
Alternative 2 included treatment of the explosives-contaminated soil through biological treatment. Biological treatment is considered an innovative, alternative technology for explosive compounds. Alternative treatment technologies, as well as cost effective, permanent solutions, are preferred under SARA to the maximum extent practicable. For the purpose of the FS, composting was evaluated. Composting involves mixing soil with organic amendments (such as animal manure) and bulking agents (such as wood chips) to enhance biological activities which reduce the amount of explosives present. Had it been selected, composting biological treatment could have increased (approximately doubled) the volume of treated material due to the addition of these materials. Aerobic and/or anaerobic slurry-based biological treatment could also have been used. Slurry treatment involves mixing water and nutrients with the contaminated soil in a closed vessel to promote biodegradation.

Figure 10 shows the major components of this alternative. The major components of Alternative 2 included the following:

- Excavate contaminated soil and debris.
- Sample to verify excavation to cleanup goals.
- Blend soil to reduce any reactive levels of explosives compounds.
- Treat explosives-contaminated soil using biological treatment and test the soil to verify the degree of treatment.
- Backfill treated soil or compost on-site.
- Dispose oversized material and debris in an authorized off-site landfill.

Table 7 shows estimated costs for this alternative. Capital costs include the direct and indirect costs associated with construction (or implementation) of the alternative. The annual operation and maintenance costs (O&M) are the post-construction costs necessary to ensure the continued

Figure 10
MAJOR COMPONENTS OF ALTERNATIVE 2
Record of Decision
Operable Unit 1
Former NOP Site
Mead, Nebraska



OEW = Ordnance and Explosive Waste

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TABLE 7

ESTIMATED COSTS FOR ALTERNATIVE 2
(BIOLOGICAL TREATMENT)
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

CAPITAL COSTS:	
Soil Removal	$245,000
Biological Treatment	$3,555,000
Treated Soil Placement	$84,000
Residuals Management	$75,000
Groundwater Treatment	$57,000
Equipment Salvage	$-124,000
Subtotal Capital Costs	$3,892,000
Site PreparationRestoration (5%)	$195,000
Mobilization/Demobilization (5%)	$195,000
Health & Safety (8%)	$311,000
Prime Fixed Fee (5%)	$195,000
Subtotal	$4,787,000
Bonds and Insurance (1%)	$48,000
Subtotal	$4,835,000
Scope Contingency (20%)	$967,000
Permitting and Legal (5%)	$242,000
Design Engineering (8%)	$387,000
Construction-Related Services (8%)	$387,000
Total Capital Cost	$6,817,000
O&M COSTS:	
O&M Annual Costs	$124,000
O&M Present Worth Cost (6% discount rate)	$1,700,000
Total Present Worth Cost	$8,517,000
References: Assumptions and calculations for estimated costs are included in the Draft Final Feasibility Study Report for OU 1.	

effectiveness of the alternative. The present worth cost represents the amount of money that, if invested during the current year, would be sufficient to cover all expenditures over the life of the alternative. The cost estimates are conceptual with an estimated +50 percent to -30 percent level of accuracy.

2.8.3 Alternative 3 - Rotary Kiln Incineration

Alternative 3 would treat explosives-contaminated soil using on-site thermal treatment. Possible treatment technologies would include on-site incineration, vitrification, or low-temperature thermal desorption (LTTD). LTTD and vitrification have not been used to treat explosives-contaminated soil at other sites. Incineration is the only thermal treatment technology previously used successfully at full-scale for explosives-contaminated soil.

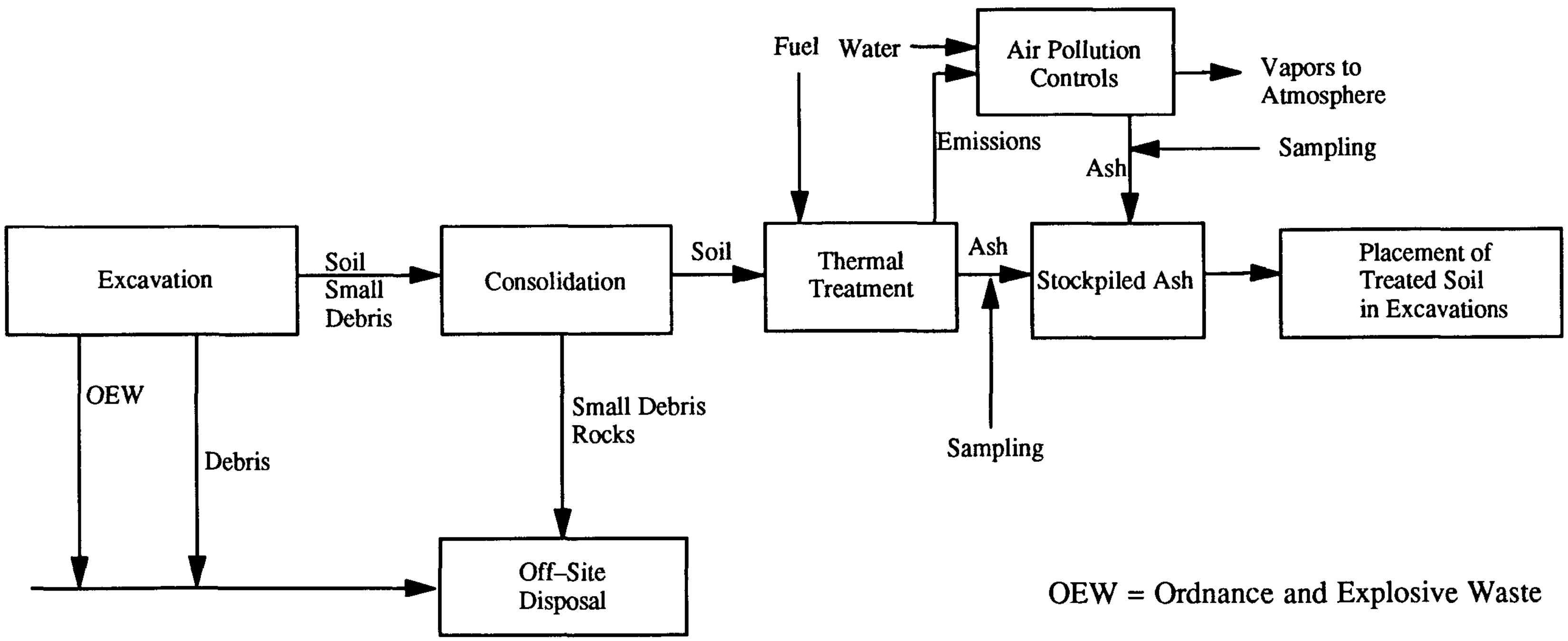
Figure 11 shows the major components of this alternative. The major components of Alternative 3 include the following:

- Excavate contaminated soil and debris.
- Sample to verify excavation to cleanup goals.
- Blend soil to reduce any reactive levels of explosives compounds.
- Conduct a risk assessment based on USEPA's combustion strategy.
- Conduct a trial burn to test the performance and emission controls of the incinerator.
- Treat explosives-contaminated soil using on-site rotary kiln incineration and test the soil to verify the degree of treatment.
- Test treated soil and residuals to verify that they are not hazardous due to the toxicity characteristic (TCLP) for metals. If treatment residual fails TCLP for metals, it will be disposed of at an appropriate off-site facility.
- Blend treated soil and solid treatment residuals, backfill on-site in excavations, and cover with clean soil, as necessary or appropriate, to sustain vegetation.
- Dispose of oversized material and debris in an authorized off-site landfill.

Rotary kiln incineration is the selected thermal treatment technology because LTTD has not been proven for site soil and, although treatability studies indicate vitrification is effective, treatability studies also indicate that vitrification is cost-prohibitive. Thus, rotary kiln incineration is the most cost-effective, proven thermal treatment for the site.

Estimated costs for implementation of this alternative are shown in Table 8.

Figure 11
MAJOR COMPONENTS OF ALTERNATIVE 3
Record of Decision
Operable Unit 1
Former NOP Site
Mead, Nebraska



OEW = Ordnance and Explosive Waste

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TABLE 8

ESTIMATED COSTS FOR ALTERNATIVE 3
(THERMAL TREATMENT)
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

CAPITAL COSTS:	
Soil Removal	$245,000
Thermal Treatment	$7,091,000
Treated Soil Placement	$42,000
Residuals Management	$98,000
Groundwater Treatment	$57,000
Equipment Salvage	$-27,000
Subtotal Capital Cost	$7,464,000
Site Preparation/Restoration (5%)	$373,000
Mobilization/Demobilization (5%)	$373,000
Health & Safety (8%)	$597,000
Prime Fixed Fee (5%)	$373,000
Subtotal	$8,808,000
Bonds and Insurance (1%)	$88,000
Subtotal	$8,896,000
Permitting and Legal (5%)	$445,000
Design Engineering (8%)	$712,000
Construction Services (8%)	$712,000
Scope Contingency (20%)	$1,779,000
Total Capital Cost	$12,543,000
O&M COSTS:	
Annual O&M Costs	$124,000
O&M Present Worth Cost (6% discount rate)	$1,700,000
Total Present Worth Cost	$14,243,000
References: Assumptions and calculations for estimated costs are included in the Draft Final Feasibility Study Report for OU 1.	

2.8.4 Alternative 4 - On-Site Landfill

Alternative 4 would have minimized the potential for soil exposure pathway completion through containment of explosives-contaminated soil in an on-site landfill. The landfill would have been designed with engineering controls meeting the technical requirements described in Resource Conservation and Recovery Act (RCRA) Subtitle C landfill regulations. A 5-year review would have been required under CERCLA to assess the long-term effectiveness of this alternative, because soil contaminated above RGs would have remained on-site.

Figure 12 shows the primary components of this alternative. The primary components of Alternative 4 included the following:

- Clear, grub, and excavate clean soil from the landfill site, and construct the landfill liner and leachate collection system. The liner would have met Subtitle C design requirements or be designed to provide equivalent performance.
- Excavate contaminated soil and debris.
- Sample to verify excavation to cleanup goals. Backfill excavations with clean fill, compact backfill, and revegetate the surface.
- Construct the landfill cover over the consolidated soil and debris. The cover would have met performance requirements for a Subtitle C landfill.
- Erect a fence around the landfill area and implement deed restrictions.
- Conduct groundwater monitoring.
- Conduct quarterly leachate monitoring and collection. Leachate would have been discharged under an National Pollutant Discharge Elimination System (NPDES) process or treated and disposed off-site.

Estimated costs for Alternative 4 are shown in Table 9.

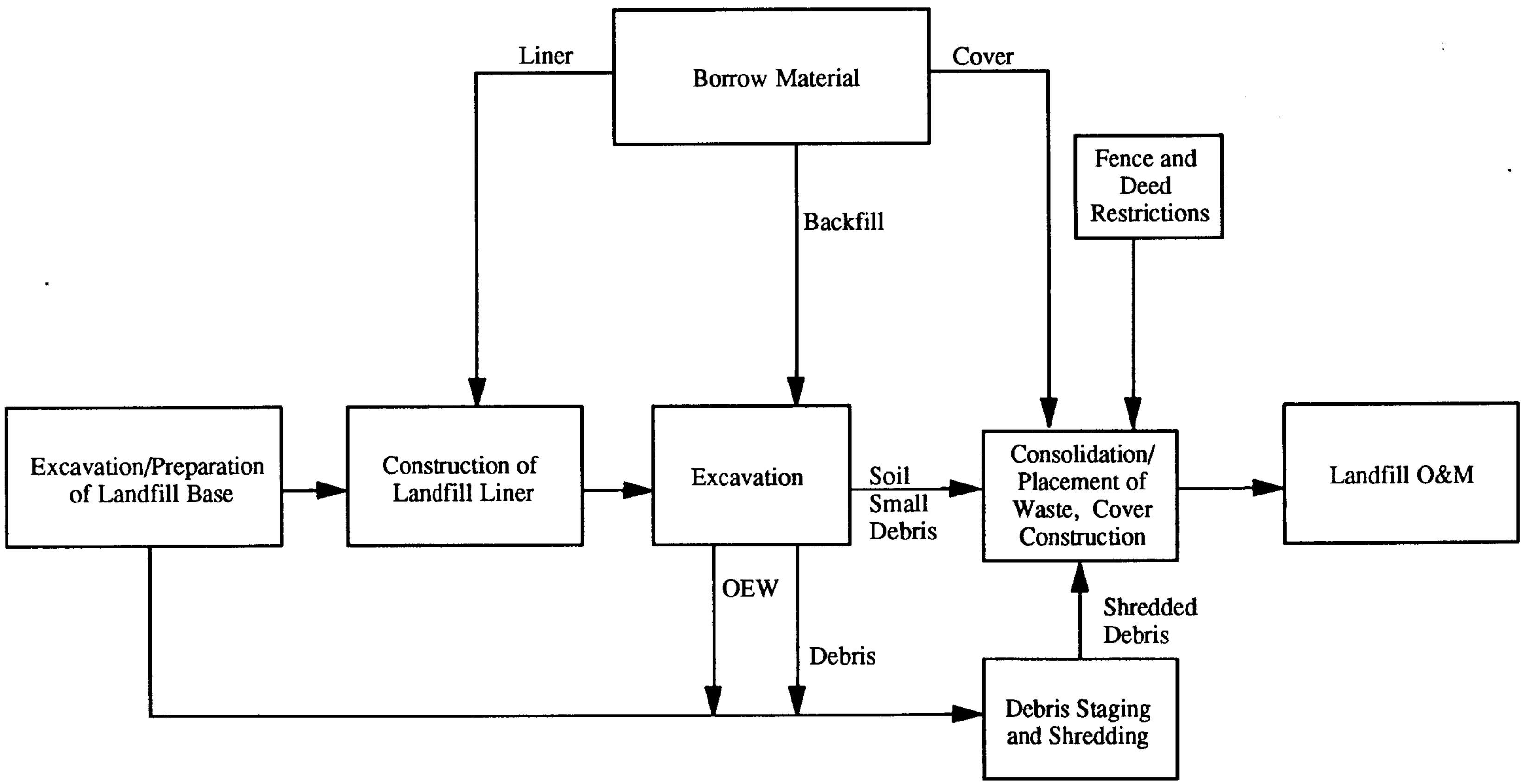
2.8.5 Alternative 5 - Off-site Landfill

Alternative 5 would have included removal of explosives-contaminated soil from the site for disposal in an off-site landfill with engineering controls meeting the technical requirements described in RCRA Subtitle C. Off-site disposal is the least preferred alternative under SARA.

