PB98-964304
EPA 541-R98-167
March 1999

EPA Superfund Record of Decision:

Iowa Army Ammunition Plant OU 1 Middletown, IA 9/29/1998

RECORD OF DECISION

IOWA ARMY AMMUNITION PLANT
SOILS OPERABLE UNIT #1

MIDDLETOWN, IOWA

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
OMAHA DISTRICT
OMAHA, NEBRASKA

AUGUST, 1998

This document is intended to comply with the National Environmental Policy Act of 1969

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ACRONYMS

ATL	Alternate Treatment Level
ARAR	Applicable or Relevant and Appropriate Requirement
BDAT	Best Demonstrated Available Technology
BLRA	Baseline Risk Assessment
CAA	Clean Air Act
CAMU	Corrective Action Management Unit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
2,4-DNT	2,4-Dinitrotoluene
EPA	U.S. Environmental Protection Agency
g	Grams
g/dscm	Grams Per Dry Cubic Meter at Standard Conditions
g/dscf	Grams Per Dry Cubic Feet at Standard Conditions
HAL	Health Advisory Level
IAAAP	Iowa Army Ammunition Plant
I.A.C.	Iowa Administrative Code
IDNR	Iowa Department of Natural Resources
IEQA	Iowa Environmental Quality Act
kg	Kilogram
LDR	Land Disposal Restriction
LTTD	Low Temperature Thermal Desorption
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/kg	Milligrams Per Kilogram
mg/L	Milligrams Per Liter
Mg/yr	Megagrams Per Year
mrem	Millirems
MSWLF	Municipal Solid Waste Landfill
NAAQS	National Ambient Air Quality Standard
NCP	National Contingency Plan
NESHAP	National Emission Standard for Hazardous Air Pollutant
NPDES	National Pollutant Discharge Elimination System
NRL	Negligible Risk Level
OU	Operating Unit
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
pCi/L	Pico Curies Per Liter
pH	Unit of Measure for Hydrogen Ion Concentration

ACRONYMS (Continued)

PM_{10}	Particulate Matter (particles with an aerodynamic diameter less than or equal to a nominal 10 micrometers)
ppm	Parts Per Million
RCRA	Resource Conservation and Recovery Act
RDX	1,3,5-Trinitro-1,3,5-triazacyclohexane
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SDWA	Safe Drinking Water Act
SVOC	SemiVolatile
SWMU	Solid Waste Management Unit
TBC	To Be Considered
TCLP	Toxicity Characteristic Leaching Procedure
1,3,5-TNB	1,3,5-Trinitrobenzene
TNT	Trinitrotoluene
2,4,6-TNT	2,4,6-Trinitrotoluene
TSCA	Toxic Substances Control Act
T/S/D	Treatment/Storage/Disposal
U.S.C.	United States Code
UST	Underground Storage Tank
$\mu g/m^3$	Micrograms Per Cubic Meter

1.0 DECLARATION

Site Name And Location

Iowa Army Ammunition Plant (IAAAP)
Soils Operable Unit #1 (OU#1)
Middletown, Iowa

Statement of Basis And Purpose

This decision document presents the selected remedial action for the Soils Operable Unit #1 at the Iowa Army Ammunition Plant (IAAAP) in Middletown, Iowa. The remedial action 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 information in the site Administrative Record file, which is located in the following information repositories:

Iowa Army Ammunition Plant
Visitor Reception Area
Building 100-101
Middletown, Iowa 52683-5000
(319) 753-7710

Burlington Public Library
501 N. Fourth Street
Burlington, Iowa 52601
(319) 753-1647

Danville City Hall
105 W. Shepard
Danville, Iowa 52623
(319) 392-4685

The U.S. Army (Army) has coordinated selection of this remedial action with the U.S. Environmental Protection Agency (EPA). The Army is the lead agency for implementing the remedial action at the IAAAP. As the support agency, the EPA oversees the cleanup activities conducted by the Army to ensure that requirements of CERCLA/SARA, the NCP, and the Federal Facilities Agreement between the Army and the EPA have been met. EPA concurs with the selected remedy. The State of Iowa has not participated in the review of CERCLA clean up activities at the IAAAP and has declined to comment upon the selected remedy presented in this Record of Decision (ROD).

Assessment of The Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

Description of The Selected Remedy

The IAAAP has been divided into a Soils OU (OU#1), a Groundwater OU (OU#3), and an Installation-Wide OU (OU#4) to facilitate management of contamination at the site. The Soils OU#1 addresses contamination in the soils. The Groundwater OU#3 addresses contamination of groundwater within the IAAAP boundaries and potentially off-site. The Installation-wide OU#4 addresses other unacceptable risks not addressed in either OU#1 or OU#3. The Remedial Investigation for the Soils OU is complete and has been followed by a Feasibility Study (FS). Additional data have been requested by the EPA to complete the investigation of the Groundwater OU and the Installation-Wide OU.

An interim remedial action for the Soils OU#1 called for the temporary stockpiling, for future treatment, of the most highly contaminated soils and the permanent disposal of the remaining contaminated soils from various sites at the IAAAP. The Interim Action ROD specified that the most highly contaminated soils will be stockpiled in the on-site Corrective Action Management Unit (CAMU), which was constructed to specifications which meet Resource Conservation and Recovery Act (RCRA) Subtitle C landfill requirements. The remaining contaminated soils will be permanently disposed in either the on-site Soil Repository, which is also constructed to RCRA Subtitle C landfill specifications, or the on-site Inert Landfill. A synthetic liner (HDPE) and GCL cover system will cover contaminated soils placed in the Soil Repository. The cover for the Inert Landfill is of similar design to the Soil Repository cover, absent the GCL. Soils in both the Soil Repository and Inert Landfill will remain on-site for long-term management.

The remedial action presented in this Record of Decision is intended to provide for treatment and ultimate disposal of soils, which are being temporarily stockpiled in the CAMU as a result of the interim action. Soils stockpiled in the CAMU are managed based on the nature of contamination:

- Explosives-contaminated soils
- Explosives plus metals contaminated soils
- SVOC-contaminated soils

Any long-term monitoring needed to evaluate the performance of the remedy, land usage restrictions as required, a closure plan to address the CAMU, and the identification and inclusion of any other contaminated areas requiring remediation will be addressed in the Installation-Wide OU #4.

The major components of the selected remedy include:

Explosives-Contaminated Soils

- Excavate explosives-contaminated soil from the CAMU and transport it to a temporary treatment facility on-site.

- Screen, shred and blend the soil to produce a uniform feed material.

- Process the blended soil through a mobile direct-fired low temperature thermal desorption (LTTD) unit (Selected Remedy) or a temporary Biological Treatment unit (Contingent Remedy).

- Following confirmation sampling, dispose of treated soil according to the following criteria:

  A. For soils with cumulative risks less than 10^{-6}, in compliance with LDRs, and exceeding Summers model remediation goals, dispose in the Soil Repository or under another synthetic landfill cap on-site.

  B. For soils with cumulative risks less than 10^{-6}, in compliance with LDRs, and satisfying Summers model remediation goals, dispose on IAAAP property in an appropriate manner protective of human health and the environment. For Biotreated soils, treatment residuals must also be shown to be non-toxic or not bioavailable at levels posing a threat to human health or the environment.

Explosives Plus Metals Contaminated Soils

- Excavate explosives plus metals contaminated soil from the CAMU and transport it to a temporary treatment facility on-site.

- Screen, shred and blend the soil to produce a uniform feed material.

- Process the blended soil through a temporary solidification/stabilization facility.

- Following sampling to confirm compliance with TCLP based remediation goals. dispose of treated soil on-site in the Soil Repository or under another synthetic landfill cap.

SVOC-Contaminated Soils

- Excavate SVOC-contaminated soil from the CAMU.

- Transport the soil to a commercial waste treatment and disposal facility off-site.

Statutory Determination

The selected remedy is protective of human health and the environment, complies with Federal and State of Iowa requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This action utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this site and satisfies the statutory preference for remedies that employ treatment to reduce toxicity, mobility, or volume as a principle element.

Because this remedy may result in hazardous substances remaining on-site above health based levels, depending upon the method of treatment selected, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. This review may be based on or incorporated into a similar review which is required to be conducted within five years after commencement of the Soils OU#1 interim remedial action that disposes contaminated soil in the on-site Soil Repository and Inert Landfill.

for William Rice

Dennis Grams, P.E.
Regional Administrator
U.S. Environmental Protection Agency
Region VII

9/29/98

Date

Jyuji D. Hewitt

Jyuji Hewitt
Lieutenant Colonel, OD
Commander, Iowa AAP

19 Aug 98

Date

Norman E. Williams

Norman E. Williams
Major General, U.S. Army
Chief of Staff, U.S. Army Material Command

21 Sep 98

Date

CONCURRENCE

Installation Remedial Project Manager — Date 8/19/98

Major Subordinate Command Project Manager — Date 25 Aug 98

Installation/MSC Legal Advisor — Date 28 Aug 98

2.0 DECISION SUMMARY

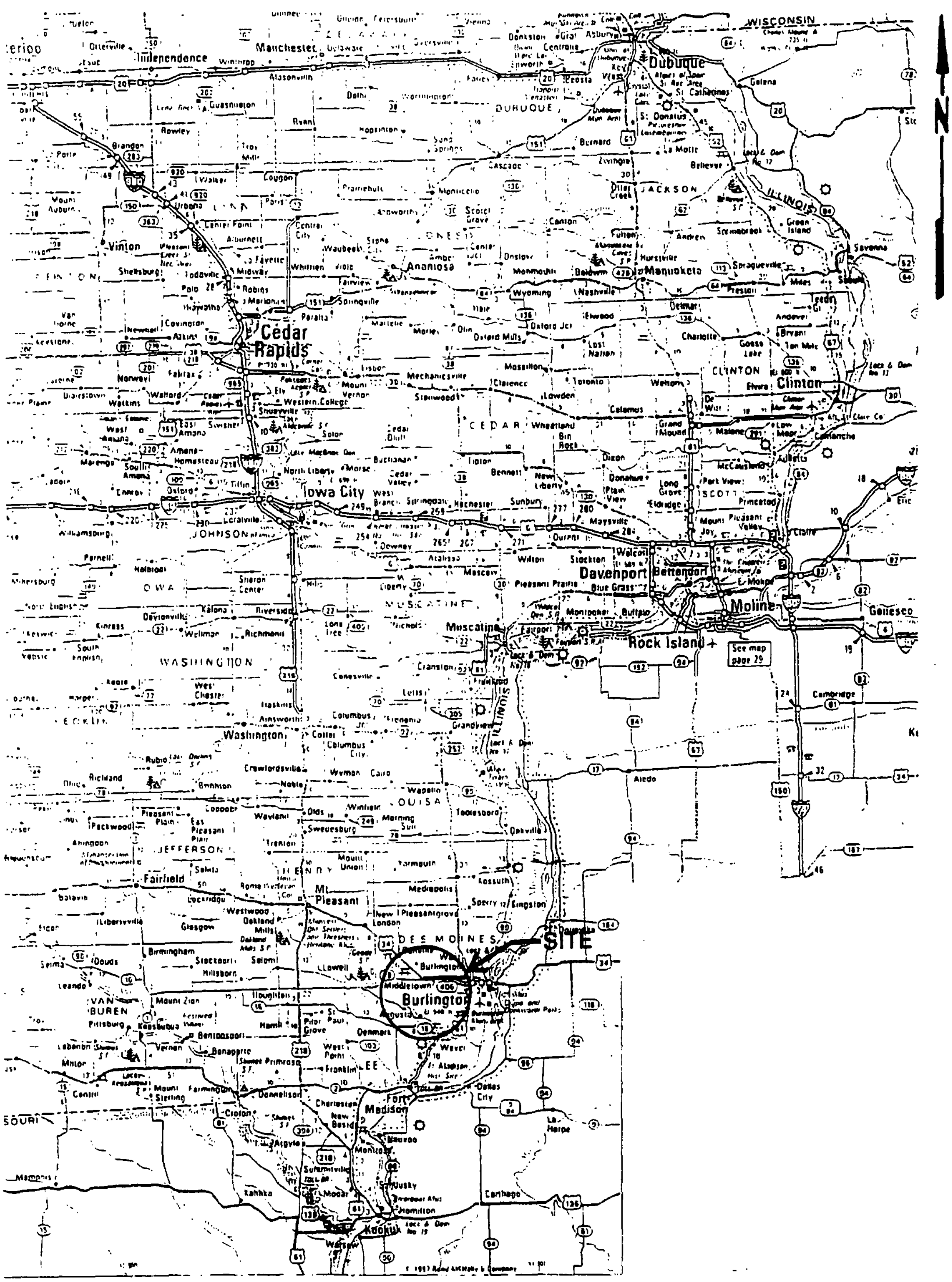
2.1 Site Name, Location, and Description

The Iowa Army Ammunition Plant (IAAAP) is a load, assemble, and pack (LAP) munitions facility located in Middletown, a rural area of eastern Iowa, 10 miles west of Burlington in Des Moines County, and approximately nine miles northwest of the Skunk and Mississippi Rivers (see Figure 1). Croplands comprise about 60 percent of the county; the remaining area is composed of 10 percent urban use, eight percent pasture use, and 22 percent woodland or idle land. The IAAAP is located on about 19,000 acres. Approximately 8,000 acres are leased for agricultural use, about 7,500 acres are forested, and the remaining area is used for administrative and industrial operations. Deer hunting is regulated at the IAAAP through the use of permits. Approximately 41 housing units and 112 acres of land outside of the operating areas of the plant have been transferred to the City of Middletown. Two housing units remain on-site and are currently occupied by military personnel and their families.

The northern area of the IAAAP consists of gently undulating terrain. The central portion is characterized by rolling terrain dissected by a shallow drainage system, while the southern area of the site contains drainage ways with steep slopes down to the creek beds. Elevations within the IAAAP range from 730 feet above mean sea level in the north to 530 feet in the south. There are four principal aquifers in Des Moines county. These include a shallow or surficial aquifer (drift aquifer) in unconsolidated Recent Pleistocene sediments, and bedrock aquifers occurring in the Mississippian, Devonian, and Cambro-Ordovician units.