Figure 13 shows the major components of this alternative. The primary components of Alternative 5 included the following:

- Excavate contaminated soil and debris.

Figure 12
MAJOR COMPONENTS OF ALTERNATIVE 4
Record of Decision
Operable Unit 1
Former NOP Site
Mead, Nebraska



OEW = Ordnance and Explosive Waste

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TABLE 9

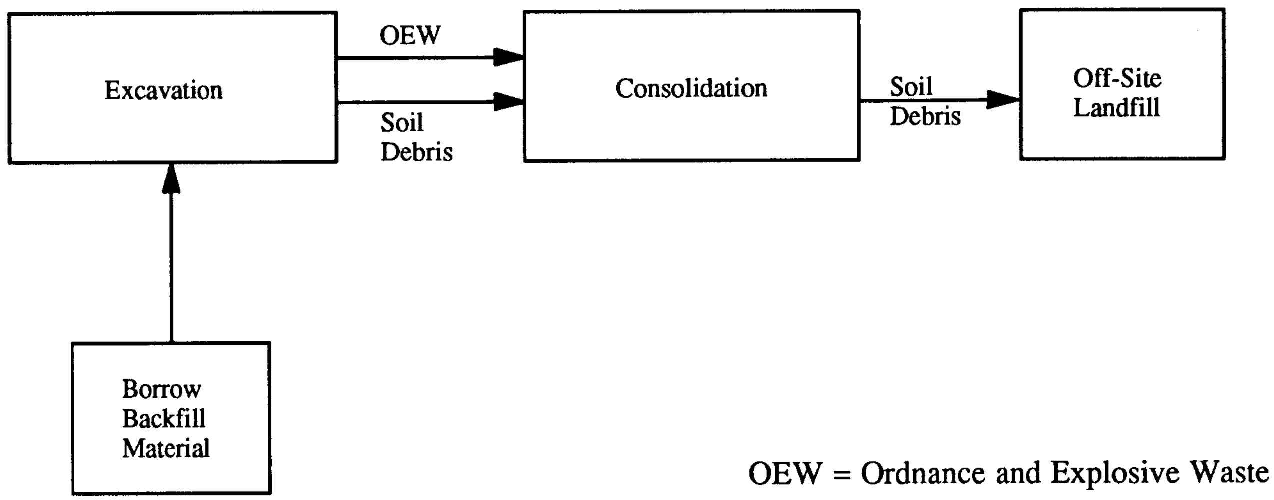
ESTIMATED COSTS FOR ALTERNATIVE 4
(ON-SITE LANDFILL)
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

CAPITAL COSTS:	
Soil Removal	$304,000
Landfill Construction	$404,000
Groundwater Treatment	$57,000
Monitoring Wells	$50,000
Subtotal Capital Cost	$815,000
Site Preparation/Restoration (5%)	$41,000
Mobilization/Demobilization (5%)	$41,000
Health and Safety (8%)	$65,000
Prime Fixed Fee (5%)	$41,000
Subtotal	$1,012,000
Bonds and Insurance (1%)	$10,000
Subtotal	$1,022,000
Scope Contingency (20%)	$202,000
Permitting and Legal (5%)	$51,000
Design Engineering (8%)	$152,000
Construction-Related Services (8%)	$81,000
Total Capital Cost	$1,498,000
O&M COSTS:	
Annual O&M Cost (years 1 through 5)	$166,000
Annual O&M Cost (years 5 through 30)	$148,000
Annual O&M Cost (after year 30)	$26,000
O&M Present Worth Cost (6%)*	$2,200,000
Total Present Worth Cost (6%)*	$3,698,000

*Assumes quarterly monitoring for years 1 through 5 and annual monitoring thereafter.

References: Assumptions and calculations for estimated costs are included in the Draft Final Feasibility Study Report for OU 1.

Figure 13
MAJOR COMPONENTS OF ALTERNATIVE 5
Record of Decision
Operable Unit 1
Former NOP Site
Mead, Nebraska



1204

- Sample to verify excavation to cleanup goals. Backfill excavations with clean fill, compact backfill as needed, and revegetate the surface.

- Haul excavated soil and debris to an off-site landfill with engineering controls meeting the requirements described in RCRA in Subtitle C.

Estimated costs for Alternative 5 are shown in Table 10.

2.9 TREATABILITY STUDIES

Treatability studies were performed to assess the feasibility of rotary kiln incineration, vitrification, and slurry-based biological treatment.

The incineration study consisted of bench-scale treatability tests. The results of the study indicate that explosives-contaminated soil from the former NOP site can be treated to meet RGs and that the treated soil would not be classified as RCRA hazardous by toxicity characteristic testing.

The vitrification study consisted of a bench-scale test. Results of this bench-scale test indicate that explosives-contaminated soil from the former NOP site can be treated to meet RGs. The treated vitrified product was not classified as RCRA hazardous by toxicity characteristic testing, and air emissions did not contain detectable levels of explosive compounds.

The slurry-based biological study consisted of simultaneous laboratory-scale and bench-scale testing. The goals of biological treatability testing were to assess the biodegradability and fate of the explosive compounds. Treatability studies included aerobic, anaerobic, and sequential anaerobic/aerobic treatments. The studies used shake flasks to simulate batch and continuous flow slurry-phase bioreactors. The results of these tests indicate that, under the conditions evaluated, limited treatment of explosives-contaminated soil from the site could occur. RGs were not met during the slurry-based biological study performed for the former NOP site. Further testing and optimization would be required to determine if slurry-based biological treatment or composting would be able to meet RGs.

2.10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

2.10.1 Introduction

USEPA has established nine criteria that balance health, technical, and cost considerations to determine the most appropriate remedial action alternative. These criteria are used to select a remedial action that is protective of human health and the environment, attains ARARs, is cost effective, and utilizes permanent solutions and treatment technologies to the maximum extent practicable. The remedial action alternatives developed in the FS have been evaluated and compared using the nine criteria set forth under NCP 300.430(e)(9)(iii). These nine criteria are summarized as follows:

TABLE 10

ESTIMATED COSTS FOR ALTERNATIVE 5
(OFF-SITE LANDFILL)
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

CAPITAL COSTS:	
Soil Removal and Backfill	$304,000
Soil Disposal	$1,680,000
Groundwater Treatment	$57,000
Subtotal Capital Cost	$2,041,000
Site Preparation/Restoration (5%)	$102,000
Mobilization/Demobilization (2%)	$41,000
Health & Safety (8%)	$163,000
Prime Fixed Fee (5%)	$102,000
Subtotal	$2,449,000
Bonds and Insurance (1%)	$24,000
Subtotal	$2,473,000
Scope Contingency (20%)	$495,000
Permitting and Legal (5%)	$124,000
Design Engineering (2%)	$49,000
Construction-Related Services (3%)	$74,000
Total Capital Cost	$3,215,000
O&M COSTS:	
Annual O&M Costs	$124,000
O&M Present Worth Cost (6% discount rate)	$1,700,000
Total Present Worth Cost	$4,915,000
References: Assumptions and calculations for estimated costs are included in the Draft Final Feasibility Study Report for OU 1.	

1. OVERALL PROTECTION OF PUBLIC HEALTH AND THE ENVIRONMENT addresses whether a remedial action provides protection of human health and the environment and describes how risks which are posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs) addresses whether a remedial action will meet all applicable or relevant and appropriate requirements of Federal and State laws and regulations and/or provides grounds for invoking a waiver.

3. LONG-TERM EFFECTIVENESS AND PERMANENCE refers to the ability of a remedial action to maintain reliable protection of human health and the environment over time, after RAOs have been met.

4. REDUCTION OF CONTAMINANT TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT addresses the anticipated performance of the treatment technologies a remedial action employs.

5. SHORT-TERM EFFECTIVENESS addresses the period of time needed to achieve protection from adverse impacts on human health and the environment that may be posed during the construction and implementation period, until RAOs are achieved.

6. IMPLEMENTABILITY is the technical and administrative feasibility of a remedial action, including the availability of materials and services needed to implement a particular option.

7. COST includes estimated initial capital, O&M costs, and present worth costs.

8. STATE ACCEPTANCE indicates whether the state agency concurs with, opposes, or has no comment on the preferred remedial action alternative at the present time.

9. COMMUNITY ACCEPTANCE is based on comments received from the public during the public comment period. These comments are assessed in the Responsiveness Summary attached to this ROD.

2.10.2 Comparison of Alternatives

Alternatives were compared in the FS with respect to the nine evaluation criteria. This comparison is discussed below. For the purpose of this discussion, the evaluation criteria have been divided into three groups (threshold, balancing, and modifying criteria) based on the function of each criterion during remedial action evaluation and selection.

A. Threshold Criteria

Threshold criteria are statutory requirements that must be satisfied by a remedial action alternative in order for it to be eligible for further detailed evaluation in the FS and subsequent selection. These two criteria are discussed below.

Overall Protection of Human Health and the Environment

Alternative 1 (no action) would not have satisfied the requirement for overall protection of human health and the environment. Estimated risks remaining under the no action alterative would have been the same as those identified in the Baseline Risk Assessment. Alternatives 2 and 3 are the most protective of human health and the environment because they include treatment. The goal of biological treatment is to transform contaminants to less toxic products, therefore, successful application of biological treatment would have permanently reduced the potential for exposure to explosives compounds. Thermal treatment (Alternative 3) is expected to permanently eliminate the potential for exposure by any exposure route through destruction of the contaminants. Alternative 4 would have been protective because it included on-site containment of contaminated soil, thereby interrupting the potential soil exposure pathways. Alternative 5 would have provided protection through containment at an off-site location.

Compliance with ARARs

All alternatives except Alternative 1 could have met ARARs which have been identified for the site.

B. Balancing Criteria

Five balancing criteria are used to identify major trade-offs between the remedial action alternatives which satisfy the two threshold criteria. These tradeoffs are ultimately used to identify the preferred alternative and to select the final remedy. Because Alternative 1 does not meet the threshold criteria, it is not evaluated under the balancing criteria.

Long-Term Effectiveness and Permanence

Had they been selected and effectively implemented, all of the action alternatives would have resulted in risks at or below the target level (cancer risk = 3E-06 and noncancer HI=1) either by interrupting exposure pathway completion or by treating the exposure source (contaminated soil). Alternatives 2 and 3 reduce risks by treating the potential exposure source (contaminated soil). Thermal treatment (Alternative 3) may be more protective than biological treatment (Alternative 2) because it has been proven on a full-scale basis for explosives and has achieved the RGs for explosives compounds during site-specific treatability studies. Alternatives 4 and 5 would have provided long-term effectiveness by interrupting the soil exposure pathways. However, alternative 4 would have required significant long-term maintenance and management and a five-year review. A five-year review is required for those remedial actions that result in hazardous substances remaining on-site above health-based levels. No five-year review would be required for the off-site landfill alternative or the treatment alternatives as long as the treatment alternatives met the RGs. If Alternative 2 had been selected and did not achieve the RGs, a five-year review would have been required.

Long-term controls for the on-site containment alternative (Alternative 4) consisted primarily of cover and leachate control maintenance, groundwater monitoring, and deed restrictions. Maintenance and monitoring are reliable and should have been adequate to detect failure. Deed restrictions would have been reliable only if they had been effectively enforced. Long-term controls at the off-site landfill (Alternative 5) would have been the responsibility of the receiving facility.

Reduction of Toxicity, Mobility, or Volume through Treatment

If effectively implemented, alternatives 2 and 3 are the only alternatives which would satisfy the preference for remedial actions that employ treatment technologies that significantly reduce toxicity, mobility, or volume of the untreated waste. These alternatives would use treatment to destroy or degrade the explosive compounds in the former NOP site soil, thereby significantly reducing the toxicity and mobility of these compounds. Alternative 3 is expected to provide a greater reduction of toxicity and mobility than Alternative 2 because greater contaminant destruction is expected, and because biological treatment (Alternative 2) may produce unknown breakdown products. In addition, it is uncertain whether biological treatment would have achieved the RGs for the site. Thermal treatment is not expected to significantly reduce the volume of soil. Biological treatment would have increased the volume of material if composting had been used. However, the contaminants in the soil would be reduced and, therefore, the volume of contaminated soil should have been eliminated or significantly reduced by both Alternative 2 and 3.

Alternatives 4 and 5 would not have included treatment of contaminated soil. They would not have reduced the toxicity or volume of contaminated soil. Both alternatives, however, would have reduced the mobility of contaminants by containment. Leachate from the on-site landfill would have been collected and treated under Alternative 4, minimizing potential migration to groundwater.

Alternatives 4 and 5 would not have satisfied the statutory preference for treatment under CERCLA Section 121(b). In addition, off-site disposal (Alternative 5) is the least preferred remediation option as noted under CERCLA. Additionally, containment on-site would have been potentially reversible; if containment structures had been breached, exposure pathways would have potential to be completed again.

Short-Term Effectiveness

All action alternatives would have had the potential to generate dust, noise, and increased traffic during excavation activities. Alternative 4 would have provided the most short-term effectiveness because only excavation, on-site hauling, and routine construction activities were involved. Short-term risks to workers, the community (including University of Nebraska personnel), and the local environment from these activities are easily controlled. Short-term risks for Alternative 2 were expected to be similar to those for Alternative 4 because biological treatment was not expected to pose significant short-term risks beyond those associated with excavation. Alternative 5 (off-site landfilling) would have posed additional potential short-term risks to both workers and the community because contaminated material would have been transported off-site. Thermal treatment (Alternative 3) may potentially pose some short-term risk to on-site workers through operations of the treatment facility, and to the community through possible fugitive emissions. A risk assessment will be conducted for the incineration alternative in accordance with USEPA's combustion strategy. The incineration facility will include emissions control equipment, such as a baghouse to remove particulates and afterburners to destroy remaining contaminants or combustion products, to minimize these short-term risks.

An alternative's implementation time is the time it takes from mobilization of facilities and equipment to demobilization. Table 11 lists implementation times that were estimated for each alternative, based on the +50 percent to -30 percent FS level of accuracy.