The IAAAP contains four watersheds. Brush Creek drains the central portion of the site, exits at the southeastern boundary, and flows into the confluence of the Skunk and Mississippi Rivers. The creek's flood plain at the southern boundary of the site is estimated to be 200 feet wide. Spring Creek drains the eastern portion of the site, exits at the southeastern corner, and flows off site directly into the Mississippi River. The creek's flood plain at the southeastern boundary of the site is estimated to be 400 feet wide. Long Creek drains the western portion of the IAAAP, exits at the southwestern boundary, and joins the Skunk River just south of the site. The Skunk River then flows into the Mississippi River. The Long Creek drainage way has been dammed near the center of the site to create the 85-acre George H. Mathes Lake. Use of this lake by the plant as a water source was discontinued in January 1977. An open recreation area and a boat ramp used by fishermen are present at the lake. North of Mathes Lake is the 7-acre Stump Lake, which was built to serve as a sediment control for Mathes Lake. The flood plain of Long Creek is widest (500 feet) at the southern plant boundary. The Skunk River is located south of the IAAAP, bordering the site's perimeter on the southwest corner. The Skunk River provides year-round recreational use. Figure 2 provides a site plan of the IAAAP.

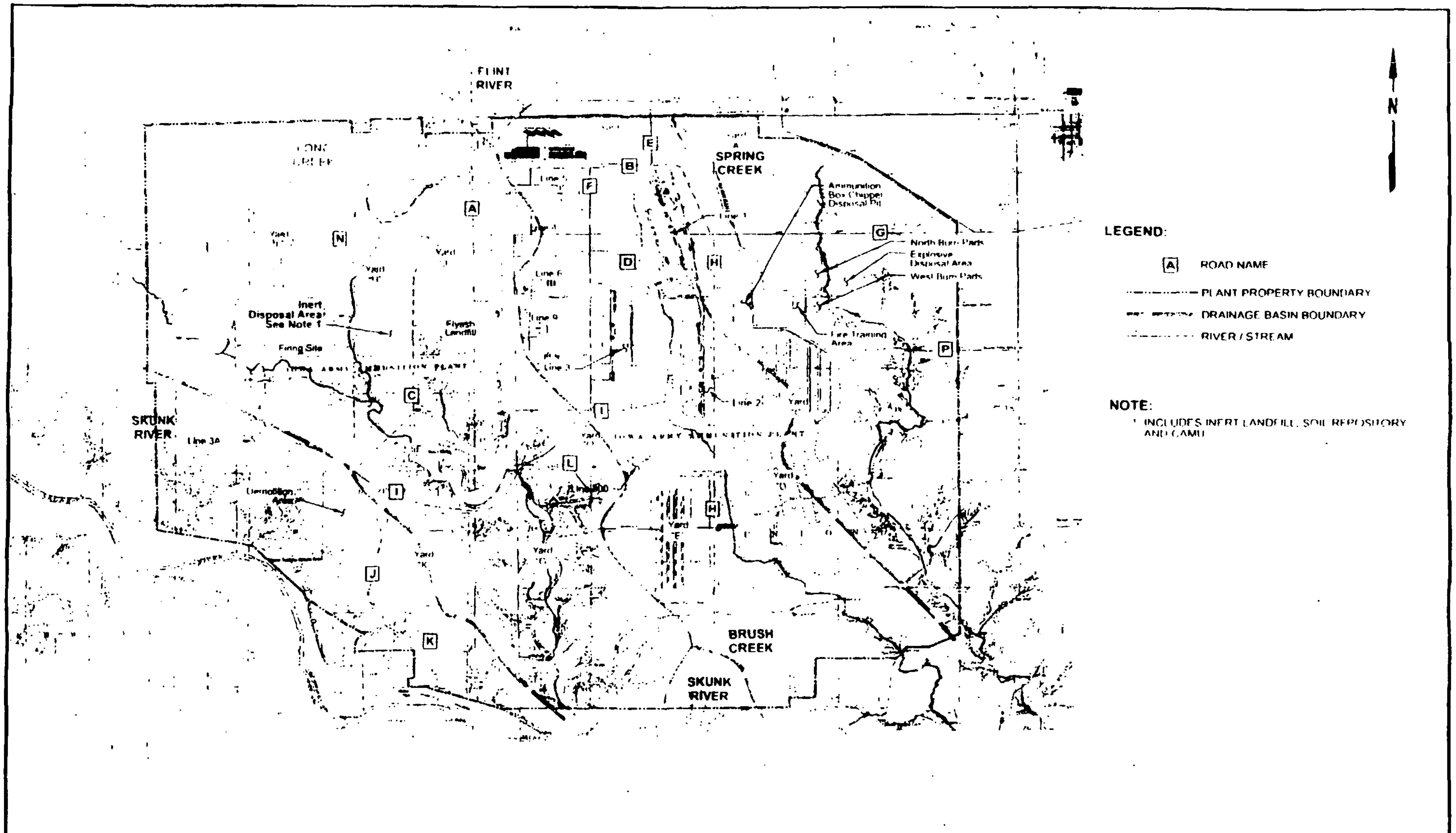
The CAMU is located along the western edge of the Inert Landfill at IAAAP as illustrated in Figure 3. The area is part of the Long Creek watershed.



SOURCE. Minnesota's Geology

HARZA Consulting Engineers and Scientists

Figure 1
SITE LOCATION MAP
SOILS OU No.1 RECORD OF DECISION
IOWA ARMY AMMUNITION PLANT
Middletown, Iowa



HARZA Consulting Engineers and Scientists

Figure 2

DRAINAGE BASINS AND SITE FEATURES MAP

SOILS OU No. 1 RECORD OF DECISION

IOWA ARMY AMMUNITION PLANT

Middletown, Iowa

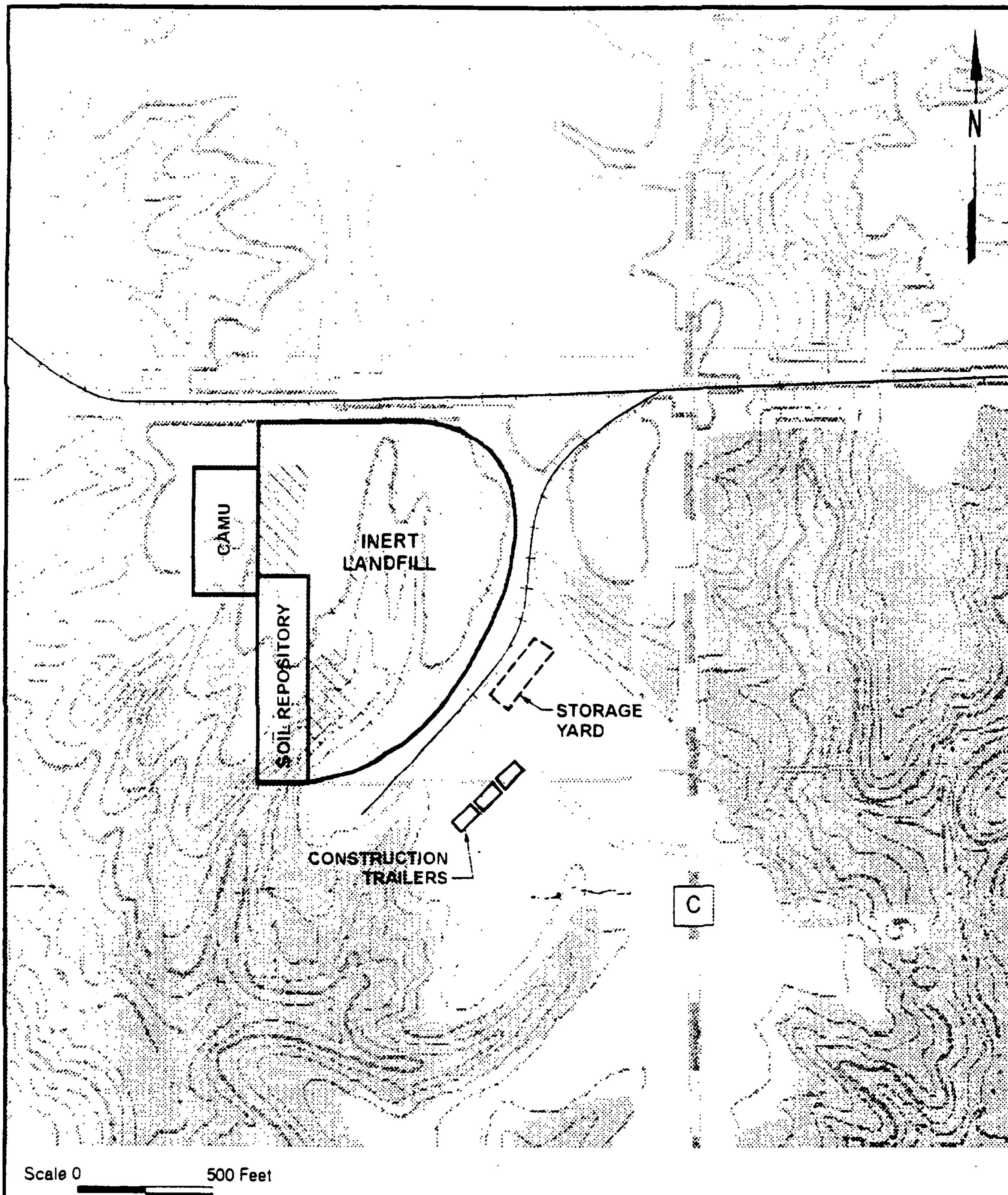


Figure 3

CAMU LOCATION

SOILS OU No.1 RECORD OF DECISION

IOWA ARMY AMMUNITION PLANT

Middletown, Iowa

HARZA *Consulting Engineers and Scientists*

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2.2 Site History and Enforcement Activities

The IAAAP produced munitions for World War II from the plant's inception in September 1941 until August 1945, and munitions for military activities in southeast Asia in the 1960s and early 1970s. Activities at the IAAAP continued at a reduced level during peacetime. The plant was operated from 1941 - 1946 by Day & Zimmerman Corporation. The former Atomic Energy Commission operated at Line 1 from 1948 through mid-1975, at which time operation reverted to U.S. Army (Army) control. The Army continues to own the IAAAP, which has been operated by the private contractor Mason & Hanger Corporation since 1951. The IAAAP currently is operating to load, assemble, and pack (LAP) munitions, including projectiles, mortar rounds, warheads, demolition charges, anti-tank mines, anti-personnel mines, and the components of these munitions, including primers, detonators, fuses, and boosters. Since the installation is an active production plant, inactive lines are maintained on a standby status or leased to other contractors.

The primary source of contamination at the site is attributable to past operating practices in which explosives-contaminated wastewaters and sludges were discharged to uncontrolled, on-site lagoons and impoundments. Additional sources of contamination include open burning of explosives materials and munitions, and landfilling of waste material. Process wastewaters currently are treated and recycled, while only a small portion of the treated wastewater, containing residual explosives and other contaminants regulated under the plant's NPDES permit, is discharged to surface. Pink/red wastewaters from trinitrotoluene (TNT) operations are a listed hazardous waste (K047) according to the Resource Conservation and Recovery Act (RCRA).

The U.S. Environmental Protection Agency (EPA) added the IAAAP to the National Priorities List (NPL) in 1990. The NPL is the EPA's list of sites that appear to pose the greatest threat to human health and the environment, based on the site assessment process. The Department of Defense (DOD) has established the Defense Environmental Restoration Account to address sites under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), that are within the responsibility of the DOD. The Army, as an agency within the DOD, is the lead agency for implementing the interim remedial action at the IAAAP. As the support agency, the EPA oversees cleanup activities conducted by the Army to ensure that the requirements of CERCLA/SARA and the National Contingency Plan (NCP) have been met. The EPA and the Army signed a Federal Facilities Agreement (FFA) for site cleanup, which became effective December 10, 1990, following public comment. The FFA provides a framework for CERCLA response actions to be performed at the IAAAP, including the investigation and cleanup of contamination. The State of Iowa has declined to participate as a signatory party to this FFA.

Numerous investigations have been conducted at the site by the Army from 1975 to the present to investigate soil and groundwater contamination. Based on data collected at the site, the Army has initiated response actions at the IAAAP to address soil contamination at several areas across the IAAAP. These actions are documented in several Action Memoranda from 1995 through 1997 and an Interim Action Record of Decision (ROD) signed by EPA in March 1998. During removal actions completed at the former Line 1 impoundment and the Line 800 pinkwater lagoon, cumulative risk levels were determined for soils at each source based on sampling and analysis for contaminants of concern. Soils with the highest contaminant concentrations were excavated and stockpiled in a lined storage facility known as a Corrective Action Management Unit (CAMU) for subsequent treatment. Moderately contaminated soils were excavated and disposed in an on-site Soil Repository. Lightly contaminated soils were disposed under the synthetic cap of the Inert Landfill on-site. Excavation of materials from the Line 1 Impoundment and the Line 800 Lagoon was completed in August, 1997. The remaining areas of soil contamination will be excavated and placed in the CAMU or in the Soil Repository according to the March 1998 Interim Action ROD.

2.3 Highlights of Community Participation

The RI/FS and Interim Action Proposed Plan for the Soils OU were released to the public in November 1996 and May 1997, respectively. These documents were made available to the public in both the administrative record and the site information repositories. The notice of availability for the Interim Action Proposed Plan was published in the Burlington Hawk Eye on May 28, 1997. A public comment period was held from May 28, 1997 to June 30, 1997. In addition, a public meeting was held on June 5, 1997 at the Danville Community Center. At this meeting representatives from the Army and EPA were available to the public to discuss concerns, accept comments, and answer questions regarding the preferred alternative presented in the Interim Action Proposed Plan. There were no written or verbal comments regarding the Interim Action Proposed Plan submitted to the Army at this meeting or during the comment period, thus a Responsiveness Summary was not included in the Interim Action ROD.

The Proposed Plan for final action for the Soils OU #1 was released to the public on June 20, 1998. This document was made available to the public in both the administrative record and the site information repositories. The notice of availability for the Proposed Plan was published in the Burlington Hawk Eye on June 20, 1998 and later in the Ft. Madison Daily Democrat. A public comment period was held from June 20, 1998 to July 19, 1998. In addition, a public meeting was held on July 9, 1998 at the Pzazz Best Western Motor Inn in Burlington, Iowa. At this meeting representatives from the Army and EPA were available to the public to discuss concerns, accept comments, and answer questions regarding the preferred alternative presented in the Proposed Plan. All comments received by the Army and the USEPA during the public comment period, including those expressed at the public meeting, are addressed in the Responsiveness Summary which is attached to this document.

An IAAAP Restoration Advisory Board (RAB) has been established to enable the community and representatives of government agencies to meet and exchange information about the IAAAP's environmental cleanup program and to provide the community an opportunity to review progress and participate in dialogue with decision makers. The RAB was organized in mid-1997 and has held public meetings generally monthly. This decision document presents the selected remedial action for the Soils OU#1 at the IAAAP in Middletown, Iowa, chosen in accordance with CERCLA, as amended by SARA and, 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 Units

Due to the complexity of the problems associated with the IAAAP, the site has been divided into three OUs to facilitate project management. These are the:

- Soils OU (#1), to address contamination in the soils.
- Groundwater OU (#3), to address contamination of groundwater within the IAAAP boundaries and potentially off-site.
- Installation-Wide OU (#4), to address closure of the CAMU, institutional controls, previously unaddressed areas of soil contamination, VOC-contaminated media, ecological risks, long-term monitoring requirements, and any other unacceptable risks which may be identified and not addressed in either OU #1 or OU #3.

OU #2 was originally established for the soils interim action, but was subsequently merged into OU #1 for simplicity and completeness.

The Removal Actions and the Interim Action for the Soils OU #1 addressed the contaminated soils in a number of areas at the IAAAP. These areas posed an unacceptable threat to human health and the environment due to risks from possible ingestion or dermal contact with soils, and due to potential contaminant leaching from soil to groundwater. Under these actions, soils contaminated at levels posing a potential health threat, or acting as a potential source of continuing groundwater contamination, were contained in on-site landfill facilities. Highly contaminated soils were stockpiled in the CAMU for subsequent treatment, while moderately and lightly contaminated soils were disposed permanently in a Soil Repository or beneath an Inert Landfill cap on-site. Potential groundwater impacts as measured by Summer's model and Land Disposal Restrictions (LDRs) were also considered in identifying principal threats and low-level threats. This ROD provides for treatment and ultimate disposal of the soils representing the principal threat at the IAAAP which have been stockpiled in the CAMU under the Soils OU #1. Substantial on-site activities associated with treatment will commence within 15 months of the physical completion of the interim remedial action for the Soils OU#1. The action specified in this ROD is intended to be the final action under the Soils OU (OU # 1) at IAAAP. Separate RODs will be issued for the Groundwater OU #3 and the Installation-Wide OU #4 to provide an opportunity for the public to comment on cleanup plans under consideration for those areas.

2.5 Summary of Site Characteristics

Table 1 summarizes the sources and quantities of soils removed under Removal Actions or Interim Action. Only the soils stockpiled in the CAMU are intended to receive additional treatment under this ROD prior to final disposal. Table 2 identifies the individual sources, quantities, and characteristics of soils stockpiled in the CAMU. Soils identified in this table are characterized as follows:

- Approximately 9,000 cubic yards of soil contaminated with explosives.
- Approximately 600 cubic yards of soil contaminated with explosives plus metals.
- Approximately 200 cubic yards of soil contaminated with semi-volatile organic compounds (SVOCs).

The Interim Action ROD identified approximately 300 cubic yards of soil to be excavated and stabilized because of the presence of radionuclides. However, there is currently uncertainty whether these soils are contaminated above naturally occurring levels. If excavation and treatment ultimately is required, these soils will be addressed later under a separate OU or response action.

Excavation of materials from the Line 1 Impoundment and the Line 800 Lagoon was completed in August, 1997. The remaining sources will be excavated and placed in the CAMU or in the Soil Repository according to the March 1998 Interim Action ROD. Volumes and concentrations of contaminated soil to be removed from these remaining sources are estimated based on limited site sampling. The actual volumes and characteristics will be determined based on additional confirmation sampling during the Interim Action. Actual volumes and characteristics may vary from those shown in Table 2. However, since the greatest volume of soil to be treated originated from the Line 1 Impoundment and the Line 800 Lagoon excavation, which has already been completed, the total volumes and characteristics presented in Table 2 are considered representative for the purposes of this ROD.

2.6 Summary of Site Risks

During the RI/FS, an analysis was conducted to estimate the health or environmental problems that could result if the soil contamination at IAAAP was not cleaned up. This analysis is referred to as a Baseline Risk Assessment (BLRA). In conducting the BLRA, the focus was on the health effects that could result from direct exposure to contaminants as a result of the soil coming into contact with the skin, or from direct ingestion of the soil. The analysis identified explosives as the major contaminants of concern. Metals and semi-volatile organic compounds (SVOCs) were also identified as contaminants of concern at certain sites. The BLRA for the IAAAP identified unacceptable risk based on a future commercial/industrial land use setting due to possible incidental

TABLE 1
SOURCES AND DISPOSITIONS OF SOILS

SOURCE	DISPOSITION					
	CAMU	SOIL REPOSITORY			INERT LANDFILL CAP	TOTAL
Criteria:	A	B	C	D		
Removed Under Removal Action (Currently stockpiled)						
Line 1 Impoundment	618	1,234			6,418	8,270
Line 800 Lagoon	6,803	12,133			55,800	74,736
Subtotal (cubic yards)	7,421	13,367			62,218	83,006
Removed Under Interim Action (To be removed)						
Line 1 (R01)	402		3,960	1,874		6,236
Line 2 (R02)	86	452	1,117	293		1,948
Line 3 (R03)	1,395	175	1,086	837		3,493
Line 3A (R04)	327	442	0	1,267		2,036
Lines 4A&B (R05)	0	0	153	0		153
Lines 5A&B (R06)	187	244	0	300		731
Line 6 (R07)	0	401	44	0		445
Line 8 (R09)	0	0	476	0		476
Line 9 (R10)	0	0	469	0		469
Linr 800 (R11)	0	1,095	117	113		1,325
East Burn Pas (R12)	140	293	0	20,978		21,411
Demolition Area (R15)	0	0	753	0		753
West Burn Pads (R24)	0	0	1,112	339		1,451
North Burn Pad (R25)	0	41	0	0		41
Roundhouse (R28)	0	599	0	0		599
		3,742	*9,287*	*26,001*		
Subtotal (cubic yards)	2,537	39,030			*	41,567
Total (cubic yards)	9,958	52,397			62,218	124,573

Criteria:

A (risk >10-5): Place in CAMU

B (risk between 10-6 & 10-5): Place in Soil Repository

C (risk <10-6, w/ metals): Place in Cap

D (risk <10-6, w/o metals): Place in Cap

* Inert Landfill not available for additional fill

Data taken from: Focused Feasibility Study, Appendix E (5-8-98)

TABLE 2
CAMU CONTENTS

SOURCE	VOLUME	RDX		TNT		TNB		DNT		Lead		Arsenic		Benzo(a)pyrene		Dibenz(a,h)anthracene		Benzo(a)anthracene		Benzo(b)fluoranthene		Bismuth	
	(cy)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)	(conc, mg/kg)	(mass, lb)
EXPLOSIVES:																							
Line 1 Impoundment	618	408	881	3,382	5,880																		
Line 800 Lagoon	6803	408	7,484	3,382	62,306			55.9	1,027														
B 2-05/Down Sump 2 140-7	47	5500	888	1400	178	350	44																
B 2-05/NE Sump 2 140-3	39	50017.5	5,267	135050	14,221																		
B 3-05-1/SE Corner	650	64.4	113	42580	74,728	240	421																
B 3-05-2/N Side	121	816.34	271	1616.67	537			31.54	10														
B 3-70-2/SE Building	222	270	132	84000	38,362			180	108														
B 5A-26/E Side	162	1.41	1	9933.33	4,345																		
B Pad 8E/Middle of Pad	140	21033.33	7,851	31933.33	12,071			76	29														
Subtotal (1)	8,804	951	22,807	8,936	212,405	20	400	49	1,174														
EXPLOSIVES + METALS:																							
B-3-05-2/SE Corner	188	13.77	7	34085.67	17,108	360	181	18.5	8	2978.5	1,496	79	40										
B-3-30/N Side	95	35.34	9	87000	22,310	23000	5,900	210	54	1204	309												
B 3A-05-1/S Side	327	2647.5	2,337	5140	4,538					1657	1,463												
B 5B-28/S Side	25	75000	5,063	250	17					1629	110												
Subtotal (1)	635	4,338	7,416	25,732	43,978	3,558	6,080	38	62	1,976	3,378	23	40										
SVOCs:																							
B-1-15-NE Corner	217													100	50	5	3	80	47	100	50		
RADIONUCLIDES:																							
B-1-70-1/SE Corner	185																					0.88	0.5
B-3-10/X-Ray Bay	119																					1.51	0.5
Subtotal (1)	304																					1.2	1
TOTAL (1)	9,958	1,117	30,023	8,538	256,383	243	6,548	46	1,236	120	3,378	1.5	40	2.2	50	0.1	3	1.7	47	2.2	50	0.64	1

(1) Conc = weighted avg

NOTE: Soils underlying the IAAAP consist predominantly of dense, silty, sandy clay glacial till typically classified "CL" using the Unified Soil Classification System

Data taken from: Focused Feasibility Study, Appendix E (5-8-97) ingestion and dermal contact with contaminated soils. The BLRA also identified unacceptable risk associated with potential consumption of contaminated groundwater on-site. Site soils have been determined to be acting as a continuing source of groundwater contamination at unacceptable levels.

The BLRA provided the basis for the response actions that determined what soils were to be excavated and either disposed in the Soil Repository of the Inert Landfill or stockpiled in the CAMU for subsequent treatment. Under the CERCLA, containment of low level threats is acceptable while treatment of principal threats to permanently reduce contaminant toxicity, mobility and volume is preferred. Principal threats are defined as the most highly contaminated, most toxic, and most mobile source materials. Under the Interim Action ROD, highly contaminated soils (cumulative risk greater than 10^{-5}) were considered to represent the principal threat and therefore were stockpiled in the CAMU for treatment at a later date. Moderately contaminated soils (cumulative risk between 10^{-5} and 10^{-6}) and lightly contaminated soils (cumulative risk less than 10^{-6}) were considered to present low-level threats and therefore were permanently disposed in the Soil Repository or the Inert Landfill cap. Potential groundwater impacts as measured by Summer's model and LDRs were also considered in identifying principal threats and low-level threats.

The BLRA presents risks associated with the "baseline" condition at the site prior to execution of any response actions. For the purposes of this ROD the "baseline" conditions as defined in the BLRA no longer exist because response actions been taken or are planned to abate certain site risks.

2.7 Description of Alternatives

Separate alternatives were developed for soils contaminated with explosives, soils contaminated with explosives and metals, and soils contaminated with SVOCs. The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison of other alternatives. The "no-action" alternative was evaluated as part of the OU #1 Interim Action, which is the precursor to this Final Action for OU # 1. Since the Final Action is intended to address treatment of the principal threat, the "no-action" alternative was not considered further.

2.7.1 Alternatives for Explosives-contaminated Soils

Approximately 9,000 cubic yards of soil are identified as being contaminated solely with explosives, without metals contamination exceeding LDRs. Alternatives for treating soils contaminated solely with explosives are as follows:

Alternative E1A: Incineration

This alternative consists of on-site incineration, with disposal of incinerator ash in an on-site landfill; because metals concentrations in the soils are low, it is assumed that additional treatment of incinerator ash (i.e., solidification/stabilization) will not be required. The principal elements of this alternative are as follows:

- Excavate explosives-contaminated soil from the CAMU and transport it to a temporary treatment facility on-site.

- Screen, shred and blend the soil to produce a uniform feed material.

- Process the blended soil through a mobile rotary-kiln incinerator to achieve disposal criteria outlined below.

- Following confirmation sampling, dispose of treated soil (ash) on-site either:

  a. For soils with cumulative risk less than 10^{-6}, in compliance with LDRs, and exceeding Summers model remediation goals, dispose in the Soil Repository or under another synthetic landfill cap on-site.

  b. For soils with cumulative risk less than 10^{-6}, in compliance with LDRs, and satisfying Summers model remediation goals, dispose on IAAAP property in an appropriate manner protective of human health and the environment.

Incineration is the primary treatment technology used under this alternative. Incineration is a thermal treatment method in which organic compounds are oxidized at elevated temperatures (combusted) and decomposed into basic products of combustion such as carbon dioxide (CO_2), water vapor, and (in some cases) inorganic gases. In most incinerator applications, an auxiliary heat source such as fossil fuel-fired burners is used to achieve the temperature necessary to evaporate water from the feed material and combust the organic compounds. Emissions from the incinerator will be controlled with proper emission control devices such as a baghouse, and by routing off-gases through an afterburner for complete combustion of gases prior to release to the atmosphere. Results from a trial burn will be used to define operating parameters for the incinerator. During a trial burn, the incinerator will be operated for a specified regulatory duration under assumed operating conditions to monitor performance, emissions, and operational safety.

Capital costs for incineration include mobilization and project planning; site preparation; erection of a temporary shelter for stockpiled soil; conduct of a trial burn; and demobilization and site restoration. Operating costs include excavation of soils from the CAMU; incinerator operation; labor; utilities; confirmation sampling; and disposal of treated soil in the Soil Repository. Corps of Engineers program management costs are additional. For cost estimating purposes, the treatment unit is assumed to be located adjacent to the CAMU and disposal is assumed to be in the Soil Repository. Treatment capacity is assumed to be approximately 250 tons/day based on commercially available equipment, experience at other sites, and consideration of the clay soil at IAAAP. Costs for treatment of 9,000 cubic yards of explosives-contaminated soil are estimated as follows:

TABLE 3
Costs
Alternative EIA: Incineration

	Unit Rate	Cost
Capital Cost		$ 4,600,000
Operating Cost	$ 370/cy	$ 3,330,000
Subtotal		$ 7,930,000
Project Contingency	30%	$ 2,380,000
Total Project Budget		$10,310,000

This represents a present worth value of $10,310,000. Details of these cost estimates are presented in the Feasibility Study report.

Remediation could be completed in less than two months of incineration. Additional time would be required for planning, design, mobilization, conducting a trial burn and obtaining approvals, and for demobilization. These activities are expected to require approximately two additional years.

Significant applicable or relevant and appropriate requirements (ARARs) for this alternative include requirements relating to ambient air quality and air emissions specified under IAC 28.1 (455 B), IAC 22.3 (3), IAC 23.3 (2) (a) and Table 1, and IAC 23.3 (a) (c) (1); CERCLA's preference for treatment specified under Section 121 (b); Land Disposal Restrictions specified under 40 CFR 268 Subparts A and D; and requirements for incineration of hazardous waste specified under 40 CFR 264, Subpart 0.