Implementability

Alternative 5 would have been the most implementable because the construction or process activities involved (landfills and hauling firms) are available. Construction, maintenance, and monitoring included in Alternative 4 would have been implementable, and specialists are readily available. Alternative 3 (incineration) specialists and equipment are also readily available. Alternative 2, biological treatment, would have been the least implementable alternative because it has not been used full-scale on explosives, it is available from only a limited number of vendors, there was uncertainty associated with performance, and it may have been difficult to monitor due to unknown intermediate compounds. Composting requires conventional technology and can be readily implemented using commercially available equipment and materials; however, its application to explosives-contaminated soil is innovative.

Costs

Alternatives were evaluated in terms of estimated capital, O&M, and present worth cost. Estimated costs based on a +50 percent to -30 percent level of accuracy are provided in Tables 7 through 10. These costs were based on a remediation volume of 8,400 cubic yards.

C. Modifying Criteria

The two modifying criteria were evaluated following comment on the proposed plan and are addressed as the final decision is made and the ROD is prepared. The results of the modifying criteria are summarized below.

State Acceptance

This assessment evaluates technical and administrative issues and concerns NDEQ may have regarding each of the alternatives. NDEQ has been actively involved in the entire RI/FS process leading to the development of this ROD, including being party to the Interagency Agreement,

TABLE 11

ESTIMATED IMPLEMENTATION TIMES
Record of Decision
Former NOP Site
Operable Unit 1
Mead, Nebraska

Alternative	Implementation Time
2	32 months
3	15 months
4	8 months
5	4 months

NOTE: Implementation times have an +50/-30 percent level of accuracy.

participating in all technical review and public meetings, oversight of field work, and review and comment on all draft project documents. The Department continues to work toward a final decision for timely remediation of the site.

Community Acceptance

Public comments on the selected remedial action were presented at the public meeting on June 23, 1994. Twenty-four written comments were received during the comment period which extended from June 14, 1994, to August 22, 1994. An additional ten comments were received during the public comment period from February 22, 1995 to March 8, 1995.

In general, the public had differing opinions regarding the use of incineration as the preferred alternative. Nine comment letters fully supported the use of incineration. Nineteen comment letters were received that neither supported nor opposed the use of incineration. Ten comment letters, including one submitted by a public interest group, opposed the use of incineration. A summary of public comments and USEPA/USACE responses are provided in the Responsiveness Summary, Section 3.0 of this document.

2.10.3 Summary

Based on the nine evaluation criteria, Alternative 1 would not have provided protection from the potential site risks and would not have complied with ARARs. Therefore, it did not meet the threshold criteria for selection of a remedial action alternative for the site.

If it had been selected Alternative 2 may have reduced contaminant mobility and toxicity through biological transformation of explosive compounds to other organic compounds, but final transformation products may have been unknown. Slurry-based biological treatment has not shown the ability to achieve the RGs. Additional studies would be required to determine the effectiveness and implementability of biological treatment.

Alternative 3 will be protective of human health and the environment and would attain ARARs. Thermal treatment (incineration) has been proven for explosives-contaminated soil, and will achieve RGs. Thermal treatment provides a greater degree of long-term effectiveness and permanence because it consists of a proven treatment method, and does not rely upon containment of contaminants. Because incineration results in complete destruction of contaminants, no long-term management and maintenance will be required.

If Alternative 4 had been selected, it would have been protective for soil exposure risks, but containment would have been reversible. Alternative 5 would have provided protection, but transferred untreated contaminants to another location. Off-site disposal is the least preferred alternative under SARA.

Implementation for on-site rotary kiln incineration should not pose technical problems, because similar remedies have been implemented at other sites. Had the containment alternatives (4 and 5) been selected, this would have been true for those alternatives also. Biological treatment, however, is a relatively new technology for explosives-contaminated soil and, therefore, may have been difficult to implement.

2.11 THE SELECTED REMEDIAL ACTION

Alternative 3 was selected because it will be protective of human health and the environment, will comply with ARARs, will utilize permanent solutions to the maximum extent practicable, will significantly reduce the toxicity, mobility, and volume of contaminants through treatment, and is implementable. This alternative satisfies the RAOs for this remedial action discussed in Section 2.8.

The major components of the selected remedial action for OU 1 include:

- Excavate contaminated soil and debris.
- Sample to verify excavation to cleanup goals.
- Blend soil to reduce any reactive levels of explosives compounds.
- Conduct a risk assessment based on USEPA's combustion strategy.
- Conduct a trial burn to test the performance and emission controls of the incinerator.
- Treat explosives-contaminated soil using on-site rotary kiln incineration and test the soil to verify the degree of treatment.
- Test treated soil and residuals to verify that they are not hazardous due to the toxicity characteristic (TCLP) for metals. If treatment residual fails TCLP for metals, it will be disposed of at an appropriate off-site facility.
- Blend treated soil and solid treatment residuals, backfill on-site in excavations, cover with clean soil, as necessary or appropriate, to sustain vegetation.
- Dispose of oversized material and debris in an authorized off-site landfill.

2.12 STATUTORY DETERMINATIONS

CERCLA Section 121(d) requires that the selected remedy comply with all federal and state environmental laws that are applicable or relevant and appropriate to the hazardous substances, pollutants, or contaminants at the site or to the activities to be performed at the site. Therefore, to be selected as the remedy, an alternative must meet all applicable or relevant and appropriate requirements (ARARs) or a waiver must be obtained. A discussion of how each ARAR applies to OU 1 is provided below.

2.12.1 Protection of Human Health and the Environment

The selected remedial action will protect human health and the environment through thermal treatment of soil at a depth of 4 feet or less posing risk greater than the target risk. This will eliminate the soil ingestion pathway through which contaminants pose risk.

2.12.2 Compliance with ARARs

The selected remedy will be designed to comply with all ARARs of Federal and State laws. A list of ARARs pertinent to the site is contained in the detailed analysis section of the FS Report. The ARARs that will be achieved by the selected alternative are:

FEDERAL

Clean Air Act of 1963, as amended:

40 CFR 50.1-6, 8, 9, 11, 12, and Appendices A-H, J, K; 40 CFR 60.50-54; and 40 CFR 61.01, 5, 6, 10-15, 19

This regulation is pertinent to excavation and materials handling activities which may cause particulate emission concerns. Control measures, including water or other dust suppressants, truck tarpaulins, covers for soil stockpiles, and temporary structure for the treatment process train, will be used to mitigate particulate values to the atmosphere. Thermal treatment emissions of particulate matter and nitrogen dioxide are also of concern. The air pollution control system for the rotary kiln incinerator will be designed to meet appropriate Clean Air Act requirements.

Clean Water Act of 1977, as amended:

40 CFR 122.1-7, 21, 22, 28, 29, 41-48, 49, 61-64; 40 CFR 125.1-3; 40 CFR 136.1-5 and Appendices A-C; 40 CFR 403.5-7, 13, 15

Fluids from equipment decontamination will be discharged, if needed, to the surface, surface water, or an on-site treatment facility, or will be disposed, if needed, by an off-site facility. Surface or surface water discharge is acceptable for liquid residuals that meet substantive requirements of the NPDES. These regulations are also pertinent to the discharge of process water. Process water may be recycled to quench the ash, sprayed back on-site for dust control, discharged to the surface or surface water, or treated off-site. Discharge limits will be established during the design phase.

40 CFR 125.30-32

This regulation is applicable if effluent discharge factors are fundamentally different from the factors considered by USEPA in the development of the national limits. Under CWA301 and 304, USEPA may require that the effluent be analyzed for explosives, which are not on the analytical list of compounds.

40 CFR 125.70-73

This regulation is applicable if the thermal treatment residual water (if any) discharge limit to surface water is "more stringent than necessary." This regulation specifies requirements for obtaining approval of an alternate effluent limit.

40 CFR 125.100-104

This regulation provides guidelines for preventing discharge of toxic pollutants from material handling and storage areas to waters of the United States.

Public Health Service Act: Title XIV, as amended by the Safe Drinking Water Act of 1986, as amended:

40 CFR 141.11-12; 40 CFR 141.50; 40 CFR 141.60-63; 40 CFR 143.03

Residual water from thermal treatment (if any) and fluids from equipment decontamination will be discharged to the surface, surface water, an on-site treatment facility, or an off-site treatment facility. If it is discharged at the surface, it can percolate into groundwater. This regulation is not applicable to explosive compounds. However, due to the chemical composition of explosives, there is a potential for nitrate in the discharge. Surface or surface water discharge is acceptable for liquid residuals that meet substantive requirements; however, if treatment is required prior to surface discharge, it may be more cost-effective to treat and dispose residual water at an off-site facility. Private use of groundwater is not precluded, therefore these requirements are relevant and appropriate.

Solid Waste Disposal Act (SWDA) as amended by Resource Conservation and Recovery Act (RCRA) of 1976:

40 CFR 261.1-7

This regulation applies to OU 1 in determining the classification of soil and debris as nonhazardous.

40 CFR 261.10, 11, 20-24, 30-33, 268.30,40

Residuals produced through thermal treatment must be tested to determine if they exceed the TCLP.

40 CFR 264.340-351

These technical requirements for incinerators are relevant and appropriate to thermal treatment of soil. Substantive requirements of these regulations will be met.

STATE

Nebraska Surface Water Quality Standards - Title 117:

Ch. 2-4

Residual water from thermal treatment (if any) and fluids from equipment decontamination may be discharged to surface water or an on-site treatment facility in accordance with the substantive requirements of the NPDES permit process. Surface or surface water discharge is acceptable for liquid residuals that meet substantive requirements; however, if treatment is required prior to surface discharge, it may be more cost-effective to treat and dispose liquid residuals at an off-site facility.

Groundwater Quality Standards and Use Classification - Title 118:

Ch. 8

This regulation is applicable because it establishes a classification system for groundwater which is used to develop site-specific standards for discharge to the surface or surface water. Surface or surface water discharge is acceptable for liquid residuals that meet substantive requirements; however, if treatment is required prior to surface discharge, it may be more cost-effective to treat and dispose liquid residuals at an off-site facility.

Rules and Regulations Pertaining to the Issuance of Permits Under the National Pollutant Discharge Elimination System - Title 119:

Ch. 2-66

Residual water from thermal treatment (if any) and fluids from equipment decontamination may be discharged in accordance with the substantive requirements of the NPDES permit process.

Rules and Regulations Governing the Nebraska Pretreatment Program - Title 127:

Ch. 2-38

Residual water from thermal treatment (if any) and fluids from equipment decontamination may be discharged to surface water or an on-site treatment facility in accordance with the substantive requirements of the NPDES permit process. Surface or surface water discharge is acceptable for liquid residuals that meet substantive requirements; however, if treatment is required prior to surface discharge, it may be more cost-effective to treat and dispose liquid residuals at an off-site facility.

Nebraska Air Pollution Control Regulations - Title 129:

Ch. 3

This regulation is applicable due to the potential for particulate matter emissions during excavation.

Ch. 4.6.002

This regulation is applicable to incineration which will meet emission requirements.

Ch. 5

This regulation is applicable to the design of the incinerator stack height.

Ch. 6.007

This regulation is applicable if Ch. 4 emission limits are exceeded. The substantive requirements of a permit may still be required if BACT is applied and if 40 CFR 60 and 61 standards are not exceeded.

Ch. 7

This regulation is applicable due to the potential for particulate matter emissions during excavation.

Ch. 16

This regulation prohibits visible emissions of a capacity equal to or greater than 20 percent.

Ch. 17

This regulation is applicable because of the potential for dust emission during excavation, handling, transportation, and construction.

Ch. 24

This regulation is applicable to the selected remedial action because it incorporates the use of diesel-powered equipment for excavation, handling, transportation, and construction.

2.12.3 Cost Effectiveness

The selected remedial action is cost-effective because it provides overall effectiveness proportional to its costs. The estimated costs of the selected remedy are somewhat greater than the other alternatives, yet provides a much higher degree of overall protection than the less costly alternatives by utilizing a proven treatment method to address the potential risks of the explosives-contaminated soil rather than an unproven treatment method or a containment method. The selected remedy will be effective in the long-term due to the significant and permanent reduction of the toxicity, mobility, and volume of explosives-contaminated soil.

2.12.4 Utilization of Permanent Solutions and Innovative Treatment Technologies to the Maximum Extent Practicable

SARA specifies a preference for utilization of permanent solutions and innovative treatment technologies or resource recovery technologies to the maximum extent practicable. The selected remedial action utilizes a permanent solution but not an innovative treatment technology. Of those alternatives that comply with the threshold criteria, USACE, USEPA, and NDEQ have determined that the selected alternative provides the best balance in terms of long-term effectiveness and permanence, reduction of toxicity, mobility, and volume through treatment, short-term effectiveness, and cost.

2.12.5 Preference for Treatment Which Reduces Toxicity, Mobility, or Volume

By treating soil containing explosives greater than excavation RGs, the selected remedial action addresses one of the principal threats posed by the former NOP site and satisfies the statutory preference for remedial actions that employ treatment to significantly reduce toxicity, mobility, or volume of contaminants in soil. Thermal treatment using rotary kiln (based on the treatability study) will irreversibly reduce the toxicity and mobility of the explosive contaminants.

3.0 RESPONSIVENESS SUMMARY

In June 1994, the U.S. Environmental Protection Agency (USEPA) and the U.S. Army Corps of Engineers (USACE) released the Proposed Plan for the Former Nebraska Ordnance Plant (NOP), Operable Unit 1 (OU1), i.e., soil contaminated by explosives. A public comment period for the Proposed Plan, originally scheduled for June 14, 1994, to July 14, 1994, was extended to August 22, 1994, as a result of requests from the public. During this period, 28 comment letters were received. The USEPA and the USACE sponsored a public availability session on June 15, 1994, and a public meeting on June 23, 1994, during which the preferred alternative was presented and explained to the public and questions and comments were taken for the record.

A second public availability session was held on February 22, 1995, and a second public comment period ran from February 22 to March 8, 1995, to answer additional questions and take additional public comment. During this second comment period 10 comment letters were received.

This Responsiveness Summary serves two functions. First, it provides the decision-maker with information about the views of the community regarding the preferred alternative. Secondly, it provides the USEPA and the USACE responses to comments on the Proposed Plan that were made at the public meeting and submitted in writing during the public comment periods.