Alternative E1B: Low Temperature Thermal Desorption (LTTD)

This alternative consists of on-site LTTD, with disposal of residuals in an on-site landfill; it is assumed that additional treatment (i.e., solidification/stabilization for metals) will not be required. The principal elements of this alternative are as follows:

- Excavate explosives-contaminated soil from the CAMU and transport it to a temporary treatment facility on-site.
- Screen, shred and blend the soil to produce a uniform feed material.
- Process the blended soil through a mobile direct-fired LTTD unit to achieve disposal criteria outlined below.

- Following confirmation sampling, dispose of treated soil on-site either:

  a. For soils with cumulative risk less than 10^{-6}, in compliance with LDRs, and exceeding Summers model remediation goals, dispose in the Soil Repository or under another synthetic landfill cap on-site.

  b. For soils with cumulative risk less than 10^{-6}, in compliance with LDRs, and satisfying Summers model remediation goals, dispose on IAAAP property in an appropriate manner protective of human health and the environment.

LTTD is the primary treatment technology used under this alternative. LTTD treatment is similar to rotary kiln incineration except that the process operates at a lower temperature (typically 200 to 600 ^{0}F in the primary chamber, depending on the contaminants of concern). At this lower temperature, volatilization is the primary mechanism at work in the primary chamber. Organic contaminants are driven off as gases which are then destroyed at higher temperatures in the secondary chamber or afterburner. Emissions from the LTTD unit will be controlled with proper emission control devices such as a baghouse, and by routing off-gases through an afterburner for complete combustion of gases prior to release to the atmosphere. Results from treatability tests will be used to define operating parameters for the LTTD unit.

Capital costs for LTTD treatment include mobilization and project planning, site preparation, erection of a temporary shelter for stockpiled soil, conduct of treatability tests, and demobilization and site restoration. Operating costs include excavation of soils from the CAMU, LTTD operation, labor, utilities, confirmation sampling, and disposal of treated soil in the Soil Repository. Corps of Engineers program management costs are additional. For cost estimating purposes, the treatment unit is assumed to be located adjacent to the CAMU and disposal is assumed to be in the Soil Repository. Treatment capacity is assumed to be approximately 5 tons/hour based on commercially available equipment, experience with other applications, and consideration of the clay soil at IAAAP. Costs for treatment of 9,000 cubic yards of explosives-contaminated soil are estimated as follows:

TABLE 4
Costs
Alternative EIB: LTTD

	Unit Rate	Cost
Capital Cost		$ 830,000
Operating Cost	$ 300/cy	$ 2,700,000
Subtotal		$ 3,530,000
Project Contingency	30%	$ 1,060,000
Total Project Budget		$ 4,590,000

This represents a present worth value of $4,590,000. Details of these cost estimates are presented in the Feasibility Study report.

It is expected that remediation could be completed in approximately six months of LTTD operation. Additional time would be required for planning, design, mobilization, conducting treatability tests and a trial burn and obtaining approvals, and for demobilization. These activities are expected to require approximately two additional years. Treatability test results will provide a clearer indication of actual time required for LTTD treatment.

Significant ARARs for this alternative include requirements relating to ambient air quality and air emissions specified and IAC 28.1 (455 B), IAC 22.3 (3), IAC 23.3 (2) (a) and Table 1, and IAC 23.3 (a) (c) (1); CERCLA's preference for treatment specified under Section 121 (b); Land Disposal Restrictions specified under 40 CFR 268 Subparts A and D; and requirements for incineration at hazardous waste specified under 40 CFR 264, Subpart 0.

Alternative E2A: Composting

In this alternative, composting will be used to treat contaminated soils. The principal elements of this alternative are as follows:

- Excavate explosives-contaminated soil from the CAMU and transport it to a temporary treatment facility on-site.

- Screen, shred and blend the soil to produce a uniform feed material.

- Process the blended soil in a temporary compost shelter by mixing with amendments such as manure, corn stalks, and food processing wastes; spreading the mixture in windrows; and turning periodically to help aerate the material and regulate temperature. Soils will be treated to achieve disposal criteria outlined below.

- Following confirmation sampling, dispose of treated soil on-site either:

  a. For soils with cumulative risk less than 10^{-6}, in compliance with LDRs, and exceeding Summers model remediation goals, dispose in the Soil Repository or under another synthetic landfill cap on-site.

  b. For soils with cumulative risk less than 10^{-6}, in compliance with LDRs, and satisfying Summers model remediation goals, dispose on IAAAP property in an appropriate manner protective of human health and the environment. Treatment residuals must also be shown to be non-toxic or not bioavailable at levels posing a threat to human health or the environment.

Composting is the primary treatment technology used under this alternative. Composting is a biological process in which naturally occurring micro-organisms degrade contaminants into intermediates, some of which bind to soil organic components in such a way as to reduce the mobile or extractable fraction of the contaminants. In windrow composting, contaminated soils are mixed with locally available amendments (manure, wood chips, food processing wastes, molasses, etc.) and water, then spread out in long rows. Facilities required for window composting include an asphalt pad and a temporary structure to protect the windrows from precipitation and temperature fluctuations. Conventional earth moving equipment (front end loader, dump trucks) is used to place contaminated soil and remove finished compost, while a commercially available windrow turning machine is used in the composting process. Alternatives to windrow composting include use of a mechanical agitated vessel to help aerate the material and regulate temperature, while in a static pile the soil/amendment mix is left undisturbed.

It is assumed that treated soils will be disposed of in an on-site landfill (disposal option "a" above). If composting can reliably achieve risk levels less than 10^{-6} and comply with Summers' model treatment requirements and LDRs, on-site land application of the finished compost (disposal option "b" above) may be feasible. However, additional studies of long-term stability and toxicity of compost treatment residues will be required to verify the acceptability of unrestricted land application. Because of available landfill capacity, the Army does not expect land application to provide significant cost advantages.

Capital costs for composting include mobilization and project planning; site preparation; construction of a compost shelter; and demobilization and site restoration. Operating costs include excavation of soils from the CAMU; compost facility operation; labor; compost amendments; utilities; confirmation sampling; and disposal of treated soil in the Soil Repository. For cost estimating purposes, the treatment unit is assumed to be located adjacent to the CAMU and disposal is assumed to be in the Soil Repository. Corps of Engineers program management costs are additional. A treatment cycle of approximately 30 days per batch is assumed as a year-round average, allowing 5 days for loading, 20 days for composting, and 5 days for unloading. Costs for treatment of 9,000 cubic yards of explosives-contaminated soil are estimated as follows:

TABLE 5
Costs
Alternative E2A: Composting

	Unit Rate	Cost
Capital Cost		$ 1,050,000
Operating Cost	$260 - $360/cy	$ 2,340,000 - $ 3,240,000
Subtotal		$ 3,390,000 - $ 4,290,000
Project Contingency	30%	$ 1,020,000 - $ 1,290,000
Total		$ 4,410,000 - $ 5,580,000

This represents a present worth value of $ 4,410,000 - $ 5,580,000. The variation in estimated operating costs indicates the potential range of amendment requirements and costs. Details of these cost estimates are presented in the Feasibility Study report.

It is expected that remediation could be completed in approximately one year of compost facility operation. Additional time would be required for planning, design, mobilization, process optimization testing, and demobilization.

Significant ARARs for this alternative include CERCLA's preference for treatment specified under Section 121 (b); Land Disposal Restrictions specified under 40 CFR 268 Subparts A and D; and requirements for composting of hazardous waste in buildings specified under 40 CFR Part 264, Subpart DD.

Alternative E2B: Bio-Slurry Treatment

In this alternative, either aerobic/anoxic or anaerobic bio-slurry treatment will be used to treat contaminated soils. The principal elements of this alternative are as follows:

- Excavate explosives-contaminated soil from the CAMU and transport it to a temporary treatment facility on-site.
- Screen, shred and blend the soil to produce a uniform feed material.
- Process the blended soil in a bio-slurry treatment facility. Soil will be treated to achieve disposed criteria outlined below.
- Following confirmation sampling, dispose of treated soil on-site either:

  a. For soils with cumulative risk less than 10^{-6}, in compliance with LDRs, and exceeding Summers model remediation goals, dispose in the Soil Repository or under another synthetic landfill cap on-site.

  b. For soils with cumulative risk less than 10^{-6}, in compliance with LDRs, and satisfying Summers model remediation goals, dispose on IAAAP property in an appropriate manner protective of human health and the environment. Treatment residuals must also be shown to be non-toxic or not bioavailable at levels posing a threat to human health or the environment.

  If disposal option "a" is selected, an additional treatment process will be required for treatment of slurry water following solids dewatering and prior to disposal.

Bio-slurry treatment is the primary treatment technology used under this alternative. Bio-slurry treatment uses naturally occurring micro-organisms to degrade contaminants. The process involves blending contaminated soils with water to produce a slurry of between 15 and 40 % solids, adding nutrients and co-substrates (such as molasses), and mixing. Processes may use either aerobic/anoxic regimes and anaerobic regimes. In aerobic/anoxic processes, blowers cycle on and off to alternate between aerobic (oxygenated) and anoxic (oxygen-starved) conditions, while mechanical mixers maintain solids in suspension. In anaerobic processes, no aeration is provided and anaerobic conditions are maintained; mechanical mixers again maintain solids in suspension.

It is assumed that thickening and dewatering will be required prior to disposal in an on-site landfill (disposal option "a" above). If bio-slurry treatment can reliably achieve risk levels less than 10^{-6} and comply with Summers' model treatment requirements and LDRs, on-site land application of the liquid slurry (disposal option "b" above) may be feasible. However, additional studies of long-term stability and toxicity of treatment residues will be required to verify the acceptability of unrestricted land application. Because of available landfill capacity, the Army does not expect land application to provide significant cost advantages.

Capital costs for bio-slurry treatment include mobilization and project planning; site preparation; construction of a treatment facility including three 250,000 gallon treatment tanks, solids dewatering facilities (assumed to be precoat rotary drum vacuum filters), an equipment building, and associated equipment; and demobilization and site restoration. Operating costs include excavation of soils from the CAMU; treatment facility operation; labor; chemicals; utilities; confirmation sampling; and disposal of treated soil in the Soil Repository. Corps of Engineers program management costs are additional. For cost estimating purposes, the treatment unit is assumed to be located adjacent to the CAMU and disposal is assumed to be in the Soil Repository. A treatment cycle of approximately 10 weeks per batch is assumed as a year-round average. With two tanks processing at all times, this allows an additional one week for loading and three weeks for unloading and dewatering. Land application of the treated liquid slurry would require a longer treatment cycle (assumed to be approximately 18 weeks). Costs for treatment of 9,000 cubic yards of explosives-contaminated soil are estimated as follows:

TABLE 6
Costs
Alternative E2B: Bio-Slurry Treatment

	Unit Rate	Cost
Capital Cost		$ 1,950,000
Operating Cost	$300 - $440/cy	$ 2,700,000 - $ 3,960,000
Subtotal		$ 4,650,000 - $ 5,910,000
Project Contingency	30%	$ 1,400,000 - $ 1,770,000
Total		$ 6,050,000 - $ 7,680,000

This represents a present worth value of $5,740,000 to $7,070,000 based on a 5% annual discount rate. The variation in estimated operating costs indicates the potential range of slurry concentrations in the treatment tanks. Details of these cost estimates are presented in the Feasibility Study report.

It is expected that remediation to concentrations suitable for landfilling could be completed in 3 to 5 years. Additional time would be required for planning, facility design and construction, mobilization, process optimization testing, and demobilization. These activities are expected to require approximately two additional years.

Significant ARARs for this alternative include CERCLA's preference for treatment specified under Section 121 (b); Land Disposal Restrictions specified under 40 CFR 268 Subparts A and D; and surface water quality criteria and limitations on discharges to surface waters specified under IAC 61.3 (455B) and 33 USC Section 402.

2.7.2 Alternatives for Explosives plus Metals Contaminated Soils

Approximately 600 cubic yards of soil are identified as being contaminated with both explosives and metals, out of an estimated total of 10,000 cubic yards of contaminated soil. Alternatives for treating soil contaminated with both explosives and metals in excess of LDR criteria are presented in the following paragraphs. The volume of soil contaminated with both explosives and metals is small enough that it is not expected to affect the overall time required for soils remediation under any of these alternatives.

Alternative M1: Explosives Treatment Followed by Solidification

In this alternative, soils contaminated with both explosives and metals exceeding LDR criteria will be managed separately from soils contaminated solely with explosives, using the same technology selected for management of explosives-contaminated soil, followed by solidification/stabilization treatment for metals. Residuals will be disposed in an on-site landfill. It is assumed that costs for treatment of the explosives portion of the contamination in these soils will be determined by the technology selected for management of explosives-contaminated soils. Capital costs are assumed to be covered under alternatives E1A, E1B, E2A, and E2B, and operating costs for treatment of the explosives portion of the contamination vary from $260 to $440 per cubic yard. Operating costs for solidification/stabilization of metals are estimated at approximately $150 per cubic yard. Therefore, the total incremental cost for treatment of 600 cubic yards of contaminated soil is estimated at between $250,000 and $350,000.

ARAR's requirements will be determined by the alternative selected for treatment of the explosives - contaminated soil.

Alternative M2: Solidification/Stabilization With Activated Carbon

This alternative consists of stabilization using activated carbon along with solidification materials such as cement and flyash, with disposal of residuals in an on-site landfill.

A temporary solidification/stabilization facility will be erected on-site (assumed to be adjacent to the CAMU or the final disposal site). Soil stockpiled in the CAMU will be excavated, transported to the solidification/stabilization facility, screened, shredded and blended to produce a uniform feed material; and processed through the solidification/stabilization facility. Following confirmation sampling, treated soil will be transported to the disposal site (assumed to be the Soil Repository) where it will be spread, compacted, and covered.

Since solidification/stabilization immobilizes contaminants rather than destroying them, compliance with remedial action objectives will be determined based on analysis of leachate as a measure of groundwater protectiveness. For metals and explosives with Toxicity Characteristic Leaching Procedure (TCLP) limits established under RCRA, treatment will be considered protective of human health and the environment if TCLP results are below RCRA regulatory limits. For other COCs, TCLP remediation goals for groundwater protection are established based on the following hierarchy:

1. 100 times EPA Drinking Water Maximum Contaminant Level.

2. 100 times EPA Lifetime Health Advisory.