3.1 OVERVIEW

The preferred alternative for OU1 at the former NOP that was proposed by the USEPA and the USACE in the Proposed Plan, and presented during related public sessions, was on-site rotary kiln incineration of the explosives contaminated surface soils. Contaminated surface soils are those soils which contain explosives above the cleanup goals established by the USEPA, and which are present within 4 feet of the ground surface.

Verbal public comments on the preferred alternative were documented at the public meeting on June 23, 1994. A total of thirty-eight written comment letters were received during the two public comment periods.

In general, the public was divided over the use of incineration as the preferred alternative. Nine comment letters fully supported the use of incineration. Nineteen comment letters were received that neither supported nor opposed incineration. Ten comment letters, including one submitted by a public interest group, opposed the use of incineration.

3.2 BACKGROUND ON COMMUNITY INVOLVEMENT

Even before the public availability session and public meeting in June, efforts were undertaken to inform the public of steps toward remedial action at the site, and to involve the public in the decision-making process. Community relations activities increased in 1994 with the culmination of the investigation activities for explosives contaminated soils and the necessity for decision-making regarding cleanup of soil at the site. Some of the major activities aimed at involving the community and obtaining their feedback have been:

1. A community survey of residents and local officials via on-site interviews, as well as telephone interviews, was conducted in January 1992.

2. A Community Relations Plan dated May 28, 1992, was prepared that outlines the approach to be taken toward community relations and public participation.

3. Periodic fact sheets were mailed to the public in May 1992, June 1994, August 1994, and February 1995 to provide updates and additional information as necessary.

4. Public meetings were held in May 1989, June 1990, and June 1994 to report on project progress and to solicit comments. Notices of these meetings were provided to the Ashland, Wahoo, Lincoln and Omaha newspapers.

5. Two availability sessions were held at the site in June 1994 and February 1995 to discuss progress, answer questions and discuss concerns.

6. Technical Review Committee meetings are held periodically with representation by the USACE, EPA, NDEQ, Lincoln Water System, Nebraska Department of Health, and the University of Nebraska - Lincoln and the Saunders County Board of Supervisors.

7. An information repository was established at the Ashland Public Library, in Ashland, Nebraska. Site files are also available at the USEPA office in Kansas City, Kansas, and the Nebraska Department of Environmental Quality office in Lincoln, Nebraska.

8. A collect telephone line to the USACE was established so that the public can call to get questions answered without charge.

3.3 SUMMARY OF PUBLIC COMMENTS AND AGENCY RESPONSES

This responsiveness summary includes statements made at the June 23, 1994, public meeting and comments submitted in writing to the USACE during the public comment periods from June 14 to August 22, 1994, and from February 22 to March 8, 1995. It also includes USEPA and USACE responses to those comments and questions.

Comments and questions have been paraphrased or quoted in italic text. Every attempt has been made to accurately preserve the intent of the comment and to include all issues raised. The letters in parentheses following the comments represent the commentors; a commentor key is included on the page following the responsiveness summary. All commentors who raised similar or related comments are referenced.

The official public meeting transcript and written comments on file in the Administrative Record at the Ashland Public Library in Ashland, Nebraska contain the verbatim comments from all commentors. The comments have been grouped according to common issues in order to avoid repetition in the responses, and the issues have been grouped into the following categories for ease of reference:

- Remedial Alternative Preferences
- Biological Alternative
- Air Emission Concerns with Preferred Alternative
- Preferred Alternative Residuals
- Risk Assessment
- Site Characterization
- Regulatory
- Other

3.3.1 Remedial Alternative Preferences

ISSUE 1. *The identification of incineration as the preferred alternative was supported by the Chairman of the Mead Village Board, the University of Nebraska, the Lower Platte North Natural Resource District, and several residents living at or near the site.* (A, F, J, N, O, U, X, AK, AD, AL, AN).

Rotary kiln incineration is a proven technology that has been successfully used at similarly contaminated sites in the country. The USEPA and the USACE agree that based on the Remedial Investigation (RI), Feasibility Study (FS), and experience with explosives-contaminated soil incineration at other sites, rotary kiln incineration is the most appropriate method for addressing explosives-contaminated soil at the former NOP site.

ISSUE 2. *The contamination has been in the dirt for at least 40 years and nobody has died yet, so leave it alone. It will do more harm to put it into the air than leave it alone.* (Z, AA)

A Baseline Risk Assessment (BLRA) evaluates potential carcinogenic and non-carcinogenic health risks to determine if action needs to be taken at a site. A BLRA was conducted to evaluate what potential ecological and human health risks could exist on-site due to the explosives-contaminated soil. According to the National Contingency Plan (NCP), if the results of a BLRA exceed a carcinogenic risk of greater than 1 in 10,000 or a non-carcinogenic hazard index of greater than 1, then cleanup is required. For the former NOP site, the calculated risk exceeded these NCP criteria, therefore, cleanup is required.

Additionally, results of the Remedial Investigation indicate that the explosives contaminated soils have contributed to groundwater contamination in the past, and are a continuing source of contamination to groundwater. Removal of the explosives contaminated soil is necessary to stop further movement of explosives contaminants from the soil to the groundwater.

ISSUE 3. *Using an off-site landfill or an on-site landfill would be a lot cheaper than incineration and quicker in some ways. Full consideration needs to be given to the risks and benefits of*

landfilling, and it should not be essentially discounted because of its low ranking in the NCP's political hierarchy. Licensed off-site landfilling is the answer (M, AA, AF, AH, AI).

The identification of a preferred alternative and selection of a final alternative are based on the best balance of nine criteria used to evaluate remedial action options. The nine criteria are:

- Overall protection of human health and the environment.
- Compliance with applicable or relevant and appropriate federal and state requirements.
- Long-term effectiveness and permanence.
- Reduction of contaminant toxicity, mobility, and volume through treatment.
- Short-term effectiveness.
- Implementability.
- Cost.
- State acceptance.
- Community acceptance.

As stated in the comment, an off-site or on-site landfill would be cheaper and could be constructed in a short period of time. However, two of the other criteria used to evaluate remedial action options are long-term effectiveness and permanence, and reduction of contaminant toxicity, mobility, or volume by using treatment. Because long-term maintenance and management would be required for the landfill to prevent the potential for leaks and failure in the future, the landfill alternatives would not have been as effective or permanent in the long-term. Furthermore, the soil would not be treated prior to landfilling, so there would be no reduction of contaminant toxicity, mobility, or volume.

By destroying contaminants in the soil, incineration does reduce the toxicity and mobility of the contaminants. Because of this contaminant destruction, no long-term maintenance or management are required. Therefore, incineration rates more favorably than either on-site or off-site landfilling when evaluated based upon the long-term effectiveness and permanence criterion, and the contaminant reduction criterion.

In addition to these evaluation criteria, the Superfund law includes a statutory preference for treatment, rather than containment and/or disposal. Also, according to the Superfund law, off-site disposal without treatment is the least favored remedial action. Incineration meets both of these statutory preferences; landfilling does not. Reference "Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA) Section 121(b)."

ISSUE 4. *The University of Nebraska strongly suggests that soil remediation for both Operable Unit 1 and Operable Unit 2 occur concurrently.* (F)

The USEPA and the USACE agree that if OU1 and OU2 soil both require treatment, it would be most efficient to incinerate all soils from both OUs concurrently. Whether or not this is possible will depend on the results of the OU2 Feasibility Study, the timing of the OU2 remedy selection, and public comments on a proposed OU2 remedy.

ISSUE 5. *I do not believe the public has enough information to make an informed decision about this incineration option.* (B, C, H, I, J; N, O, P, and Q)

The USACE has followed the relevant guidance and regulations concerning the selection of a preferred alternative. The information generated consists of several documents, the most important being the Remedial Investigation, the Baseline Risk Assessment, and the Feasibility Study. All of these documents, along with other relevant information concerning this site, are located in the Administrative Record. The USEPA and the USACE believe that the information presented in the documents located in the Administrative Record provide sufficient information on this site and the alternatives considered. In addition, numerous public meetings, Technical Review Committee meetings and fact sheets have provided a substantial amount of information about the site to members of the public.

ISSUE 6. *I think that we are getting hung up on little things here tonight. We've been having a lot of hearings, and now we are trying to get some action and we'd like to keep it going.* (J, N, O, P)

The USEPA and the USACE agree that site cleanup should be conducted as expeditiously as possible.

3.3.2 Biological Alternative

ISSUE 7. *If biological remediation is cheaper and takes less time, why isn't it as effective? Would it get rid of as much or more of the contaminants as incineration? I have found literature on biological treatments to be rather optimistic and hope it will be seriously considered for the Mead plant.* (D, R, V, AN)

The literature referred to was for a biological treatment process called composting. Composting was initially shown to be promising by the United States Army Environmental Center (AEC) in 1982. Since 1982, AEC has conducted extensive studies at the Umatilla Army Depot Activity (UMDA) in Hermiston, Oregon. Composting was chosen to remediate explosives contaminated soils at the UMDA site. However, the UMDA site differs greatly from the former NOP site. For example, the former NOP has eleven contaminants of concern, UMDA has only two. Composting studies have been conducted for TNT and RDX. No composting studies involving all of the contaminants of concern found at the former NOP have been completed. Despite all of the studies that have been conducted, the final products of composting of TNT and RDX are unknown. In other words, these contaminants are chemically transformed in the compost pile, but no one knows exactly what happens to them or what chemicals are formed in the process. As a result, a landfill may have to be constructed to contain the composted material because there may be some hazardous materials that remain in the treated soil. Furthermore, the final treated material volume will be approximately twice the original soil volume due to the addition of amendments. Composting is an innovative technology that is promising; however, at this time it has not been completed successfully at a full scale site.

Treatment of the soil via composting would take more time than incineration. The proposed plan estimates that composting would take approximately 32 months to remediate the site. Incineration is estimated to take approximately 15 months and the actual operating time of the incinerator is estimated to be less than half that.

The Feasibility Study cost estimate did indicate that composting was less expensive than incineration; however, the USACE has a database of incineration of explosives for past sites to examine, whereas composting has no such history. Although the USACE used the most current, best available information to prepare the composting cost estimate, there is a much greater potential for actual costs to differ from estimated costs for composting (for the above reasons) than there is for incineration because of the unknowns associated with composting.

Additionally, the UMDA treatment goals for composting are 30 ppm for RDX and TNT. At the former NOP, the cleanup goals are 5.8 ppm for RDX and 17.2 ppm for TNT. Additionally, the former NOP has requirements less than 5 ppm for TNB, DNB, and DNT. The treatment goals for the former NOP are much lower than those for the UMDA because of the greater potential for future residential development. Therefore, the alternative proposed for remediating the explosives contaminated soils at the former NOP site must be able to achieve substantially lower goals than those set for the UMDA site. The bio-treatability tests conducted during the FS did not meet the clean-up goals for the former NOP site. Incineration treatability testing showed that incineration destroyed all detectable quantities of the contaminants.

ISSUE 8. *How long were biological treatability tests conducted? How close to the target concentrations did the biological treatability studies come?* (C)

The actual time that the soils were treated during the biological treatability study ranged from 8 to 60 days. The length of treatment time was one of the parameters studied in 36 different experiments conducted during the study. The planning, implementation, analysis and reporting for the entire study took over nine months.

Of all the treatment conditions evaluated in the biological treatability studies, none reached the remediation goals for all of the contaminants. Some treatment conditions resulted in better treatment for some of the contaminants than it did for others. The most promising biotreatment results showed significant TNT degradation but very little or no degradation of RDX and 2,4-DNT. In the case of 2,6-DNT, the biotreatment process actually increased the concentration of the contaminant. The following Table shows the concentration of explosives in the treated soils and the remediation goals. The remediation goals were reached for only 6 of the 11 contaminants.

TABLE 3-1

RESULTS FOR THE MOST PROMISING BIOLOGICAL TREATABILITY STUDY CONDITION

Explosives Compound	Contaminated Soil Concentration (mg/kg)	Soil Concentration After Treatment (mg/kg)	Remedial Goal (mg/kg)
TNT	1730	116	17.2
TNB	53.1	6.46	1.7
2,4-DNT	1.59	1.57	0.9
2,6-DNT	0.331 U	6.48	0.9
DNB	1.51	1.38	3.4
o-NT	0.452 U	0.608 U	343.0
m-NT	0.409 U	0.760 U	343.0
p-NT	0.433 U	0.618 U	343.0
RDX	539	451	5.8
HMX	80.3	85.7	1715.2
Tetryl	72.4	0.273 U	343.0

NOTES:

U - No contamination detected. Number represents detection limit.

ISSUE 9. *Composting and aerobic and anaerobic slurry treatments have few similarities, and the advantages and disadvantages of composting should not be used to judge the merits of other remediation treatments. Biological treatability studies should be continued and expanded in order to be given a more appropriate opportunity to show clear success or failure.* (E, T, AI, AN)

Biological treatment (biodegradation) uses microorganisms to mineralize and/or transform the explosives contaminants into other compounds that may be less toxic. Slurry-based and composting biological treatment were both evaluated during the FS. In slurry-based treatment, water and nutrients are mixed with contaminated soil in a reactor to promote biodegradation. Slurry-based biological treatment may occur under either aerobic (with oxygen) or anaerobic (without oxygen) conditions. Composting involves mixing soil with organic amendments (such as animal manure) and bulking agents (such as wood chips) to enhance biological activity.

The treatability studies conducted for the former NOP site were slurry-based to offer a greater chance of achieving treatment (by enhancing contact). The studies were conducted under aerobic and anaerobic conditions, and alternating aerobic and anaerobic conditions. All conditions evaluated in the treatability studies are reported in the Treatability Study Report.

Composting was selected as the representative process option for the biological treatment technology because it is the most widely studied and easiest to physically implement. The FS used the characteristics of composting in evaluating the nine criteria and comparing biological treatment with other technologies. However, in selecting composting as the representative process option, the advantages and disadvantages of both composting and slurry-based biological treatments were considered.

The advantage of composting is that the equipment required is simple; therefore, the associated cost is lower. The disadvantages with composting are that the amendments significantly increase the volume of material resulting from treatment, and the soil/amendment mixture limits the physical contact between the contaminants, organisms, and nutrients required for treatment to occur.

The contact limitations encountered in composting are overcome by using slurry treatment. Because a large volume of water is added to the soil, and the slurry (water and soil mix) can be mixed more readily than a compost mix, there is a much greater chance of achieving the necessary contact among contaminants, organisms and nutrients required for treatment. The disadvantage is that the equipment is much more complicated and expensive, and significant dewatering (drying) is required following treatment.

The USEPA and the USACE believe, based upon the biological treatability studies that were conducted during the Feasibility Study process, that biological treatment was given an appropriate opportunity to succeed.

ISSUE 10. *The variable nature and extent of munitions contamination at the [former] NOP site presents an excellent opportunity to investigate several remediation strategies. Would USACE consider a dual approach in remediating the [former] NOP site, with incineration being the primary* *remedial treatment performed in conjunction with other pilot-scale projects that involve alternative remediation technologies?* (E, F, T)

The variable nature and extent of munitions contamination at the former NOP site does present an opportunity to investigate several remediation strategies; however, USACE's main objective is to clean up the site in the fastest, most economical way while meeting all clean-up goals and remedial objectives. In the opinion of the USEPA and the USACE, the suggested dual approach would not be conducive to achieving this objective.

3.3.3 Air Emission Concerns with Preferred Alternative

ISSUE 11. *The full range of chemicals emitted in stack gases whenever you incinerate hazardous materials has not yet been identified either by type or by volume. Uncontrolled release of gas emissions can occur during the incinerator startup or shutdown or when the waste is fed too fast into the incinerator.* (C, P)

All combustion processes (e.g., gas stoves, automobiles, furnaces, candles, forest fires, camp fires, incinerators) emit a number of chemicals. Some are hazardous, others are not. Many compounds are present at concentrations below that which can be detected, and health effects for all such substances have not been determined. Complete identification, in any controlled combustion system, is not possible due to the high number of compounds and the minute concentrations that can be formed in combustion reactions. The bulk of total unburned hydrocarbons that are produced in combustion processes is usually methane (natural gas, on a weight basis). For incineration, a majority of the contamination will be converted to carbon dioxide and water.

While the specific compounds which may be emitted have not been completely identified, the risks from unknown compounds may be estimated. For conservative estimates a high toxicity value may be chosen and applied to the total quantity of unburned hydrocarbons. Alternate estimates could be made using a weighted average of toxicity values for organic compounds known to be present in the emissions. The risk from such estimates may be added to the risk from compounds with known quantities and toxicities (e.g., Principal Organic Hazardous Constituents measured during the trial burn) to determine total risk. Risk estimates determined by using total unburned hydrocarbons and the weighted average approach have been reported to be small.

The incinerator to be used at the site will be a state-of-the-art unit. During regularly scheduled startup and shutdowns, the system will not feed explosives contaminated material to the incinerator; therefore, no uncontrolled releases to the atmosphere will occur during these periods. During emergency shutdowns, as opposed to routine wastefeed shutoffs, the thermal relief valve will be opened and process gases will be released to the atmosphere. The duration of such events are typically very short (on the order of minutes) and all contaminants and gases released will have already passed through the rotary kiln which will operate at temperatures greater than 1500°F. Because the gases exiting the system during a thermal relief venting will have been exposed to high temperatures in the rotary kiln, explosives contaminants will have been predominantly destroyed prior to being released.

As will be discussed in the responses below, the feed rate into the incinerator is set during the trial burn. The feed rate will be continuously monitored during operations. If this feed rate ever exceeds the operating conditions found during the trial burn, the waste feed system will be shutdown.

ISSUE 12. *Virgin fuel oil, rather than waste fuel oil, should be used to fire the incinerator.* (AI)

The fuel used for the incinerator is a function of the unit design and the availability of local fuels. Potential fuels include propane, natural gas, and fuel oil. Waste fuel oil could be used as a fuel for the proposed incinerator, however, it cannot be a hazardous waste.

ISSUE 13. *Attainment by an incinerator of the current destruction and removal efficiency (DRE) standard does not assure protection of human health and the environment. What mechanisms do you use to assure that emissions standards set in the trial burn are always being met? If you cannot continuously monitor emissions and you do not have a technological instrument available to measure them, how are you going to know whether or not they meet criteria?* (C, D, M, P, AH, AI)

The DRE is a measure of the effectiveness of the combustion process in an incinerator. A trial burn will be performed to establish the operating parameters that must be maintained during normal operation of the incinerator, and adherence to these parameters, once established, will assure that the DRE is attained. A trial burn contains three separate emissions tests run under the same incinerator conditions. The incinerator must pass all three emissions tests to be considered to have passed the trial burn. The trial burn will include many different phases of testing and the incinerator will be operated under more stressful conditions than will be encountered during normal operation, i.e., more contaminated soil than is expected will be used, soil will be burned for a shorter than optimal durations, etc.. Also, only clean soil will be fed to the incinerator until various operating conditions are met. During the trial burn the exhaust stack will be sampled for metals, dioxins, POHCs, PICs (organics), oxygen, carbon monoxide, total hydrocarbons, particulates, and carbon dioxide.

During the trial burn, the operating conditions of the incinerator will be monitored via a computerized control system. The control system will record all readings from the incinerator for evaluation. The record will include the continuous real time readings from the stack gas analyzers (carbon monoxide, oxygen, carbon dioxide and total hydrocarbons) as well as continuous readings of incinerator operating parameters (soil feed rate, temperature of rotary kiln, temperature of the secondary combustion chamber, pressure in the rotary kiln, pressure drop through the air pollution control system, water flow rate in air pollution control system, temperature entering and exiting the air pollution control equipment, induced draft fan speed, flow rate of fuel and air to the burners in the rotary kiln and in the secondary combustion chamber, exhaust gas flowrate and temperature, and other items specific to the incinerator that the regulators require). This computerized record will be reviewed along with the analytical results from the exhaust stack sampling, feed and treated soils sampling, discharge water sampling, and fly ash sampling (solids from the air pollution control system) and a decision will be made regarding the operating parameters of the incinerator (all continuous measurement, as listed above for stack gas analyzers, temperatures, etc.). If the incinerator passes all emission requirements, the incineration of contaminated soils will be allowed to proceed.

The incinerator operating conditions monitored during the trial burn, together with continuous monitoring of stack gas carbon monoxide, oxygen, and opacity will become operating limits. As described above, the operating conditions that will be set as limits depends on the final design of the incinerator, but typically between 15 and 20 separate operating conditions are established. The incinerator will only be allowed to burn contaminated soils as long as all incinerator operating conditions and emission monitors are within the established limits. As during the trial burn, these operating conditions will be continuously monitored and recorded to create a permanent record. If any one operating condition deviates from the limits, then the conveyor feeding contaminated soils into the incinerator will be instantaneously shut down. This is known as the "automatic waste feed cut-off system." This automatic waste feed cut-off system must be regularly tested by the operators to ensure it continues to function, and records of the tests must be maintained.

By conducting the trial burn testing at maximum contaminated soil feed rates, maximum metal content of the soils, and exaggerated or "worst case" operating conditions, and then ensuring that during normal operation the incinerator is always operated at better conditions while burning hazardous wastes, incinerator emissions during normal operations are assured to be better than those measured during the trial burn. Operation of the incinerator in this manner assures that emissions are always within the allowable limits.

ISSUE 14. *EPA's own document stated that there is no way an incinerator can meet it's 99.99% DRE goal.* (D)

EPA is aware that information in certain EPA documents has been misinterpreted to suggest that the 99.99% DRE requirement cannot be met. EPA disagrees. Achievement of the 99.99% DRE will be a requirement. Trial burn data will be available for public review for verification that the requirement has been met.

ISSUE 15. *The hysteresis effect in incinerators means that automatic shutoff devices cannot guarantee immediate cessation of toxic emissions and that actual DREs are depressed.* (D, AI)

The study cited by the commentor states that tests to identify the hysteresis effect have been carried out only on industrial boilers and not on rotary kiln incinerators. USEPA is familiar with the theoretical existence of the hysteresis effect in industrial boilers. However, the modes of operation of industrial boilers and rotary kiln incinerators are very different. The hysteresis effect is the theory that after the waste has stopped being fed to the incinerator, that hazardous emissions may continue for sometime. In a rotary kiln incinerator, even after the automatic shutoff devices stop additional wastes from being fed into the incinerator, the incinerator continues to burn the wastes already in the rotary kiln, and the air pollution control system will continue to remove harmful constituents from the air emissions.

ISSUE 16. *When hazardous materials are incinerated, new products, called products of incomplete combustion (PICs), can be created. Only a fraction of PICs that are emitted in incinerator gases have been identified and few PICs have been fully evaluated for toxicity. Of those that have been identified, some have been determined to be highly toxic. A USEPA 1990 report indicates that combustion systems always produce PICs. Burning explosives-contaminated materials causes the* *formation of PICs which have a high nitrogen content, including nitrogenated polycyclic aromatic hydrocarbons (PAHs) which are highly carcinogenic.* (C, D, AI)

See response to ISSUE 11 for chemicals emitted. Incineration is not 100% efficient. Performance standards for incinerators require that at least 99.99% of the principle contaminant, or the Principal Organic Hazardous Constituent (POHC), be destroyed by the incinerator. When combustion fails to completely destroy the contaminants, Products of Incomplete Combustion (PICs) are formed. The formation of PICs can be minimized by maintaining the initial combustion products under high temperature (1600 - 1800°F) and oxidizing conditions for an extended time (0.5 - 2 seconds). In an incinerator, this is accomplished by using more than one combustion chamber and specially engineered turbulent mixing. Confirmatory monitoring of parameters such as carbon monoxide (the most prevalent PIC) and temperature is used to evaluate whether the incinerator is operating at the conditions found acceptable during the trial burn.

Testing has shown that PIC and POHC concentrations being emitted from the stack during trial burns for state-of-the-art incinerators were about the same, i.e., PIC emissions were very low. Air pollution control devices also remove PICs with the same efficiency as they remove POHCs. In addition, there is no evidence that PICs are necessarily more toxic than POHCs. In fact, data from incinerators have shown that some PICs are non-hazardous.

In response to concerns raised in an EPA Science Advisory Board Report released in 1985 concerning PIC emissions, EPA developed specific PIC control requirements for hazardous waste incinerators. These are maintaining carbon monoxide emissions below 100 parts per million or maintaining total hydrocarbon emissions below 20 parts per million as indicators of complete combustion. In addition, emissions PICs will be measured during the trial burn. Based on research done to date, EPA has concluded that a large percentage of PIC emissions are non-chlorinated low molecular weight compounds, such as methane and ethane. Low molecular weight organic compounds tend to be less toxic and less carcinogenic. For example, methane and ethane, which can be produced naturally by many biological processes, are not known to be carcinogenic and have low toxicity.

The PICs to be analyzed during the trial burn will include 17 chlorinated dioxin and furan compounds as well as organic compounds that will be selected based on their toxicity and potential to be emitted, given the nature of the contamination present in the soil. This PIC emission data will be evaluated in a risk assessment to evaluate whether emission of organic compounds, as well as metals, are at safe levels.

The design of an incinerator has a major impact on the formation of PICs. The incinerators used for soil cleanup projects are designed to ensure thorough mixing of combustion gases with oxygen. The operating requirements will specify that temperatures, combustion gas residence times, and excess oxygen levels are maintained at levels necessary for good combustion. Further, the post-combustion section of these incinerators are designed to minimize the low temperature formation of PICs like dioxins and furans. Based on combustion research conducted by EPA, low temperature formation of dioxins and furans can be controlled by maintaining air pollution control temperatures below 450°F or above 750°F (Combustion Science and Technology, 1990, Vol. 74, pp. 223-244). These incinerators rapidly quench combustion gases to less than 400°F, thereby minimizing the potential for formation of these compounds as PICs.

The potential emissions of the most significant PICs from a health impact standpoint, chlorinated dioxins and furans, as well as other PICs that may be emitted from the contaminated soils will be controlled at safe levels. The design and operation of the incinerator will ensure that PIC emissions will be low.

ISSUE 17. *Incineration redistributes metals rather than destroying them. Incineration of metals renders them more toxic because their surface-to-volume ratio is increased, thereby becoming more easily inhaled or ingested by living organisms, or more easily leached from incinerator ashes buried in trenches or landfills. Metal emissions have not been fully evaluated for toxicity.* (C, AI)

At the former NOP site, soils with elevated metals concentrations are generally not collocated with soils contaminated with explosives. Metals associated with airborne particulates will be removed by the Air Pollution Control System (APCS). At other sites where incineration is being used to burn explosives contaminated soils, all metals criteria have been attained. Samples of the incinerator residuals (soils and fly ash) will be tested for metals following treatment using the Toxicity Characteristic Leaching Procedure (TCLP) to determine whether metals will leach from the residuals above regulatory levels. The TCLP test is intended to simulate the amount of contaminants that will leach from the soils when placed in the environment. If the TCLP standard is exceeded, then the soil will be stabilized prior to disposal in an off-site landfill.

ISSUE 18. *When heat and pressure build up in an incineration process such that injury to personnel or damage to equipment could occur, an emergency relief valve is opened to relieve the heat or pressure. When the TRV opens, emissions go directly into the atmosphere bypassing the pollution control equipment. When the emergency relief valve is opened, there is no way that 99.99 percent destruction and removal efficiency can be met. How much (and what) is going to come out of the emergency dump stack?* (B, C, D, Y)

The Thermal Relief Valve (TRV) is used as a safeguard to prevent injury to personnel or damage to equipment. The TRV is not used to circumvent the Air Pollution Control System (APCS). Temperature, pressure and other parameters are monitored in the incinerator system, and the TRV is opened only if the integrity of the incinerator or APCS is threatened. When the TRV opens, the material feed system shuts down and no more material can be processed through the rotary kiln. When this happens, the incinerator must be brought back on line by an operator, not automatically, and only after a determination is made regarding the cause of the TRV opening and corrective actions to be taken in the future.

The TRV is not used by the operators, it is only used during an emergency. If the TRV is opened, there will be a short-term release of gases that have not passed completely through the air pollution control system. Past EPA evaluations of commercial incinerators have shown that the average length of time the TRV is open during an emergency situation is about 20 minutes.

However, because the TRV follows the primary combustion chamber (rotary kiln or the burning chamber), much of the removal and destruction occurs prior to the TRV. Any risks from TRV openings are associated only with short-term exposures.

The exact type and amount of emissions which may result from opening of the TRV would depend on the design of the particular incinerator unit. The risk assessment to be prepared for the incinerator will take into account emergency TRV openings by estimating actual emissions.