3. For carcinogens, 100 times the groundwater concentration corresponding to EPA 10^{-6} risk levels based on residential water usage.

4. For non-carcinogens, 100 times the groundwater concentration corresponding to a Hazard Index of 1.0 based on residential water usage.

It is assumed that this material will be processed at the same time as other materials in the CAMU. Capital costs for planning, site preparation, mobilization and demobilization are, therefore, assumed to be covered under alternatives E1A, E1B, E2A, and E2B. Operating costs for solidification/stabilization using activated carbon are estimated at $220 to $380 per cubic yard, depending upon the amount of activated carbon, cement, and flyash required. Therefore, the total incremental cost for treatm~~ent of 600~~ cubic yards of contaminated soil is estimated at between $130,000 and $230,000.

Significant ARARs for this alternative include CERCLA's preference for treatment specified under Section 121 (b), and Land Disposal restrictions specified under 40 CFR 268 Subparts A and D.

Alternative M3: Off-Site Disposal

Under this alternative, soil contaminated with both explosives and metals would be excavated from the CAMU and transported to a commercial waste treatment and disposal facility off-site. Capital costs for planning, site preparation, mobilization and demobilization are assumed to be covered under alternatives E1A, E1B, E2A, and E2B. Operating costs are estimated at $600,000 to $1,000,000 depending on unit prices charged by commercial waste disposal operators for transportation and disposal. These costs assume disposal as a hazardous waste based on exceeding TCLP regulatory limits under RCRA. Off-site disposal facilities must be permitted under RCRA and operate in compliance with permit conditions, based on CERCLA Off-site Policy (NCP 300.440).

2.7.3 Alternatives For SVOC-Contaminated Soils

Approximately 200 cubic yards of soil are identified as being contaminated with SVOCs. Alternatives for treating these soils are the same as presented above for soil contaminated solely with explosives:

Alternative S1A: Incineration

This alternative consists of on-site incineration, with disposal of incinerator ash in an on-site landfill. Capital costs for incineration are assumed to be covered under alternative E1A for explosives-contaminated soils. Operating costs are estimated at $370 per cubic yard. Therefore, the incremental cost for treatment of approximately 200 cubic yards of SVOC-contaminated soil is estimated at approximately $74,000. Incineration of SVOC-contaminated soils is expected to add only a couple of days to the remediation time. ARARs requirements are equivalent to those for treatment of explosives contaminated soils under Alternative E1A.

Alternative S1B: Low Temperature Thermal Desorption (LTTD)

This alternative consists of on-site low temperature thermal desorption (LTTD), with disposal of residuals in an on-site landfill. Capital costs for LTTD treatment are assumed to be covered under alternative E1B for explosives-contaminated soils. Operating costs are estimated at $300 per cubic yard. Therefore, the incremental cost for treatment of approximately 200 cubic yards of SVOC-contaminated soil is estimated at approximately $60,000. LTTD treatment of SVOC-contaminated soils would add less than a week to the remediation time. ARARs requirements are equivalent to those for treatment of explosives-contaminated soils under Alternative E1B.

Alternative S2A: Composting

This alternative consists of on-site composting, with disposal of residuals in an on-site landfill. Capital costs for compost treatment are assumed to be covered under alternative E2A for explosives-contaminated soils. Operating costs are estimated at $260 to $360 per cubic yard. Therefore, the incremental cost for treatment of approximately 200 cubic yards of SVOC-contaminated soil is estimated at approximately $52,000 to $72,000. Composting of SVOC-contaminated soils would add roughly two weeks to the overall remediation requirement. ARARs requirements are equivalent to those for treatment of explosives-contaminated soils under Alternative E2A.

Alternative S2B: Bio-slurry Treatment

This alternative consists of on-site bio-slurry treatment, with disposal of residuals in an on-site landfill. Capital costs for bio-slurry treatment are assumed to be covered under alternative E2B for explosives-contaminated soils. Operating costs are estimated at $300 to $440 per cubic yard. Therefore, the incremental cost for treatment of approximately 200 cubic yards of SVOC-contaminated soil is estimated at approximately $60,000 to $88,000. Bio-slurry treatment of SVOC-contaminated soils would add roughly one batch to the overall remediation requirement. This is not expected to have a significant impact on the overall remediation schedule. ARARs requirements are equivalent to those for treatment of explosives-contaminated soils under Alternative E2B.

Alternative S3: Off-Site Disposal

Under this alternative, soil contaminated with SVOCs will be excavated from the CAMU and transported to a commercial waste treatment and disposal facility off-site. Since sampling data does not exceed hazardous waste criteria, it is assumed that these soils can be disposed of as non-hazardous waste. Capital costs are assumed to be covered under alternatives E1A, E1B, E2A, and E2B. Operating costs are estimated at $30,000 to $70,000 depending on unit prices charged by commercial waste disposal operators for transportation and disposal. Off-site disposal facilities must be permitted under RCRA and operate in compliance with permit conditions, based on CERCLA Off-site Policy (NCP 300.440).

2.8 <u>Summary of the Comparative Analysis of Alternatives</u>

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. In accordance with Superfund guidance, each alternative is assessed against the following evaluation criteria:

- <u>Overall Protection of Human Health and the Environment</u>: Describes how the alternative, as a whole, achieves and maintains protection of human health and the environment.

- <u>Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)</u>: Describes how the alternative complies with ARARs or, if a waiver is required, how it is justified; also addresses other information from advisories, criteria, and guidance "to be considered".

- Long-Term Effectiveness and Permanence: Evaluates the long-term effectiveness of alternatives in maintaining protection of human health and the environment after response objectives have been met.

- Reduction of Toxicity, Mobility, and Volume Through Treatment: Evaluates the anticipated performance of the specific treatment technologies an alternative may employ.

- Short-Term Effectiveness: Examines the effectiveness of alternatives in protecting human health and the environment during the construction and implementation of a remedy until response objectives have been met.

- Implementability: Evaluates the technical and administrative feasibility of alternatives and the availability of required goods and services.

- Cost: Evaluates the capital and operation and maintenance (O&M) costs of each alternative.

- State Acceptance: Reflects the state's apparent preferences among or concerns about the alternatives.

- Community Acceptance: Reflects the community's apparent preferences among or concerns about alternatives.

The analysis of alternatives is arranged by type of contaminant: explosives, explosives plus metals, SVOCs.

2.8.1 Evaluation of Alternatives For Explosives - Contaminated Soils

Overall Protection of Human Health and the Environment: Since both Thermal Treatment (incineration and LTTD) and Biological Treatment (composting and bio-slurry treatment) provide for destruction/degradation of contaminants to acceptable risk levels and the management of residuals (either through landfilling or treatment to lower levels protective of groundwater), both categories of alternatives are considered equally protective of human health and the environment.

Compliance with ARARs: Most ARARs issues will be comparable for both Thermal Treatment and Biological Treatment, although Thermal Treatment will involve more concerns related to air emissions (i.e., ambient air quality standards, visible emission standards, emission standards for particulate matter) and compliance with EPA's requirement for a combustion facility risk assessment. Significant ARARs are identified in Tables 15a, 15b, and 15c.

Long-Term Effectiveness and Permanence: Thermal Treatment will permanently destroy explosives contaminants that are present above remediation goals (RGs), while Biological Treatment will degrade and stabilize them. Both of these processes are considered irreversible. While composting has been conducted on a scale similar to that required at IAAAP, long-term effectiveness of Biological Treatment is difficult to assess because of uncertainties about the degree of treatment that can be achieved and the bio-availability of treatment residuals. Thermal Treatment may be considered more effective since destruction of contaminants is more complete. However, long-term landfill operation and maintenance is required under either alternative unless Biological Treatment is determined to be acceptable for unrestricted land application.

Reduction of Toxicity, Mobility, and Volume Through Treatment: Both Thermal Treatment and Biological Treatment will reduce contaminant levels to below RGs, although Thermal Treatment will provide a greater degree of reduction in contaminant toxicity and mobility. Incineration will result in some volume reduction, while composting will result in a volume increase. LTTD and bio-slurry treatment are not expected to change soil volumes significantly as a result of treatment.

Short-Term Effectiveness: While explosives hazard assessments and control measures will be required under both Thermal and Biological Treatment, the requirements for Thermal Treatment are expected to be more rigorous than for Biological Treatment. A combustion risk assessment will demonstrate that risks associated with Thermal Treatment can be managed effectively. Other short-term effectiveness issues are considered to be equivalent.

Implementability: Both Thermal Treatment and Biological Treatment involve a number of implementability issues. Both use commercially available equipment. Testing will be required for each alternative prior to implementation: incineration and LTTD will require a trial burn; LTTD has not been utilized for remediation of explosives-contaminated soils in this country and testing will, therefore, be required to demonstrate its effectiveness; although testing has been done to demonstrate the effectiveness of composting and bioslurry treatment, additional testing will be required to define process and operating parameters. Once approvals are received and equipment is mobilized, Thermal Treatment can be accomplished in a few months while Biological Treatment will require several years.

Cost: The costs of Thermal and Biological Treatment may be compared as follows:

TABLE 7
Alternative Cost Comparisons
Explosives

Alternative	Capital Cost	Operating Cost	Present Worth (incl. contingency)
E1A: Incineration	$ 4,600,000	$ 3,330,000	$10,310,000
E1B: LTTD	$ 830,000	$ 2,700,000	$ 4,590,000
E2A:Composting	$ 1,050,000	$ 3,390,000- $ 4,290,000	$ 4,410,000- $,580,000
E2B: Bio-slurry	$ 1,950,000	$ 2,700,000- $ 3,960,000	$ 5,740,000- $7,070,000

Corps of Engineers program management costs are not included in the above costs.

Operating costs of each alternative may be influenced significantly by variables that are difficult to predict at this time. Operating efficiencies (including cycle times, labor costs, energy costs, and amendment mixes and costs) may vary considerably for any of these processes, depending on the physical characteristics of the soil, weather, treatability of the contaminants, and individual contractor capabilities. Previous studies at IAAAP included an evaluation of Thermal and Biological Treatment alternatives considering the impact of varying volumes of contaminated soil. Although total costs were significantly influenced by soil volumes, the relative positioning of the alternatives were not affected. If further investigations demonstrate that LTTD can achieve PRGs, it appears to be the least costly alternative. However, with favorable amendment requirements and costs, composting and bio-slurry treatment may be competitive with LTTD. Incineration is considerably more costly.

State and Community Acceptance: State and community acceptance issues are summarized in Section 3 of this ROD.

Summary: In summary, Biological Treatment (i.e., composting) may be cost competitive with Thermal Treatment (i.e., LTTD) or may cost up to a million dollars (roughly 20%) more. In other criteria one alternative or the other may offer specific advantages, but both comply with RAOs and on balance are considered equivalent.

2.8.2 Evaluation of Alternatives for Explosives Plus Metals Contaminated Soils

Overall Protection of Human Health and the Environment: Since Alternative M1 (Explosives

Treatment Followed by Stabilization), Alternative M2 (Solidification/Stabilization With Activated Carbon), and Alternative M3 (Off-site Disposal) all provide for destruction/degradation, immobilization, and/or containment of contaminants, all three alternatives are considered equally protective of human health and the environment.

<u>Compliance with ARARs</u>: Thermal Treatment under Alternative M1 would involve more concerns related to air emissions and compliance with EPA's requirement for a combustion facility risk assessment. ARARs are not a part of off-site alternatives. Off-site alternatives must meet conditions specified in the off-site facility's permit. Significant ARARs are identified in Tables 15a, 15b, and 15c.

<u>Long-Term Effectiveness and Permanence:</u> The long-term effectiveness of Alternative M1 will depend on the process selected for explosives treatment as discussed above for Explosives-Contaminated Soils. Both Alternatives M2 and M3 stabilize contaminants rather than degrading them, and both require long-term landfill operation and maintenance to ensure continued effectiveness.

<u>Reduction of Toxicity, Mobility, and Volume Through Treatment:</u> Alternative M1 would provide reduction in both contaminant toxicity and mobility through destruction or degradation of explosives and solidification/stabilization of metals. Alternatives M2 and M3 would provide reduction in contaminant mobility only. Contaminant volume is not expected to be reduced significantly under any of the alternatives.

<u>Short-Term Effectiveness</u>: Short-term effectiveness would be comparable for all three alternatives, although Thermal Treatment under Alternative M1 would involve more rigorous explosives, hazard assessments, and control measures.

<u>Implementability</u>~~:~~ Off-Site Disposal (~~Alternative M3)~~ would be the easiest alternative to implement. Process development testing would be required for Explosives Treatment Followed by Stabilization (Alternative M1) and for Solidification/Stabilization With Activated Carbon (Alternative M2). In addition, the presence of metals may interfere with the implementability of Biological Treatment under Alternative M1.

<u>Costs:</u> Costs may be compared as follows:

TABLE 8
Alternative Cost Comparisons
Explosives Plus Metals

Alternative	Incremental Cost
M1: Explosives Treatment Followed by Stabilization	$250,000 to $350,000
M2: Solidification/Stabilization With Activated Carbon	$130,000 to $230,000
M3: Off-Site Disposal	$600,000 to $1,000,000

State and Community Acceptance: State and community acceptance issues are summarized in Section 3 of this ROD.

2.8.3 Evaluation of Alternatives for SVOC-Contaminated Soils

Overall Protection of Human Health and the Environment: The overall protection provided by Biological Treatment is difficult to assess because of uncertainties about its effectiveness for the specific SVOCs of concern. The remaining alternatives (Thermal Treatment and Off-site Disposal) are considered equally protective of human health and the environment.

Compliance with ARARs: Thermal Treatment would involve more concerns related to air emissions and compliance with EPA's requirement for a combustion facility risk assessment. ARARs are not a part of off-site alternatives. Off-site alternatives must meet conditions specified in the off-site facilities' permit. Significant ARARs are identified in Tables 15a, 15b, and 15c.

Long-Term Effectiveness and Permanence: Thermal Treatment will permanently destroy contaminants that are present above RGs. The effectiveness of Biological Treatment is difficult to assess because of uncertainties about ability to treat the specific SVOCs of concern. Off-Site Disposal contains contaminants rather than degrading them, and requires long-term landfill operation and maintenance to ensure continued effectiveness.