ISSUE 19. *I understand it's possible to design an incinerator system that would not need an emergency relief valve.* (D)

As noted above, the purpose of the TRV on a rotary kiln incinerator is to prevent injury to personnel or damage to equipment during an emergency shut down. USEPA and USACE are not aware of any transportable rotary kiln incinerator designs which do not incorporate a TRV.

ISSUE 20. *The TRV should include mechanisms to monitor emissions quantitatively and qualitatively and the data should be disclosed publicly in writing indicating the quantity and type of materials released in addition to the reasons for the dump stack use within 2 weeks.* (AI)

See Issue 18 for more discussion on releases from Thermal Relief Valves (TRVs). Due to the short duration of these events there is no method to quantify or qualify emissions from an emergency relief. Reports on the duration and reason for opening the TRV, as well as what efforts will be conducted to prevent the situation from occurring again, are required by USEPA. This information will be made available to the public in the information repository at the Ashland Public Library.

ISSUE 21. *Will there be stack monitors and who, besides USACE, would be monitoring the system for particulates and other emissions?* (B, H, M)

The stack has continuous monitors for several parameters: oxygen, opacity, carbon monoxide, and total hydrocarbons. These systems are operated and maintained in accordance with federal and state regulations. The actual sampling of the system will be completed by the contractor under close supervision of the USACE with USEPA overseeing the operation. Results of the trial burn and monitoring will be made available to the public in the information repository.

ISSUE 22. *Stack tests of incinerator emissions should be conducted weekly during the operational phase. These tests should sample for the fullest range of compounds, including dioxins. Results should be publicly available in writing within two weeks of the test. I am concerned about the lack of periodic testing of stack emissions, and potential health threats from those emissions.* (D, M, Z, AA, AI, AM)

Analysis of stack emissions is not cost-effective and would provide no additional protection of public health and the environment. The performance of weekly stack emissions testing throughout the period of incineration operation as the commentor suggested would not be cost-effective. Preliminary estimates indicate the cost of such a testing effort could be $100,000 per sampling event, which would equate to $2 million over a five month incineration operation period.

Perhaps even more importantly, the value of such testing with respect to protection of health and the environment is minimal. Given the state of today's technology, sampling and real time analysis of stack emissions in the field is technically impossible. Following the collection of emission samples, each sample would have to be sent to an off-site independent analytical laboratory for analysis. Analysis of the samples and reporting of the results would take approximately 30 days under normal circumstances. Thus the results of the stack testing would be for emissions that had taken place about 30 days previously. Such a delay would allow no opportunity to evaluate the results and take any corrective measures in the operation of the incinerator.

Of greater value than this type of emissions testing is the continuous monitoring of incinerator operation parameters established in the trial burn. If any one of the established parameters is exceeded during incinerator operations, the incinerator operator has the opportunity and responsibility to take immediate corrective measures to ensure that the incinerator is either brought back into compliance with the established parameters or, if necessary, shut down. Thus while weekly stack emissions for site-specific parameters sounds attractive, given the state of today's analytical capabilities, public health and the environment are better protected by the continuous monitoring of incinerator operation parameters established in the trial burn.

Results of the trial burn and incinerator monitoring will be made available to the public in the information repository in the Ashland Public Library.

ISSUE 23. *Is the methodology used to test the air quality documented in a report which the USEPA oversees? Are there penalties for failure to meet the quality standards of the USEPA? At other sites where explosives-contaminated soil has been incinerated, have there been explosions, and have penalties ever been assessed? At the Cornhusker Army Ammunition Plant (CAAP), significant amounts of solid materials accumulated in the secondary combustion chamber (SCC) (which was supposed to be burning gases only). Two employees were severely burned when attempting to clean out solid materials from the SCC that had clogged the quench vessel located immediately below the SCC.* (C, G, M, AA, AI)

The methodology used to test stack gases during the trial burn will be specified in the trial burn plan and will be approved by the USEPA and the NDEQ before beginning the trial burn. The test methods to be used are governed by federal regulations. These methods have been extensively studied and rigorously evaluated in the field. If standards are not met during the trial burn, the incinerator will not be allowed to operate, and if the incinerator is not operating the incineration contractor will not be paid. The USACE will have staff on-site to monitor the operation of the incinerator and any other activities being performed on site. If operating parameters set as a result of the trial burn are not met during operation, the soils will not be fed to the incinerator.

During the incineration of soils, the dust caused by drying the soils will be carried with the gases into the secondary combustion chamber. It is for this reason that incinerators include particulate control systems (if no solids are carried over then there would be no need for particulate standards on incinerators). At Cornhusker Army Ammunition Plant (CAAP), a steam explosion did occur as a result of this solids carry-over issue. The solids that carried over from the CAAP incinerator into the secondary chamber caused a significant amount of material to collect in the secondary chamber, creating a slag of material in this chamber. A steam explosion occurred when a portion of the hot slag fell into water in the quench tank causing a steam explosion. This was an industrial accident caused by equipment design and was not related to the contaminants at the site. The design problem that caused this accident has been corrected and will not be present in the incinerator for this site.

ISSUE 24. *There should be an independent person or group monitoring the [trial burn] test.* (D)

EPA representatives will provide continuous oversight evaluations during the trial burn. EPA representatives will also provide periodic oversight evaluations throughout the period of incinerator operations to ensure that all sampling activities are in accordance with established protocols. Also, all samples collected will be analyzed by independent laboratories. Finally, the trial burn report and all subsequent reports will be reviewed by EPA and will be made available to the public in the information repository in the Ashland Public Library.

ISSUE 25. *There have been problems with every rotary kiln-type of mobile incinerator put into use to cleanup Superfund sites which would all be considered dangerous to the general populace, on record by the EPA.* (M)

EPA disagrees with the allegation of serious problems with all mobile rotary kiln incinerators, and is unaware of any such EPA record which would support the commentor's allegations. EPA is aware of several sites where rotary kiln incineration has been successfully used to treat explosives contaminated soils similar to those found at the Former NOP site. A discussion of the cleanup efforts at these sites can be found in the EPA publication "Handbook: Approaches for the Remediation of Federal Facility Sites Contaminated with Explosive or Radioactive Wastes", EPA/625/R-93/013, September 1993.

3.3.4 Preferred Alternative Residuals

ISSUE 26. *Will the highly contaminated soil, which is considered an explosive by itself, be diluted before it is put into the incinerator? How would you determine the pretreatment soil concentrations before the soil is fed into the reactor? It is not clear that sufficient characterization has been done to identify areas of high explosives concentrations which could be reactive and cause an explosion simply through handling if enough friction is created.* (C, E, AI)

Field screening analytical techniques will be used to ensure that soil is handled appropriately based upon the concentration of explosives in the soil, and to ensure that soil with contamination above cleanup goals will be incinerated. Soils considered to be an explosion hazard will be hand excavated with non-sparking tools (in accordance with the Army Explosives Center requirements) and mixed with lesser contaminated soils to ensure that no explosion hazard exists during treatment. The Remedial Investigation sampling did characterize soils with high enough concentrations of explosives to be considered an explosion hazard and found that only two areas (one location in Load Line 1 and one location in Load Line 2) contain high enough concentrations of explosives to be a potential explosion hazard. It is estimated that approximately 12.5 cubic yards of soil contain such high concentrations. These areas have been addressed in a removal action that involved fencing the areas to prevent access until the soil can be cleaned up under the OU1 remedy.

ISSUE 27. *In some cases, an incinerator may produce a larger volume of hazardous waste than it destroys. Incineration creates ash and other residues whose toxins are more highly concentrated and which must be disposed at a hazardous waste landfill. It is difficult to understand how soil is going to be non-hazardous enough to return to the place from which it was originally taken. Returning incinerated soil directly to the site may be detrimental to the environment.* (C, M, Y, AI)

This incinerator will not create a larger volume of soils and fly ash than entered the system. Based on the incineration treatability study conducted for the former NOP site, all organic compounds were below detection limits and the metals did not leach out in excess of regulatory standards. The returning of incinerated soils that have met the remediation goals for the site will not be detrimental to the environment because they will no longer be considered contaminated. Incinerator residues will be tested for explosives and metals. Any residues that still contain explosives will be incinerated until the explosives are destroyed; any residues that contain elevated amounts of metals will be disposed of off-site in accordance with State and Federal regulations.

ISSUE 28. *Is water used in the incinerator process? How much? What is done with the water following treatment? What are the costs associated with wastewater treatment?* (D, M, Y, AI)

Water is used as a part of the Air Pollution Control System (APCS). The amount of water used is a function of the type of APCS used. Any water from the APCS will be tested, treated, and disposed of following treatment in an appropriate manner based on the type and amount of contaminants, if any, that the water contains. and their concentrations. The testing, treatment and disposal of the water will be conducted in accordance with appropriate State and Federal regulations. The cost associated with treatment or disposal of APCS water is a function of the volume and concentrations of contaminants in the water. The cost for water consumption, treatment, and disposal is a very small portion of the total project cost.

ISSUE 29. *What are the expected volumes and costs of disposal for fly ash from the incinerator's APCS?* (AI)

The volume of fly ash is a function of the Air Pollution Control System (APCS) used. It is anticipated that up to 10% of the dry soils will be captured as flyash, i.e., 840 cubic yards if 8,400 cubic yards of soil are treated. These materials will be tested following the trial burn to ensure acceptability to be combined with the other treated soils and returned to the excavations.

ISSUE 30. *What constituents (organics and/or metals) will be tested for in the ash when you run a TCLP test?* (H)

The eight RCRA metals (arsenic, barium, chromium, cadmium, lead, mercury, silver, selenium) will be tested for in the ash using the Toxicity Characteristic Leaching Procedure (TCLP) test (see Issue 16 for more on TCLP). Organics will be tested using EPA method 8330 for explosives.

3.3.5 Risk Assessment

ISSUE 31. *There needs to be some explanation of why the Final Baseline Risk Assessment, October 12, 1992, Table 2-5, showing a list of chemicals of potential concern at Nebraska Ordnance Plant, OU1, indicates that some of those difficult materials which incineration can't handle well are included.* (C)

Table 2-5 identifies all of the potentially harmful chemicals detected in OU1. But the Table does not address how high the concentrations of these chemicals are, where they are located, or any other relevant factors. The two types of chemicals listed in Table 2-5 that warrant detailed consideration when an incinerator is the chosen remedy for the contamination are PCBs and metals. The Remedial Investigation showed that PCBs were present in soils at the site, but only at locations separate from the explosives contamination. These PCB-contaminated areas are being dealt with by other means than incineration (see Issue 42 for more on PCB remediation).

Metals were found in OU1 soil samples. Metals are natural components of soil and all soil samples will contain metals at some concentration. Except for a small number of localized areas, elevated concentrations of metals resulting from former NOP operations are not present in the areas of explosives contamination being addressed under OU1. To account for few localized soils areas where metals are elevated, an Air Pollution Control System will be utilized on the incinerator to minimize metals emissions from the incinerator. The potential for metals emissions and the risk posed to human health will be taken into consideration in the incinerator risk assessment.

ISSUE 32. *How are cleanup level concentrations determined? What is the specific test that determines toxicity?* (E)

Cleanup goals for the site were calculated on the basis of the results of the Baseline Risk Assessment (BLRA). In the BLRA, the potential ways that people might take in doses of chemicals were identified and likely exposure scenarios developed. The BLRA for the former NOP site showed that the "Adult-resident" and "Child-resident" scenarios yielded unacceptable total risks. It was for this reason that cleanup was determined to be required. The USEPA then calculated how much the chemical concentrations in soil would have to be reduced to be protective of human health, i.e., determined cleanup level concentrations, by preventing risk to humans above an acceptable level.

The tests that are used to determine the toxicity of chemicals are based on estimating human effects from animal data. If animal data was not used, it would be necessary to rely on data solely from humans. While there is some data from human exposure to certain contaminants, the data is frequently based upon inappropriate exposure conditions or based upon exposure conditions sufficiently rare enough that solid conclusions about the data cannot be made.

For cancer, toxicity tests usually are performed by giving rats or mice varying doses of a chemical to determine the highest dose that the animal can take before showing distinct poisoning symptoms. Statistical calculations are then performed to determine an upper bound estimate of the probability for the animal of developing cancer. A safety margin is then applied to the data to develop conservative conclusions for translation of the data to human exposure.

For non-cancer risks, animals are also used to determine the lowest and highest dose of a chemical that causes identifiable toxic effects. Safety factors are then applied to this dosage information to translate the data to human exposure with conservatism.

Both the cancer and non-cancer toxicity values contain very conservative assumptions designed to protect humans from harm even though the original data is taken from animal studies.

ISSUE 33. *Who decides what risk will be used or what risk the public will accept? The risk factor used should be one in a million or less.* (H, Y)

Currently, the U.S. EPA defines acceptable cancer risk as one in a million for an individual chemical and non-cancer risk as a hazard quotient of 1 or less. This means that for carcinogenic concerns, an individual should not be exposed to more than a one in a million chance of developing cancer from being exposed to a toxic chemical. For non-cancer risks, this means that the daily amount of a chemical taken in by a person should not exceed the dose that should not have any adverse health effects. These levels of cancer and non-cancer risks have parallels in safety standards set by other Federal agencies, such as the Food and Drug Administration.

ISSUE 34. *Because explosives are not naturally occurring compounds, the remediation goals should be set at background levels, or zero. Remediation goals for organics and metals should be set to background.* (M, Y, AI)

The purpose of the Baseline Risk Assessment (BLRA) was to identify the risks and the chemicals causing the risks. Based on the results of the Remedial Investigation and the BLRA, cleanup levels for the explosives were established by the USEPA in accordance with the National Contingency Plan. These cleanup levels ensure that all soils within four feet of the ground surface which could pose a cancer risk greater than one in a million, or a non-cancer hazard index greater than 1, will be excavated and incinerated.

The ideal solution for explosive contaminants at the former NOP would be their total destruction. Because no currently available remediation technology can assure 100 percent destruction of these contaminants, cleanup to zero concentrations cannot be achieved. However, the State and Federal regulations do require that explosives contaminants at the site be destructed sufficiently to remove 99.99% of the contamination.

In general, explosives contaminated soils at the site are not co-located with elevated metals concentrations. This means that in most locations being addressed by OU1, metals concentrations are at or near background levels. Thus, no metals remediation goals are being established as part of OU1. Rather, areas of suspected metals contamination will be addressed under OU3.

ISSUE 35. *What is the cumulative effect on humans and the environment when combining pathways of exposure to explosives-contaminated materials, heavy metals, and explosives?* (AI)

The Baseline Risk Assessment concluded that cancer risks, if cleanup of the site is not conducted, to potential future farm residents in the most contaminated areas might be as high as two in a thousand and that the dose received by these residents might be one hundred times the Reference Dose. Most of this risk was considered to be due to the explosives RDX and TNT. Eating vegetables grown in these areas was considered to be the major route of exposure. These risks exceeded the risks considered acceptable by the USEPA and NDEQ, necessitating cleanup.

ISSUE 36. *Request that full risk assessments be completed for the chosen remedy, incineration, and for the other identified alternatives: biological treatment, containment in an on-site landfill and containment in an off-site landfill. How can the public or USACE move forward until that is done?* (C, H, I, N, O, P, Q, Y)

In selecting the preferred alternative, each of the FS alternatives was compared to nine criteria listed in the National Contingency Plan (see Issue 3 for the criteria). Although not a full risk assessment, many of the nine criteria do in fact take risk into account. For example, the concept of risk is inherent in the criteria "Overall Protection of Health and the Environment", "Reduction of Contaminant Toxicity, Mobility and Volume", and "Long-Term Protectiveness and Permanence." Thus, risk related issues associated with each of the alternatives were evaluated as part of the Feasibility Study evaluation of the nine EPA criteria.
Any alternative that fails to meet the requirements of the nine criteria cannot be implemented regardless of the risk associated with it. For example, the USACE conducted a substantial study of biological treatment for OU1 soils. None of the methods studied reduced explosives concentrations to the levels required to reduce health risks to acceptable levels, which is one of the nine criteria. Since the USACE has been unable to make biological treatment meet the cleanup goals, biological treatment cannot be selected as the preferred remedy and a risk assessment of biological treatment is not necessary.

The USACE identified incineration as the preferred alternative because it is the alternative that best meets the requirements of the nine criteria. In accordance with EPA policy, a detailed risk assessment of the risks associated with incineration will be performed to evaluate potential risks. This risk assessment will be used to identify means to control these risks as much as possible.

ISSUE 37. *The baseline risk assessment should be redone to account for compounds other than explosives and PCBs, to conduct an analysis beyond the screening level done for metals, to assess non-PCB chlorinated compounds, and to account for the sampling deficiencies identified. The baseline risk assessment should take into account key pathways of exposure such as inhalation of vapors, dermal contact with soil, ingestion of milk, garden vegetables, crops and the full food chain. In addition, risk to nursing or pregnant women must be considered as well as effects on wildlife and migratory waterfowl, herbivorous mammals, and seed-eating birds.* (AI)

The Baseline Risk Assessment (BLRA) considered all the potentially harmful chemicals which were detected at the site, not just explosives and PCBs. Key pathways for human exposure were also considered. The BLRA considered soil ingestion, dermal contact with soil, inhalation of dust (PCBs and explosives generate very little, if any, vapors), and vegetable and beef consumption. The BLRA has been reviewed for adequacy and approved by EPA Region VII, NDEQ, and the Army Environmental Hygiene Agency.

ISSUE 38. *All risk assessments should quantify every conceivable concern identified on-site.* (AI)

The Baseline Risk Assessment (BLRA) did quantify risks for all the potentially harmful chemicals detected at the site by all of the significant exposure pathways, as detailed in the response to Issue 36. What the BLRA showed was that not every potentially harmful chemical was present in sufficient concentration in all complete pathways to pose a significant health risk. All significant exposure pathways were addressed, and the results showed that unacceptable risks potentially exist. Addressing "every conceivable complete pathway of exposure" would not increase the total risk relative to the risk already identified, and would have no effect at all on the decision that remediation of OU1 is needed.

3.3.6 Site Characterization

ISSUE 39. *The full extent and nature of the problems and contamination on-site have not yet been determined. Therefore, sufficient and reliable testing has not been conducted to assure that explosives are not co-located with a wide variety of additional contaminants, including metals and PCBs. USACE is attempting to evade significant problems resulting from inadequate and incompetent site characterization by testing to ensure that only explosives-contaminated soil is being fed into the incinerator.* (C, M, Y, AI)

We disagree that sufficient and reliable testing has not been conducted. The USACE has taken 1,560 samples for explosives, 488 samples for metals, 172 samples for volatile and semi-volatile organic compounds, and 530 samples for PCBs at transformer areas. The scope of OU1 was developed specifically to address the areas where explosives contamination in the soil presents a health risk. The sampling has shown that sources of soils contaminants other than explosives are not co-located and, therefore, will not be incinerated. These other areas are being addressed in other actions or OUs. For example, 1,446 tons of PCB contaminated soil was removed from the site in the summer of 1994, and metals contaminated soils are being addressed under OU3.

ISSUE 40. *Waste should be routinely fingerprinted for metals and chlorinated compounds (including PCBs) prior to incineration.* (AI)

Based on the historical process used at the site, and the extensive testing done on OU1 soils, no PCBs, chlorinated compounds or significant concentrations of metals are expected in the explosives contaminated soil. However, testing during the trial burn for the full range of contaminants will be conducted and, due to public concern for PCB contaminated soil being fed into the incinerator, periodic testing for PCBs will be conducted during incineration operation.

ISSUE 41. *Discrepancies exist within the RI Report regarding the detection of explosives in the Burning/Proving Grounds where a wide variety of metals and chlorinated compounds have been found.* (AI)

Table 1-2 of the Remedial Investigation (RI) report states that no explosives compounds were detected in the Burning/Proving Grounds in initial sampling events. However, Section 4 of the RI correctly indicates that, based on additional sampling conducted as part of a supplemental investigation, explosives compounds were found in the soil at the Burning/Proving Grounds. Metals were also detected in the Burning/Proving Grounds but not at significant levels, and the Air Pollution Control System on the incinerator will be designed to account for the metals concentrations that were found. Additionally, no chlorinated compounds have been found to be co-located with the explosives contaminated soils.

ISSUE 42. *Sampling and analysis of PCBs were conducted only around locations that housed electrical transformers and pads.* (AI)

Because PCB contamination is a result of leaking electrical transformers, PCB contamination is expected to be found only around transformers and concrete transformer pads. PCBs were investigated in the Remedial Investigation and were found only in areas where transformers exist(ed) and not in locations where explosives contamination existed. A removal action was initiated in the summer of 1994 that has already removed 1,446 tons of PCB contaminated soil and debris and will be completed by the end of 1995. Testing during the trial burn, and periodic testing during operation of the incinerator will be conducted to ensure no PCBs will be fed into the incinerator.

ISSUE 43. *Standard qualitative analytical procedures were not used in the PCB analysis: samples were not reanalyzed at lower dilutions when PCBs were not detected or were detected at levels much less than the detection limit; 28 percent of surrogates were omitted during sample extraction - therefore results were biased high or low; it was difficult to correlate field screening results with laboratory analytical results.* (AI)

Standard qualitative analytical procedures were used in the PCB analysis. Surrogates are compounds similar to the contaminant of interest which are added in the laboratory to samples to check the results of the analysis for the contaminant. Based upon the information gained from samples where surrogates were added, the PCB results tended to be biased high even though surrogates were not used for all of the samples analyzed. This means that the analysis may have indicated the presence of PCBs in a sample even though PCBs actually may not have existed in the sample. The results, therefore, are conservative since they tend to overestimate the amount of PCB contamination in the soil.

ISSUE 44. *Based on the 1990 soil gas survey, Remedial Investigation, the Baseline Risk Assessment, the Feasibility Study, and the Treatability Study, TCE and other chlorinated compounds are present in the explosives-contaminated soil on-site. Therefore, chlorinated compounds will be burned and dioxins will be formed and spewed into the atmosphere.* (M, Y, AF, AH, AI)

TCE and other chlorinated organic analytes were detected in soil gas, ground water, and soil in the Atlas and Nike Missile Areas. These areas are discrete, are not contaminated with explosives. The USACE is currently evaluating whether contaminated soils in the missile areas have the potential to act as a continuing source of VOC contamination for groundwater. However, such soils, if they exist, will be addressed as part of another operable unit.

ISSUE 45. *Certify that detection limits for all measurements were properly set at background levels for all chemicals of concern in the soils and, where applicable, ground and surface water. The background levels should be representative of uncontaminated areas in eastern Nebraska.* (AI)

A detection limit is a level of contamination below which an analytical instrument using a given analytical method will not be able to detect contamination. By contrast, background levels are levels that are believed to represent the levels that result from naturally occurring local geological conditions rather than man-made contamination. Background levels for naturally occurring compounds, such as metals, are often much higher than detection limits, while the background levels for man-made compounds are effectively zero. Therefore, arbitrarily setting detection limits equal to background is neither appropriate nor technically feasible. Rather, detection limits are established at the lowest levels possible given the limits of technology and the analytical methods employed. The required detection levels used here were established by the protocols required under the Interagency Agreement between EPA and the Army as levels that will protect human health and the environment. The OU1 Remedial Investigation determined that the analytical detection limits were adequate to measure background concentrations of analytes at levels which could adversely affect human health or the environment. Also see Issues 48 and 49 for more information.

ISSUE 46. *The entire site has not been screened for volatile and semi-volatile organic compounds.* (M, AI)

Volatile and semi-volatile organic compounds (VOCs and SVOCs) were investigated in the site-wide Remedial Investigation (RI) and in the Confirmation Study. Based on the results of these studies, VOC and SVOC contamination has been found to be limited to the Atlas and Nike missile areas. The presence of this contamination in these areas is a result of the degreasing operations (cleaning of the missile parts) and consists of limited amounts of TCE. The highest concentration of TCE in soils was 99 parts per billion (ppb) found in one sample in the Nike area. Soil samples were taken in areas where soil gas investigation indicated high concentrations of TCE in soil gas, yet TCE was identified in few soil samples above detection limits. Soil from these areas is not part of OU1 and the soil will not be incinerated under OU1.

ISSUE 47. *The RI Report indicates that soil metal contamination has been identified in the drainage ditch systems; explosives contamination exceeding Preliminary Remediation Goals is located primarily in drainage ditches. Therefore, metals are probably co-located with explosives. There is no reliable and convincing evidence to show that metals and explosives are not co-located.* (AI)

As discussed in Issue 45, metals occur naturally and are ubiquitous in the environment. Therefore, some metals will be present in the explosives contaminated soil. However, metals concentrations in the explosives contaminated areas are, in general, not significantly elevated above background levels. The Air Pollution Control System (APSC) will be designed to remove most metals that may exist in the soil and an incinerator risk assessment will be conducted to evaluate the overall risk that results from all emissions from the incinerator.

ISSUE 48. *Establishment of background levels for metals is inadequate because sampling at five on-site locations was used to establish background levels rather than sampling off-site. Was the background site for metals far enough away from where previous burning occurred?* (D,AI)

It is important to take background samples in locations geologically similar to the site so that representative background levels can be established. Because the site is very large (17,253 acres) and most of the site is unaffected by contamination from the production process, background metal samples were taken on the former NOP site but in areas removed from where the explosives were handled, stored or burned.

ISSUE 49. *The determination that metals must be elevated to five times their background level in order to constitute a level of concern is inappropriate. Because metals uptake can cause bioconcentration of metals in plants, no metal level above background is acceptable.* (AI)

Action levels for metals are commonly set at five times the background level, in lieu of a more sophisticated statistical difference test, in order to determine if metal levels are elevated and action is needed. Metals are generally not co-located with explosives contaminated soils. However, the Air Pollution Control System on the incinerator will be designed to minimize metals emissions and an incinerator risk assessment will be conducted to determine the risk from all incinerator emissions.

ISSUE 50. *Three unidentified detonation pits have not been located.* (Y)

Based upon historical aerial photographs and site surveys, a demolition area was located south of Highway 63. Samples were taken of this area under two previous investigations and no contamination was found. However, under OU3, five suspected detonation craters were identified within the demolition area and samples will be taken during upcoming OU3 field work. These areas are not included in OU1.

ISSUE 51. *The ammonium nitrate, high explosives and finished ammunition storage areas have not been characterized.* (AI)

OU1 addresses explosives contaminated soils which pose a direct contact risk only. The former ammonium nitrate plant area and the high explosives and finished ammunition storage areas will be investigated for elevated levels of nitrates in the groundwater under OU3.

ISSUE 52. *The entire site has not been screened for asbestos. Asbestos-contaminated soil is present throughout the load line areas. This must be addressed prior to selecting a final remediation strategy for OU1.* (AI)

The surface soils around the load lines were not analyzed for asbestos because asbestos was only used at the site in building materials. The buildings at the former NOP are being investigated in OU3.

ISSUE 53. *The entire site has not been screened for unexploded ordnance. Despite what the Proposed Plan and Fact Sheet say, unexploded ordnance has been found on-site. Unexploded ordnance could be encountered during remediation.* (AI)

A removal action was initiated in October 1994, to investigate for, and remove, any unexploded ordnance or related items that may exist on the site. This removal action is expected to be completed this year.

Components of ordnance have been found at the site and there is potential for unexploded ordnance (UXO) or ordnance and explosive waste (OEW) to be encountered during the remediation effort. The Department of Defense has developed criteria which requires that an explosive safety hazard analysis be performed for proposed remediation efforts prior to initiation of remedial activities. The remedial action contractor will be required to perform this analysis prior to initiation of the remediation effort and the Army will oversee the field activities to ensure compliance with these requirements.

ISSUE 54. *Wooden sewer pipes used at the former Weldon Spring Ordnance Works are being remediated because they were found to be contaminated with explosives. Sewer pipes and surrounding soil at the former NOP may also be laden with explosives residue that are sources of contamination. The site sewer system should be investigated to determine what materials were used to construct the pipes, the pipes' location, and whether they contain explosives residue and have leached into the surrounding soil. Consultation of drawings is not sufficient.* (AI)

The former Weldon Spring Ordnance Works (WSOW) plant produced raw materials (TNT) that was shipped to other facilities for loading into ordnance. Wooden sewer pipes were used for discharge of the large quantities of water that was used in the TNT production process. At the former NOP site, the raw product produced at facilities like the WSOW was loaded into ordnance and water was used primarily to washdown relatively minor amounts of residue from the loading process to prevent a buildup of explosive materials in the facilities. Because of the relatively small quantity of water used at the former NOP, as opposed to a raw production facility like the WSOW, process water was discharged directly to drainage ditches rather than to a piped sewer system.