Reduction of Toxicity, Mobility, and Volume Through Treatment: Thermal Treatment provides reduction in both contaminant toxicity and mobility through destruction of contaminants. The reduction provided by Biological Treatment is difficult to assess because of uncertainties about ability to treat the specific SVOCs of concern. Off-Site Disposal provides reduction in contaminant mobility only. Incineration will result in some volume reduction, while composting will result in a volume increase. LTTD, bio-slurry treatment, and off-site disposal are not expected to change soil volumes significantly.

Short-Term Effectiveness: Short-term effectiveness will be comparable for all three alternatives, although Thermal Treatment will involve more rigorous explosives, hazard assessments, and control measures.

Implementability: Off-Site Disposal will be the easiest alternative to implement. Process development testing will be required for Biological Treatment, and trial burns will be required for Thermal Treatment.

Costs: Costs may be compared as follows:

TABLE 9
Alternative Cost Comparisons
SVOCs

Alternative	Incremental Cost
S1A: Incineration	$74,000
S1B: LTTD	$60,000
S2A: Composting	$52,000 to $72,000
S2B: Bio-slurry	$50,000 to $72,000
S3: Off-Site Disposal	$30,000 to $70,000

State and Community Acceptance: State and community acceptance issues are summarized in Section 3 of this ROD.

2.8.4 Environmental Consequences (NEPA Evaluation)

The feasibility study reviewed the environmental and socioeconomic effects of remediating contamination at the IAAAP, in compliance with the National Environmental Policy Act of 1969 (NEPA). Thermal treatment, biological treatment and "No Action" alternatives were reviewed for effects on numerous aspects of hydrology, soils, ecology, socioeconomics, and public health. No significant adverse effects were identified in the review. Further, none were identified by reviewing agencies or the general public during the public comment period of the Proposed Plan. It was the finding of the NEPA review that neither biological nor thermal treatment would adversely affect environmental resources at the IAAAP. A combustion facility risk assessment will be performed prior to implementation of the remedial action to address potential minor risks of adverse effects of air pollution and construction worker safety from thermal treatment technologies.

2.9 Selected Remedy

Based on an evaluation of the various alternatives, the Army and EPA conclude that Biological Treatment (Alternatives E2A and E2B) and LTTD Thermal Treatment (Alternative E1B) are capable of providing treatment to reduce the toxicity, mobility, and volume of principal threat contaminants in the CAMU in response to CERCLA's expressed preference for treatment, complying with land disposal restrictions (LDRs) for disposal of treated soil, and providing long-term protection of human health and the environment.

LTTD Thermal Treatment is the remedy selected for explosives-contaminated soils, with Biological Treatment as the contingency remedy pending results of the LTTD Thermal Treatment feasibility testing field demonstrations, and risk assessment. The feasibility testing and field demonstrations will include additional process development and economic evaluations to further define the performance and cost OF the LTTD Thermal Treatment alternative. In addition, a combustion facility risk assessment will be conducted consistent with EPA policies and guidance prior to implementation of LTTD Thermal Treatment. The results of this risk assessment will be presented to the public with an opportunity to comment prior to commencing the site work. If the feasibility testing, field demonstrations, or risk assessment shows that LTTD Thermal Treatment cannot be conducted in a protective manner, appropriate documentation will be prepared for review and submitted to the Administrative Record, and the contingency remedy will be implemented. Implementation of specific biological treatment processes (composting, bio-slurry, or other) will be determined based on demonstrated effectiveness following treatability testing using IAAAP soils, and on solicitation of competitive cost proposals from remediation technology vendors.

Solidification/Stabilization With Activated Carbon (Alternative M2) is the remedy selected for soils contaminated with explosives plus metals exceeding LDRs, and Off-Site Disposal (Alternative S#) is the remedy selected for soils contaminated with SVOCs. These alternatives comply with remedial action objectives at a lower cost than other alternatives and are equivalent to or better than other alternatives in most of the remaining criteria.

2.9.1 Description

The major components of the selected remedy include:

Explosives-Contaminated Soils

- Excavated explosives-contaminated soils from the CAMU and transport it to a temporary treatment facility on-site.
- Screen, Shred and blend the soil to produce a uniform feed material.
- Process the blended soils through a mobile direct-fired low-temperature thermal desorption unit (LTTD) (Selected Remedy) or a temporary Biological Treatment Unit (Contingent Remedy).

- Following confirmation sampling, dispose of treated soil according to the following criteria:

  a. For soils with cumulative risks less than 10^{-6}, in compliance with LDRs, and exceeding Summers model remediation goals, dispose in the Soil Repository or under another synthetic landfill cap on-site.

  a. For soils with cumulative risks less than 10^{-6}, in compliance with LDRs, and satisfying Summers model remediation goals, dispose on IAAAP property in an appropriate manner protective of human health and the environment. For Biotreated soils, treatment residuals must also be shown to be non-toxic or not bioavailable at levels posing a threat to human health or the environment.

Costs for treatment of 9,000 cubic yards of explosives-contaminated soil are estimated as follows:

TABLE 10
Selected Remedy Costs
Explosives-Contaminated Soils

	LTTD Treatment		Composting		Bio-Slurry Treatment	
	Unit Rate	**Cost**	**Unit Rate**	**Cost**	**Unit Rate**	**Cost**
Capital Cost		$830,000		$1,050,000		$ 1,950,000
Operating Cost	$300/cy	$2,700,000	$260 to $360/cy	$2,340,000 to $3,240,000	$300 to $440/cy	$ 2,700,000 to $ 3,960,000
Project Contingency	30%	$1,060,000	30%	$1,020,000 to $1,290,000	30%	$ 1,400,000 to $ 1,770,000
Total	$4,590,000		$4,410,000 to 5,580,000		$ 6,050,00 to 7,680,000	
Estimated Time Required for Treatment Facility Operation	Six Months		One Year		Three to Five Years	
Present Worth Based on 5% Annual Discount Rate	$4,590,000		$4,410,000 to 5,580,000		$5,740,000 to $7,070,000	

Explosives Plus Metals Contaminated Soils

- Excavate explosives plus metals contaminated soil from the CAMU and transport it to a temporary treatment facility on-site.
- Screen, shred and blend the soil to produce a uniform feed material.
- Process the blended soil through a temporary solidification/stabilization facility.
- Following confirmation sampling, dispose of treated soil on-site in the Soil Repository or under another synthetic landfill cap.

Costs for treatment of 600 cubic yards of explosives plus metals contaminated soils are estimated as follows:

TABLE 11
Selected Remedy Costs
Explosives plus Metals Contaminated Soils

	Cost
Capital Cost	Covered under management of Explosives-Contaminated Soils
Operating Cost (unit rate)	$220 to $380 per cubic yard
Incremental Cost (total)	$130,000 to $230,000

SVOC-Contaminated Soils

- Excavate SVOC-contaminated soil from the CAMU.
- Transport the soil to a commercial waste treatment and disposal facility off-site.

Costs for treatment of 200 cubic yards of SVOC-contaminated soils are estimated as follows:

TABLE 12
Selected Remedy Costs
SVOC-Contaminated Soils

	Cost
Capital Cost	Covered under management of Explosives-Contaminated Soil
Operating Cost (unit rate)	$150 to $350 per cubic yard
Incremental Cost (total)	$30,000 to $70,000

Capital costs for the selected remedy may vary as a result of changes made to the remedy during the remedial design and construction processes. Operating costs may be influenced significantly by variables that are difficult to predict at this time. Operating efficiencies (including cycle times, labor costs, energy costs, and amendment mixes and costs) may vary considerably for any of these processes, depending on the physical characteristics of the soil, weather, treatability of the contaminants, and individual contractor capabilities.

2.9.2 Remediation Goals

Chemical-specific remediation goals have been established for treatment of soils stockpiled in the IAAP CAMU. These treatment goals are based on risk considerations and are considered to be protective of individuals who may be exposed at the site. Remediation goals have been established at 1 E(-6) risk level to the reasonably maximum exposed individual considering an industrial land use setting. Exposure assumptions have been adopted from those specified in EPA guidance (see OSWER Directive 9285.6-03) Remediation goals based on these criteria are outlined in Table 13, with exceptions noted.

TABLE 13
Soil Remediation Goals
at 10^{-6} Risk Level
Based on Ingestion/Dermal Contact

Chemical	*PRG (µg/g)*
Antimony	816
Arsenic	30.0
Beryllium	5
Cadmium	1,000
Chromium VI	10,000
Lead[1]	1000
Thallium	143
Benzo(a)anthracene	8.1
Benzo(a)pyrene	0.81
Benzo(b)fluoranthene	8.1
Dibenz(a,b)anthracene	0.81
Total PCBs[2]	10
1,3,5- Trinitrobenzene	102
2,4-Dinitrotoluene (2,4-DNT)	8.7
2,4,6-TNT	*196*[3]
RDX	*53*[3]
HMX	51,000

1. Remediation goal for lead is determined based on the "PRG Screen Model," rather than a carcinogenic risk.
2. Remediation goal for PCB is based on EPA OSWER Directive 9355.4-01, "Guidance on Remedial Actions for Superfund Sites with PCB Contamination"
3. See Table 14

Remediation goals for other constituents which may be detected at the site and which are not specified in this table will be established using similar criteria.

In addition to risk-based soil remediation goals for protection of human health, impact to groundwater from residual soil contamination has been evaluated. The Summers' model was utilized to estimate the point at which contaminant concentrations in the soils will produce groundwater contamination at concentrations above acceptable levels. The resultant soil concentrations can then be used as a guidelines in estimating boundaries or extent of soil contamination and specifying soil cleanup goals for remediation. The Summers' model was used to determine acceptable levels for explosives COCs in soils (RDX, and 2,4,6-TNT), which are found in on-and off-site groundwater. The model was based on not exceeding groundwater concentrations of 2 ppb RDX and 2 ppb 2,4,6-TNT. The model was not used for metals as metals are relatively immobile in the clay soils found at the IAAAP. There are also no Summers' model limits for SVOCs. The site-specific remediation goals for the major contributing explosives are:

TABLE 14
Soil Remediation Goals
Based on Soil Leaching

Chemical	*PRG (μg/g)*
RDX	1.3
2,4,6-TNT	47.6

These concentrations of RDX and 2,4,6-TNT were used as remediation goals in order to satisfy the remedial action objectives for the protection of human health and the protection of groundwater. These values supersede those presented in Table 13 for RDX and TNT for unrestricted land application of treated soil.

Compliance with the stated objectives for this ROD may be achieved in one of two ways:

a. Treatment to a cumulative risk level of 10^{-6} and compliance with LDRs, followed by management of residuals in a landfill. This would result in 95% to 99+% removal of contaminants, which is consistent with CERCLA's requirement for "significant" treatment, and would be protective of groundwater.

b. Treatment to lower levels protective of groundwater (as defined by the Summers' model) followed by on-site management of treatment residuals. Unrestricted land application of residuals would require a demonstration of contaminant destruction or a demonstration that residuals are not toxic or not bioavailable at levels that would pose a threat to human health and the environment.

Since solidification/stabilization immobilizes contaminants rather than destroys them, compliance with remedial action objectives for treatment of explosives plus metals contaminated soil will be determined based on analysis of leachate as a measure of groundwater protectiveness. For metals and explosives with Toxicity Characteristic Leaching Procedure (TCLP) limits established under RCRA, treatment will be considered protective of human health and the environment if TCLP results are below RCRA regulatory limits. For other chemicals of concern, TCLP remediation goals for groundwater protection are be established based on the following hierarchy:

1. 100 times EPA Drinking Water Maximum Contaminant Level.

2. 100 times EPA Lifetime Health Advisory.

3. For carcinogens, 100 times the groundwater concentration corresponding to EPA 10^{-6} risk levels based on residential water usage.

4. For non-carcinogens, 100 times the groundwater concentration corresponding to a Hazard Index of 1.0 based on residential water usage.

2.10 Statutory Determinations

In accordance with the statutory requirements of Section 121 of CERCLA, remedial actions that are selected are required to:

- Protect human health and the environment.
- Comply with applicable or relevant and appropriate requirements (ARARs).
- Be cost effective.
- Use permanent solutions and alternative treatment technologies to the maximum extent practicable.
- Satisfy the preference for treatment that reduces contaminant toxicity, mobility, or volume as a principal element.

The manner in which the IAAAP Soils OU #1 remedial action satisfies the above requirements is discussed in the following sections.

2.10.1 Protection of Human Health and the Environment

The selected remedy will provide for protection of human health and the environment through destruction/degradation of explosives contamination to acceptable risk levels and through management of residual explosives, metals, and SVOC contaminants through landfilling.

2.10.2 Compliance with ARARs

The selected remedy will comply with applicable or relevant and appropriate requirements (ARARs). ARARs are presented in Table 15a, 15b, and 15c according to location-specific, chemical-specific, and action-specific requirements. Activities conducted entirely on-site do not require Federal, State, or local permits, but on-site actions must comply with the substantive requirements of any Federal or State environmental laws that are ARARs. Off-site activities must meet conditions specified in the off-site facility's permits.

Significant ARARs associated with the selected remedy include:

TABLE 15a
COMPLIANCE OF ALTERNATIVES WITH LOCATION-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils		Explosives Plus Metals Contaminated Soils	SVOC - Contaminated Soils
	Thermal Treatment	Biological Treatment	Solidification/Stabilization with Activated Carbon	Off-site Disposal
Endangered Species Act, 16 U.S.C. 1531 *et seq.*; and Fish and Wildlife Coordination Act, 16 U.S.C. 661 *et seq.* 50 CFR Part 200, 50 CFR Part 402, and 33 CFR Parts 320 - 330	Excavation and construction activities may affect habitat upon which the federally listed bald eagle or Indiana bat may depend. Measures will be taken to avoid affecting critical habitat.	Excavation and construction activities may affect habitat upon which the federally listed bald eagle or Indiana bat may depend. Measures will be taken to avoid affecting critical habitat.	Excavation and construction activities may affect habitat upon which the federally listed bald eagle or Indiana bat may depend. Measures will be taken to avoid affecting critical habitat.	Excavation and construction activities may affect habitat upon which the federally listed bald eagle or Indiana bat may depend. Measures will be taken to avoid affecting critical habitat.
Bald Eagle Protection Act, 16 U.S.C. 668 *et seq*	Excavation and construction activities may affect habitat upon which the bald eagle may depend. Measures will be taken to avoid affecting the bald eagle's habitat.	Excavation and construction activities may affect habitat upon which the bald eagle may depend. Measures will be taken to avoid affecting the bald eagle's habitat.	Excavation and construction activities may affect habitat upon which the bald eagle may depend. Measures will be taken to avoid affecting the bald eagle's habitat.	Excavation and construction activities may affect habitat upon which the bald eagle may depend. Measures will be taken to avoid affecting the bald eagle's habitat.
Migratory Bird Treaty Act of 1972, 16 U.S.C. Section 703	Excavation and construction activities may adversely impact migratory bird species present on or in the vicinity of the IAAAP. Measures will be taken to avoid such adverse impacts	Excavation and construction activities may adversely impact migratory bird species present on or in the vicinity of the IAAAP. Measures will be taken to avoid such adverse impacts.	Excavation and construction activities may adversely impact migratory bird species present on or in the vicinity of the IAAAP. Measures will be taken to avoid such adverse impacts	Excavation and construction activities may adversely impact migratory bird species present on or in the vicinity of the IAAAP Measures will be taken to avoid such adverse impacts.
National Archeological and Historical Preservation Act, 16 U.S.C. Section 469 36 CFR Part 65	Excavation and construction activities are not expected to unearth significant scientific, prehistoric, or archaeologic data. If such artifacts are discovered during excavation activities, measures will be taken to avoid irreparable harm, loss or destruction of the artifacts	Excavation and construction activities are not expected to unearth significant scientific, prehistoric, or archaeologic data. If such artifacts are discovered during excavation activities, measures will be taken to avoid irreparable harm, loss or destruction of the artifacts.	Excavation and construction activities are not expected to unearth significant scientific, prehistoric, or archaeologic data. If such artifacts are discovered during excavation activities, measures will be taken to avoid irreparable harm, loss or destruction of the artifacts.	Excavation and construction activities are not expected to unearth significant scientific, prehistoric, or archaeologic data If such artifacts are discovered during excavation activities, measures will be taken to avoid irreparable harm, loss or destruction of the artifacts
Native American Graves and Repatriation Act, 25 U.S.C. Section 3001	Excavation and construction activities are not expected Native American graves or Native American cultural objects If such graves or objects are discovered during excavation activities, measures will be taken to avoid their irreparable harm, loss or destruction	Excavation and construction activities are not expected Native American graves or Native American cultural objects. If such graves or objects are discovered during excavation activities, measures will be taken to avoid their irreparable harm, loss or destruction.	Excavation and construction activities are not expected Native American graves or Native American cultural objects. If such graves or objects are discovered during excavation activities, measures will be taken to avoid their irreparable harm, loss or destruction.	Excavation and construction activities are not expected Native American graves or Native American cultural objects. If such graves or objects are discovered during excavation activities, measures will be taken to avoid their irreparable harm, loss or destruction
Fish and Wildlife Coordination Act, 16 U.S.C. 661 *et seq.* 40 CFR 6.302	Surface water removed from excavated areas or decontamination water may be discharged to Brush, Long, or Spring Creeks If so, the water will be treated as necessary to avoid modifying the creeks and affecting fish or wildlife.	Surface water removed from excavated areas or decontamination water may be discharged to Brush, Long, or Spring Creeks If so, the water will be treated as necessary to avoid modifying the creeks and affecting fish or wildlife.	Surface water removed from excavated areas or decontamination water may be discharged to Brush, Long, or Spring Creeks If so, the water will be treated as necessary to avoid modifying the creeks and affecting fish or wildlife.	Surface water removed from excavated areas or decontamination water may be discharged to Brush, Long, or Spring Creeks. If so, the water will be treated as necessary to avoid modifying the creeks and affecting fish or wildlife.

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TABLE 15a
COMPLIANCE OF ALTERNATIVES WITH LOCATION-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils		Explosives Plus Metals Contaminated Soils	SVOC - Contaminated Soils
	Thermal Treatment	**Biological Treatment**	**Solidification/Stabilization with Activated Carbon**	**Off-site Disposal**
Farmland Protection Policy Act, 7 U.S.C. 4201 *et seq* 7 CFR Part 658.4 and 658.5	Prime and unique farmland may be present at the IAAAP. However, excavation and construction activities are not expected to occur near such farmland.	Prime and unique farmland may be present at the IAAAP. However, excavation and construction activities are not expected to occur near such farmland.	Prime and unique farmland may be present at the IAAAP. However, excavation and construction activities are not expected to occur near such farmland.	Prime and unique farmland may be present at the IAAAP. However, excavation and construction activities are not expected to occur near such farmland.
Iowa Environmental Quality Act, I.A.C., Division 567, Title XI, Chapter 151, Iowa Hazardous Waste Facilities Siting Regulations I.A.C. 151.3(2) and Table 1	Thermal treatment facilities will not be sited in critical wildlife habitat or prime farmland.	Biological treatment facilities will not be sited in critical wildlife habitat or prime farmland	Treatment facilities will not be sited in critical wildlife habitat or prime farmland.	Materials handling facilities will not be sited in critical wildlife habitat or prime farmland
Iowa Environmental Quality Act, I.A.C., Division 567, Title XI, Chapter 151, Iowa Hazardous Waste Facilities Siting Regulations I.A.C. 151.3(1)	Thermal treatment facilities will not be sited within 1 mile of wetlands.	Biological treatment facilities will not be sited within 1 mile of wetlands.	Treatment facilities will not be sited within 1 mile of wetlands.	Materials handling facilities will not be sited within 1 mile of wetlands
Iowa Code Annotated, Title XI, Natural Resources; Subtitle 6, Wildlife; Chapter 481A, Wildlife Conservation I.A.C. 481A.38	Excavation and construction activities may affect habitat upon which the federally listed bald eagle or Indiana bat may depend, or upon which the state-listed orangethroat darter or yellow trout lily may depend. Measures will be taken to avoid the "taking" of wildlife.	Excavation and construction activities may affect habitat upon which the federally listed bald eagle or Indiana bat may depend, or upon which the state-listed orangethroat darter or yellow trout lily may depend. Measures will be taken to avoid the "taking" of wildlife.	Excavation and construction activities may affect habitat upon which the federally listed bald eagle or Indiana bat may depend, or upon which the state-listed orangethroat darter or yellow trout lily may depend. Measures will be taken to avoid the "taking" of wildlife.	Excavation and construction activities may affect habitat upon which the federally listed bald eagle or Indiana bat may depend, or upon which the state-listed orangethroat darter or yellow trout lily may depend. Measures will be taken to avoid the "taking" of wildlife.

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Table 15b

COMPLIANCE OF ALTERNATIVES WITH CHEMICAL-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils: Thermal Treatment	Explosives Contaminated Soils: Biological Treatment	Explosives Plus Metals Contaminated Soils: Solidification/Stabilization with Activated Carbon	SVOC Contaminated Soils: Off-Site Disposal
SOILS				
Iowa Underground Storage Tanks Acts, I.A.C., Division 567, Title X, Chapter 135, Iowa Underground Storage Tanks Regulations I.A.C. 135.7(455B)(9) [Petroleum Contamination Corrective Action Levels]	Compliance with the petroleum corrective action level of 100 mg/kg will be achieved by off-site disposal of SVOC-contaminated soils.	Compliance with the petroleum corrective action level of 100 mg/kg will be achieved by off-site disposal of SVOC-contaminated soils.	Compliance with the petroleum corrective action level of 100 mg/kg will be achieved by off-site disposal of SVOC-contaminated soils.	Compliance with the petroleum corrective action level of 100 mg/kg will be achieved by off-site disposal of SVOC-contaminated soils.
AIR				
Iowa Environmental Quality Act (IEQA), Division 567, Title II, Chapter 28, Ambient Air Quality Standards I.A.C. 28.1(455B) [Ambient Air Quality Standards]	This alternative involves excavation and construction activities that may release lead and particulate matter into the air, and thermal treatment of metals/explosives-contaminated soils that may release lead and particulate matter into the air. Control equipment will be used to ensure compliance with the ambient air quality standards.	This alternative involves excavation and construction activities that may release lead and particulate matter into the air. Engineering measures will be used to ensure compliance with the ambient air quality standards.	This alternative involves excavation and construction activities that may release lead and particulate matter into the air. Engineering measures will be used to ensure compliance with the ambient air quality standards.	This alternative involves excavation and construction activities that may release lead and particulate matter into the air. Engineering measures will be used to ensure compliance with the ambient air quality standards.
IEQA, Division 567, Title II, Chapter 22, Controlling Pollution I.A.C. 22.3(3) [Visible Emission Standard Set in Permit]	This alternative involves the thermal treatment of contaminated soils in a mobile unit, which is subject to new source review. Although the IAAAP is not required to obtain a permit, it will need to meet the visible air emission standard that is IDNR's policy.	This alternative does not involve new source review.	This alternative does not involve new source review	This alternative does not involve new source review.
IEQA, Division 567, Title II, Chapter 23, Emission Standards for Contaminants I.A.C. 23.3(2)(a) and Table 1 [Emission Standard for Particulate Matter]	This alternative involves the thermal treatment of contaminated soils, which is a process that may emit smoke, particulate matter, gaseous matter or other contaminants. Control equipment will be used to ensure compliance with the emission standard for particulate matter	This alternative does not involve emission of particulate matter from any process.	This alternative does not involve emission of particulate matter from any process.	This alternative does not involve emission of particulate matter from any process.

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TABLE 15b
COMPLIANCE OF ALTERNATIVES WITH CHEMICAL-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils: Thermal Treatment	Explosives Contaminated Soils: Biological Treatment	Explosives Plus Metals Contaminated Soils: Solidification/Stabilization with Activated Carbon	SVOC Contaminated Soils: Off-Site Disposal
AIR				
IEQA, Division 567, Title II, Chapter 23, Emission Standards for Contaminants I.A.C. 23.3(2)(c)(1) [Emission Standard for Fugitive Dust]	This alternative involves the excavation and onsite transport of contaminated soils, and construction activities, which may release particulate matter into the air. Control measures will be used to ensure compliance with the fugitive dust standard for materials to be handled, transported or stored, and for the use/construction/repair of construction haul roads.	This alternative involves the excavation and onsite transport of contaminated soils, and construction activities, which may release particulate matter into the air. Control measures will be used to ensure compliance with the fugitive dust standard for materials to be handled, transported or stored, and for the use/construction/repair of construction haul roads.	This alternative involves the excavation and onsite transport of contaminated soils, and construction activities, which may release particulate matter into the air. Control measures will be used to ensure compliance with the fugitive dust standard for materials to be handled, transported or stored, and for the use/construction/repair of construction haul roads.	This alternative involves the excavation and onsite transport of contaminated soils, and construction activities, which may release particulate matter into the air. Control measures will be used to ensure compliance with the fugitive dust standard for materials to be handled, transported or stored, and for the use/construction/repair of construction haul roads.
SURFACE WATER				
Federal Water Pollution Control Act (FWPCA), 33 U.S.C. Section 402 [National Pollutant Discharge Elimination (NPDES) permit conditions]	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure that discharges comply with standards in the NPDES permit issued to the IAAAP.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure that discharges comply with standards in the NPDES permit issued to the IAAAP	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure that discharges comply with standards in the NPDES permit issued to the IAAAP	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure that discharges comply with standards in the NPDES permit issued to the IAAAP.
Safe Drinking Water Act (SDWA), 42 U.S.C. 300 *et seq.* 40 CFR 141.11; 40 CFR 141.15(a) and (b); 40 CFR 141.16(a); 40 CFR 141.61(c); and 40 CFR 141.61(b) EPA, Office of Water, "Drinking Water Regulations and Health Advisories," October 1996 [Maximum Contaminant Levels (MCLs)]	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure compliance with the MCLs.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure compliance with the MCLs.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure compliance with the MCLs.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure compliance with the MCLs.
SDWA, 42 U.S.C. 300 *et seq* 40 CFR 141.50(a), and 40 CFR 141.51(b) [Maximum Contaminant Level Goals (MCLGs)]	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure compliance with the MCLGs	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure compliance with the MCLGs.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure compliance with the MCLGs	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure compliance with the MCLGs

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TABLE 15b
COMPLIANCE OF ALTERNATIVES WITH CHEMICAL-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils		Explosives Plus Metals Contaminated Soils	SVOC Contaminated Soils
	Thermal Treatment	**Biological Treatment**	**Solidification/Stabilization with Activated Carbon**	**Off-Site Disposal**
SURFACE WATER				
IEQA, I.A.C., Division 567, Title III, Chapter 62, Effluent and Pretreatment Standards: Other Effluent Limitations or Prohibitions I.A.C. 62.1(455B)(1) [NPDES permit conditions]	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure discharges comply with standards in the NPDES permit issued to the IAAAP.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure discharges comply with standards in the NPDES permit issued to the IAAAP.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure discharges comply with standards in the NPDES permit issued to the IAAAP.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure discharges comply with standards in the NPDES permit issued to the IAAAP.
IEQA, I.A.C., Division 567, Title III, Chapter 41, Iowa Drinking Water Regulations I.A.C. 41.3(455B)(1)(b), 41.3(455B)(5)(a) and (b), and 41.3(455B)(6)(a) [state MCLs]	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure water quality complies with the state MCLs.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure water quality complies with the state MCLs.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure water quality complies with the state MCLs.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure water quality complies with the state MCLs.
IEQA, I.A.C., Division 567, Title IV, Chapter 61, Surface Water Quality Criteria I.A.C. 61.2(455B)(2) [Antidegradation Policy]	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure discharges comply with the state antidegradation policy.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure discharges comply with the state antidegradation policy.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure discharges comply with the state antidegradation policy.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. Appropriate treatment will ensure discharges comply with the state antidegradation policy.
IEQA, I.A.C., Division 567, Title IV, Chapter 61, Surface Water Quality Criteria I.A.C. 61.3(455B) [Water Quality Criteria for general use segments, and for designated use water segments]	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. The discharge will be treated appropriately to ensure compliance with the state water quality criteria for Class B(LR) waters.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. The discharge will be treated appropriately to ensure compliance with the state water quality criteria for Class B(LR) waters.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. The discharge will be treated appropriately to ensure compliance with the state water quality criteria for Class B(LR) waters.	This alternative may involve the discharge of surface water removed from excavated areas, or decontamination water, into Brush, Long, or Spring Creeks. The discharge will be treated appropriately to ensure compliance with the state water quality criteria for Class B(LR) waters.