However, because explosives contaminated clothing was laundered in the Administration Area, explosives contamination was found in a culvert pipe near the former laundry facility and this pipe will be removed under this operable unit.

ISSUE 55. *Sampling was conducted mainly in areas suspected to be contaminated. Given approximately 40 years of erosion and tilling, open burning activities in the burning/proving ground, and the lack of information regarding activities conducted during operation, contaminants can be expected to have dispersed very long distances across the site and off-site.* (M, AI)

The Remedial Investigation (RI) was conducted to identify the extent of contamination for the entire former NOP site. During the RI, grid sampling was conducted to determine if dispersion of contaminants over a wide area was a concern. The grid sampling indicated that dispersion is not a concern, and that the contamination existed primarily in the drainage ditches as a result of washdown from the historical production processes. In addition, sampling was conducted in the deeper subsurface soils in all locations where there was a potential, based upon historical aerial photographs, for soils to have been disturbed due to tilling, grading, backfilling, etc.

3.3.7 Regulatory

ISSUE 56. *Based upon our review of the record, there is no question that the explosives-contaminated soil at the [former] NOP site must be managed as RCRA wastes. Immediate and forceful enforcement actions [should] be taken against USACE if it fails to adhere to this regulatory mandate.* (AI)

The USEPA, the NDEQ and the USACE agree that the Resource Conservation and Recovery Act (RCRA) requirements are relevant and appropriate to the remediation efforts to be conducted under OU1 and that the remediation efforts will comply with the substantive requirements of RCRA.

ISSUE 57. *EPA Region 7 and [N]DEQ should acquire the assistance of persons with demonstrated expertise in the manufacturing, detonation, disposal, and incineration of military explosives for regulatory oversight of this project and that his or her credentials be made publicly available upon hiring or execution of a contract.* (AI)

Paragraph 300.120 of the National Oil and Hazardous Substances Pollution Contingency Plan states that: "DOD will be the removal response authority with respect to incidents involving DOD military weapons and munitions, or weapons and munitions under the jurisdiction, custody, and control of the DOD." Although the former NOP is not currently under the jurisdiction, custody and control of the DOD, the Army has expertise in the manufacture, detonation and disposal of unexploded ordnance or ordnance and explosive waste (UXO/OEW) and all remedial activities conducted at this site will include prior clearance of UXO/OEW or activity oversight by UXO/OEW experts within the Army.

ISSUE 58. *Has an incinerator contractor been identified? To what extent does the Army indemnify the incineration contractor and any other contractors who work for the Army?* (C, G, M)

An incinerator contractor has been identified for cleanup of the soils under this operable unit. The USACE will not indemnify the contractor for the incinerator.

ISSUE 59. *Given that the City of Omaha has a much more stringent standard for particulate matter, why was 0.08 per dry standard cubic foot selected as the standard for particulate matter?* (H)

No particulate matter standard has been selected for the site. The value of 0.08 grains per dry standard cubic foot was referenced in the public meeting as the standard because it is the federal standard for incinerators burning hazardous waste (40 CFR 264.343(c)). The standard for the former NOP site will be set during the design in accordance with the substantive requirements of State and Federal regulations.

ISSUE 60. *Nebraska Department of Environmental Quality (NDEQ) offices in Lincoln should have continuously-connected communication to the incinerator operation which will notify the office when the dump stack is in use.* (AI)

EPA has requested that the Army provide immediate phone notification followed by a written explanation for the event if the TRV is used, and the Army has agreed to provide this. Given the anticipated short duration of burning at the site, we believe a continuously-connected communication link would not provide additional protection of public health.

ISSUE 61. *A memorandum of agreement between NDE[Q] and USACE [concerning Cornhusker Army Ammunition Plant] waived the application of enforcement actions and penalties provided in Nebraska regulations. This waiver must not be applied to the Mead site.* (AI)

No such waiver will be applied to this site.

ISSUE 62. *It is imperative that this incinerator be permitted just like the commercial incinerator operating permanently in the State.* (C)

According to the Superfund law, incinerators used for remedies at Superfund sites do not have to be permitted like commercial units. However, the incinerator to be used at the former NOP site will be required to meet all the substantive, as opposed to administrative, requirements of a RCRA permit.

ISSUE 63. *If the Interagency Agreement (IAG) is regarded as an impediment to thorough characterization of the site with respect to chlorinated and other organic compounds prior to remediation of OU1 because of the designation of Operable Units specified in the Interagency Agreement, the agreement should be amended.* (AI)

Given the size of the site, the OUs were created to prioritize investigative and cleanup action at this site and to ensure that the project was divided up into manageable units. This is common at large Superfund sites. Explosives contaminated soils, under OU1, were given the highest priority for cleanup because of their potential to act as a continuing source of contamination to groundwater. Dividing the project into manageable units and prioritizing was helpful in completing this work.

The Interagency Agreement was signed pursuant to Section 120 of CERCLA. The IAG is not an impediment to thorough site characterization.

ISSUE 64. *A federal judge ordered an incinerator shut down because it was violating the law and threatened the public's health. However, the judge's decision was overturned by the Circuit Court of Appeals who ruled that because the cleanup of the Superfund site had already begun, the federal courts had no jurisdiction. The affected community had no opportunity to seek recourse for the problems, malfunctions, violations, and lack of enforcement by the government once the cleanup began.* (C)

The U.S. Court of Appeals for the Eighth Circuit held in Arkansas Peace Center v. Arkansas Department of Pollution Control and Ecology that under Section 113(h) of CERCLA a citizen suit cannot be brought to challenge a Superfund removal action until that action is completed. To expedite Superfund cleanups, Congress made them immune from several different kinds of court challenges. The commentor is correct that options for a suit challenging an ongoing remedy are limited under existing law unless the lawsuit falls within one of the exceptions given in the Superfund law. In response to the underlying concern that the comment appears to convey, the USEPA and the USACE intend to insure that the incinerator is operated in a safe and lawful manner, and to be responsive to community concerns in the event that there are any problems that need to be addressed.

3.3.8 Other

ISSUE 65. *We would appreciate further public notice and input opportunity.* (B, I, P, Q)

As a result of requests from members of the public, the 30-day public comment period was extended from June 14 - July 14, 1994 to end on August 22, 1994 to provide additional time for public comments to be submitted. The proposed plan, public meeting, public comment period, and this responsiveness summary are Superfund requirements which provide the public with information regarding the investigations and decisions about the site and to seek public input for those decisions. Documents for the site have been placed in the information repository at the Ashland Public Library for public review. USEPA and USACE have attempted to provide the public with additional information by holding additional meetings, preparing fact sheets, holding Technical Review Committee meetings, and holding public availability sessions at the site.

ISSUE 66. *A shotgun or other firearm should not be used to remove slag stuck to the incinerator.* (AI)

A shotgun will not be allowed to be used in this project. See also Issue 23 for more discussion relating to this issue.

ISSUE 67. *Information requests were made regarding indemnification agreements and the liabilities for current non-DOD landowners and taxpayers should any problems arise at the site during remediation.* (AI)

There are no indemnification agreements between non-DOD landowners and the Army at this site.

ISSUE 68. *I am concerned with solvent [VOC] contamination in the groundwater spreading southeast. Will there be free water testing for area residents? If the affected ground is not removed, how much water over time will be affected?* (L, R, S)

Private well testing is being conducted on a quarterly basis for those wells in or near the groundwater contamination plume. Bottled water or water treatment has been provided for residents when sampling has indicated that the groundwater is contaminated with concentrations of site-related contaminants above federal standards or health advisories, as applicable. Additionally, water will continue to be provided for affected (current and future) residents.

This responsiveness summary addresses OU1, but we agree that the excavation of explosives contaminated soil is an important factor in alleviating future groundwater contamination. OU2 addresses existing groundwater contamination and additional soil below a depth of 4 feet that is a continuing source of contamination to groundwater. The removal of explosives contaminated soil by OU1 will significantly reduce the source of explosives contamination to groundwater.

The USACE is currently evaluating whether contaminated soils in the missile areas have the potential to act as a continuing source of VOC contamination for groundwater. However, such soils, if they exist, will be addressed as a part of another operable unit.

ISSUE 69. *There is a rumor that some of the contaminated soil is being transported to a location down south. Is this true?* (L)

Neither EPA, nor the USACE, have arranged for soil to be transported off-site with the exception of small quantities of soil that were taken to a laboratory to be used in bench-scale treatability studies conducted for the USACE by its' contractor. EPA will attempt to determine whether excavation is taking place on behalf of third parties.

ISSUE 70. *The Corps needs to begin at once the cleanup of contaminated groundwater.* (M)

At the time of negotiation of the Interagency Agreement, the parties agreed to organize the site into three operable units in order to address the multiple site issues in an efficient manner. Operable Unit 1, the explosives contaminated soils, was designated for investigation and cleanup first in order to remove those soils which were a direct contact threat to on-site workers, students and other members of the general public, and which were also acting as a continuing source to the groundwater contamination. However, work on Operable Unit 2, the contaminated groundwater, is also a high priority for action. The USACE is developing plans for containing the portion of the groundwater plume contaminated with TCE as a removal action. This removal action will stop the further migration of the TCE contaminated groundwater. The public will have the opportunity to review and comment on the Engineering Evaluation/Cost Analysis (EE/CA) for the containment project very soon. Although containment of the TCE plume does not complete all the action that will be required for the contaminated groundwater, the Superfund law requires that the removal action will be consistent with the final groundwater cleanup plan. The investigation of groundwater contamination, and the analysis of final cleanup alternatives, has been undertaken concurrently with the soils cleanup analysis process, and is nearing completion. As with Operable Unit 1, a Proposed Plan for cleanup of the contaminated groundwater will be issued for public review and comment prior to a final decision being made.

ISSUE 71. *It does not appear that the full costs associated with incineration have been calculated.* (AI)

The FS costs for all alternatives are calculated to be a -30/+50% estimate used for the purpose of comparing alternatives (cost is one of the nine criteria). This means that the actual cost could range from 30% below to 50% above the estimate if all criteria, components or conditions remain the same. Cost estimates for the selected remediation will be refined during the remedial design phase.

ISSUE 72. *Can those who have made comments or questions identify their affiliation, if any, or their place of residence? Maybe the people living in this area should have a little more to say in the cleanup situation than people or groups that are representing others.* (J, K, X)

Most commentors did identify their address and affiliation in their comment. The record reflects this information. USEPA and USACE have attempted to address all public comments regardless of the residency of the commentor.

ISSUE 73. *I would like to see the Corps of Engineers use skilled local craftsmen in the site cleanup efforts.* (AL)

The cleanup contract will be performed by a contractor selected in accord with the Federal Acquisition Regulations and the contractor will be required to comply with the laws, regulations and executive orders applicable to such contracts. While the Corps of Engineers cannot mandate the hiring of local craftsmen, contractors generally hire local workers to the extent a local work forces exists with the necessary skills because cost savings can be realized by such hiring practices.

ISSUE 74. *We would like to express our concern with the amount of time it is taking to begin cleanup. We would like to see the contaminated soil cleaned up as soon as possible.* (L, Y, AJ)

The USEPA and the USACE also want to see the contaminated soil cleaned up as soon as possible. Rotary kiln incineration will result in the explosives contaminated soils being cleaned up sooner than biological treatment for two reasons. First, rotary kiln incineration is a proven treatment technology for explosives contaminated soils, therefore, no lengthy treatability studies to determine whether it will effectively treat such soils will be required. Because biotreatment of explosives contaminated soils is not a proven technology, treatability studies would be required before soil cleanup could begin. Second, rotary kiln incineration requires the shortest time to treat site soils to the required cleanup levels of the treatment options considered.

The landfilling alternatives would result in the removal of contaminated soil more quickly than treatment by incineration. However, landfilling simply moves the contaminated soils from one location to another, whereas, rotary kiln incineration would result in actual destruction of contaminants. See Issue 3 for a more complete discussion of the landfilling alternatives as compared with incineration.

ISSUE 75. *Will there be testing for radioactive materials that were buried in the Mead area?*

The USACE has analyzed a limited number of samples for radioactivity near the burning/proving grounds, and has not identified any elevated levels of radioactivity in the samples analyzed. Those results can be found in the April 1989 Confirmation Study Final Report.

The University of Nebraska has been issued a permit by the Nebraska Department of Environmental Quality for the burial of radioactive materials on-site. The buried materials are associated with University research efforts and consist of such items as paper, glass, liquid scintillation vials, etc. The University of Nebraska has installed groundwater monitoring wells downgradient of the burial areas, and is responsible for monitoring those wells in accordance with the conditions of the burial permit. Further information can be obtained from the University of Nebraska Agricultural Research and Development Center at (402) 624-8000.

SUMMARY OF COMMENTORS

Public Meeting, June 23, 1994

The following people made oral comments:

A Douglas Gustafson
B Pat Sheele
C Lynn Moorer
D Melissa Konecky
E Steve Comfort
F Richard McManaman for Dan Duncan
G Mark Hutcherson
H Dorothy Lanphier
I Lori Moseman
J John Kirchmann
K Karen Johnson
L Viola Irvin
M Denise Meyer
N Richard McManaman
O Larry Heldt

The following people made written comments at or outside of the public meeting:

A Douglas Gustafson
D Melissa Konecky
E Steve Comfort
F Dan Duncan
I Lori Moseman
J John Kirchmann
L Viola Irvin
M Denise Meyer
N Richard McManaman
P Harland and Judy Schauer
Q Ione Hall
R James Morgan
S Mary Eggeling
T Patrick Shea
U John Miyoshi and Larry Angle
V Wendy Hall
X Tricia Kirchmann
Y Larry Meyer
Z Mr. and Mrs. Robert Drews and Family
AA Lester and Evelyn Drews

AB Joe Francis (NDEQ)
AC Doris Karloff
AD Saunders County Board of Supervisors
AE Victor Sedlacek
AF Stephen Exon
AG Jacqueline Eihausen
AH Heather Exon
AI Michael Ryan and Lynn Moorer
AJ Doug and Viola Irvin
AK Gene Lewis
AL Tom Banks
AM Dorothy and D. Konecky
AN Larry Erickson