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TABLE 15b
COMPLIANCE OF ALTERNATIVES WITH CHEMICAL-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils: Thermal Treatment	Explosives Contaminated Soils: Biological Treatment	Explosives Plus Metals Contaminated Soils: Solidification/Stabilization with Activated Carbon	SVOC Contaminated Soils: Off-Site Disposal
GROUNDWATER				
SDWA, 42 U.S.C. 300 *et seq* 40 CFR 141.11; 40 CFR 141.15(a) and (b); 40 CFR 141.16(a); 40 CFR 141.61(c); and 40 CFR 141.61(b) EPA, Office of Water, "Drinking Water Regulations and Health Advisories," October 1996 [MCLs]	This alternative includes the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with MCLs	This alternative may include the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with MCLs.	This alternative includes the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with MCLs.	This alternative does not involve on-site disposal of SVOC contaminated soil.
SDWA, 42 U.S.C. 300 *et seq* 40 CFR 141.50(a); and 40 CFR 141.51(b) [MCLGs]	This alternative includes the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water Groundwater monitoring will ensure compliance with MCLGs.	This alternative may include the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with MCLGs.	This alternative includes the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with MCLGs.	This alternative does not involve on-site disposal of SVOC contaminated soil.
Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 *et seq.* 40 CFR 258.40(a)(1), and Table 1 [Groundwater Protection Standards for solid waste disposal facilities]	This alternative includes the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with the groundwater protection standards.	This alternative may include the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with the groundwater protection standards.	This alternative includes the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with the groundwater protection standards.	This alternative does not involve on-site disposal of SVOC contaminated soil.
Solid Waste Disposal Act, as amended by the RCRA, 42 U.S.C. 6901 *et seq* 40 CFR 264.92 - 264.94, and Table 1 [Groundwater Protection Standards for permitted hazardous waste facilities]	This alternative includes the onsite disposal of treatment residuals into an on-site landfill This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water Groundwater monitoring will ensure compliance with the groundwater protection standards	This alternative may include the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water Groundwater monitoring will ensure compliance with the groundwater protection standards	This alternative includes the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water Groundwater monitoring will ensure compliance with the groundwater protection standards	This alternative does not involve on-site disposal of SVOC contaminated soil. 4 of 5

TA[redacted]b
COMPLIANCE OF ALTERNATIVES WITH CHEMICAL-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils		Explosives Plus Metals Contaminated Soils	SVOC Contaminated Soils
	Thermal Treatment	**Biological Treatment**	**Solidification/Stabilization with Activated Carbon**	**Off-Site Disposal**
GROUNDWATER				
IEQA, I.A.C., Division 567, Title III, Chapter 41, Iowa Drinking Water Regulations I.A.C. 41.3(455B)(1)(b); 41.3(455B)(5)(a) and (b); and 41.3(455B)(6)(a) [state MCLs]	This alternative includes the onsite disposal of treatment residuals into on-site landfill This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with the state MCLs.	This alternative may include the onsite disposal of treatment residuals into an on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water Groundwater monitoring will ensure compliance with the state MCLs.	This alternative includes the onsite disposal of treatment residuals into on-site landfill. This may present a potential for leaching of contaminants into the groundwater, which is a potential source of drinking water. Groundwater monitoring will ensure compliance with the state MCLs.	This alternative does not involve on-site disposal of SVOC contaminated soil
IEQA, I.A.C., Division 567, Title X, Chapter 133, Iowa Responsible Parties Cleanup Regulations I.A.C. 133.4(455B.455E)(2) and (3)(b)(1) [Action Levels for groundwater cleanup actions]	This alternative includes the onsite disposal of treatment residuals into an on-site landfill. This may result in point source contamination presenting a significant risk to groundwater, through leaching of contaminants. Groundwater monitoring will ensure compliance with the state action levels.	This alternative may include the onsite disposal of treatment residuals into an on-site landfill. This may result in point source contamination presenting a significant risk to groundwater, through leaching of contaminants. Groundwater monitoring will ensure compliance with the state action levels.	This alternative includes the onsite disposal of treatment residuals into an on-site landfill This may result in point source contamination presenting a significant risk to groundwater, through leaching of contaminants. Groundwater monitoring will ensure compliance with the state action levels.	This alternative does not involve on-site disposal of SVOC contaminated soil 5 of 5

TABLE 15c
COMPLIANCE OF ALTERNATIVES WITH ACTION-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils — Thermal Treatment	Explosives Contaminated Soils — Biological Treatment	Explosives Plus Metals Contaminated Soils — Solidification/Stabilization with Activated Carbon	SVOC Contaminated Soils — Off-Site Disposal
CERCLA Section 121 (b) [Preference for treatment]	This alternative involves thermal treatment of contaminated soils. This alternative ensures compliance with CERCLA's preference for treatment, and compliance with the established 50 percent treatment goal.	This alternative involves biological treatment of contaminated soils. This alternative ensures compliance with CERCLA's preference for treatment, and compliance with the established 50 percent treatment goal	This alternative involves solidification/stabilization of contaminated soils. This alternative ensures compliance with CERCLA's preference for treatment, and compliance with the established 50 percent treatment goal	This alternative involves disposal to a landfill of contaminated soils. If these contaminated soils are restricted from land disposal, alternative treatment levels will be met before disposal in a landfill
Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 *et seq* 40 CFR 268 Subparts A and D [Land Disposal Restrictions]	This alternative may involve disposal to a landfill of metals - contaminated soils that have been solidified and stabilized. If these contaminated soils are restricted from land disposal, alternative treatment levels will be met before disposal in a landfill	This alternative may involve disposal to a landfill of metals - contaminated soils that have been solidified and stabilized. If these contaminated soils are restricted from land disposal, alternative treatment levels will be met before disposal in a landfill	This alternative may involve disposal to a landfill of metals - contaminated soils that have been solidified and stabilized. If these contaminated soils are restricted from land disposal, alternative treatment levels will be met before disposal in a landfill	This alternative involves disposal to a landfill of contaminated soils. If these contaminated soils are restricted from land disposal, alternative treatment levels will be met before disposal in a landfill
Iowa Environmental Quality Act (IEQA), I.A.C., Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR 261.21 - 261.24, and Table 1 (adopted at I.A.C. 141.2[1]) [Criteria for Identifying the Characteristics of RCRA Hazardous Wastes]	Excavated soils will be identified as either RCRA or non-RCRA hazardous wastes. This alternative will comply with the relevant and appropriate action-specific requirements within the state's hazardous waste program	Excavated soils will be identified as either RCRA or non-RCRA hazardous wastes. This alternative will comply with the relevant and appropriate action-specific requirements within the state's hazardous waste program	Excavated soils will be identified as either RCRA or non-RCRA hazardous wastes. This alternative will comply with the relevant and appropriate action-specific requirements within the state's hazardous waste program	Excavated soils will be identified as either RCRA or non RCRA hazardous wastes. This alternative will comply with the relevant and appropriate action-specific requirements within the state's hazardous waste program
IEQA, I.A.C., Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR 261.32 (adopted at I.A.C. 141.2[1]) [Criteria for Listing RCRA Hazardous Wastes]	Prior to placement in the CAMU, excavated soils will be tested to determine if the listed RCRA hazardous waste K047 is present (based on ignitability). This alternative will comply with the relevant and appropriate action-specific requirements within the state's hazardous waste program	Prior to placement in the CAMU, excavated soils will be tested to determine if the listed RCRA hazardous waste K047 is present (based on ignitability). This alternative will comply with the relevant and appropriate action-specific requirements within the state's hazardous waste program	Prior to placement in the CAMU, excavated soils will be tested to determine if the listed RCRA hazardous waste K047 is present (based on ignitability). This alternative will comply with the relevant and appropriate action-specific requirements within the state's hazardous waste program	Prior to placement in the CAMU, excavated soils will be tested to determine if the listed RCRA hazardous waste K047 is present (based on ignitability). This alternative will comply with the relevant and appropriate action-specific requirements within the state's hazardous waste program

TABLE 15c
COMPLIANCE OF ALTERNATIVES WITH ACTION-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils		Explosives Plus Metals Contaminated Soils	SVOC Contaminated Soils
	Thermal Treatment	Biological Treatment	Solidification/Stabilization with Activated Carbon	Off-Site Disposal
IEQA, I A C , Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR 264 14 (adopted at I A C 141 5[455B]) [Security Requirements]	Unauthorized persons and livestock will be restricted from all active portions of the IAAAP during soil remediation actions, using fencing and site control measures	Unauthorized persons and livestock will be restricted from all active portions of the IAAAP during soil remediation actions, using fencing and site control measures	Unauthorized persons and livestock will be restricted from all active portions of the IAAAP during soil remediation actions, using fencing and site control measures	Unauthorized persons and livestock will be restricted from all active portions of the IAAAP during soil remediation actions, using fencing and site control measures
IEQA, I A C., Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR 264 17(a) and (b) (adopted at I A C 141 5[455B]) [General Requirements for Ignitable, Reactive, or Incompatible Wastes]	Contaminated soils may be incompatible with each other or with hazardous wastes in the soil repository, or hazardous based on the characteristics of ignitability or reactivity Precautions will be taken to prevent accidental ignition or reaction of ignitable or reactive wastes	Contaminated soils may be incompatible with each other or with hazardous wastes in the soil repository, or hazardous based on the characteristics of ignitability or reactivity Precautions will be taken to prevent accidental ignition or reaction of ignitable or reactive wastes	Contaminated soils may be incompatible with each other or with hazardous wastes in the soil repository, or hazardous based on the characteristics of ignitability or reactivity Precautions will be taken to prevent accidental ignition or reaction of ignitable or reactive wastes	Contaminated soils may be incompatible with each other or with hazardous wastes in the soil repository, or hazardous based on the characteristics of ignitability or reactivity Precautions will be taken to prevent accidental ignition or reaction of ignitable or reactive wastes
IEQA, I A C , Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR Part 264, Subpart F (adopted at I A C 141 5[455B]) [Groundwater Protection Requirements for Disposal in a Land Disposal Unit]	This alternative involves the disposal of certain treated contaminated soils into a landfill which is a land disposal unit Measures will ensure this alternative will meet the groundwater protection requirements	This alternative may involve the disposal of treated and untreated contaminated soils into a landfill which is a land disposal unit Measures will ensure the alternative will meet the groundwater protection requirements	This alternative involves the disposal of certain treated contaminated soils into a landfill which is a land disposal unit Measures will ensure this alternative will meet the groundwater protection requirements	This alternative does not involve on-site disposal of SVOC contaminated Soil
IEQA, I A C , Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR Part 264, Subpart G (adopted at I A C 141 5[455B]) [Closure and Post-Closure Requirements]	This alternative involves the disposal of certain treated contaminated soils into a landfill The alternative will comply with the closure and post-closure requirements when the soil repository is closed	This alternative may involve the disposal of treated and untreated contaminated soils into a landfill The alternative will comply with the closure and post-closure requirements when the soil repository is closed	This alternative involves the disposal of certain treated contaminated soils into a landfill The alternative will comply with the closure and post-closure requirements when the soil repository is closed	This alternative does not involve on-site disposal of SVOC contaminated Soil 2 of 4

TABLE 15c
COMPLIANCE OF ALTERNATIVES WITH ACTION-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils: Thermal Treatment	Explosives Contaminated Soils: Biological Treatment	Explosives Plus Metals Contaminated Soils: Solidification/Stabilization with Activated Carbon	SVOC Contaminated Soils: Off-Site Disposal
IEQA, I.A.C., Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR Part 264, Subpart I (adopted at I.A.C. 141.5[455B]) [Requirements for Use and Management of Containers]	Surface water from excavated areas, and decontamination water may result from this alternative. Storage of these waters in containers would be necessary until treatment and/or disposal could occur. The alternative will comply with the requirements for the use and management of containers.	Surface water from excavated areas, and decontamination water may result from this alternative. Storage of these waters in containers would be necessary until treatment and/or disposal could occur. The alternative will comply with the requirements for the use and management of containers.	Surface water from excavated areas, and decontamination water may result from this alternative. Storage of these waters in containers would be necessary until treatment and/or disposal could occur. The alternative will comply with the requirements for the use and management of containers.	Surface water from excavated areas, and decontamination water may result from this alternative. Storage of these waters in containers would be necessary until treatment and/or disposal could occur. The alternative will comply with the requirements for the use and management of containers.
IEQA, I.A.C., Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR Part 264, Subpart L (adopted at I.A.C. 141.5[455B]) [Requirements for Storage of Hazardous Waste in Piles]	Excavated soils may be temporarily stored in piles prior to treatment and/or disposal. This alternative will comply with the requirements for storage of hazardous waste in piles.	Excavated soils may be temporarily stored in piles prior to treatment and/or disposal. This alternative will comply with the requirements for storage of hazardous waste in piles.	Excavated soils may be temporarily stored in piles prior to treatment and/or disposal. This alternative will comply with the requirements for storage of hazardous waste in piles.	Excavated soils may be temporarily stored in piles prior to treatment and/or disposal. This alternative will comply with the requirements for storage of hazardous waste in piles.
IEQA, I.A.C., Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR Part 264, Subpart N (adopted at I.A.C. 141.5[455B]) [Requirements for Disposal of Hazardous Waste in Landfills]	This alternative involves the disposal of certain treated contaminated soils into a landfill. The alternative will comply with the disposal requirements.	This alternative may involve the disposal of treated and untreated contaminated soils into a landfill. The alternative will comply with the disposal requirements.	This alternative involves the disposal of certain treated contaminated soils into a landfill. The alternative will comply with the disposal requirements.	This alternative may involve the disposal of treated and untreated contaminated soils into an off-site landfill. The alternative will comply with the disposal requirements.
IEQA, I.A.C., Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR Part 264, Subpart O (adopted at I.A.C. 141.5[455B]) [Requirements for Incineration of Hazardous Waste]	This alternative may involve the incineration of contaminated soils. Incineration will comply the performance, operating and monitoring requirements.	This alternative does not involve the incineration of contaminated soils.	This alternative does not involve the incineration of contaminated soils.	This alternative does not involve the incineration of contaminated soils.

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TABLE 15c
COMPLIANCE OF ALTERNATIVES WITH ACTION-SPECIFIC ARARS
IOWA ARMY AMMUNITION PLANT, MIDDLETOWN, IOWA

ARAR Citation	Explosives Contaminated Soils		Explosives Plus Metals Contaminated Soils	SVOC Contaminated Soils
	Thermal Treatment	**Biological Treatment**	**Solidification/Stabilization with Activated Carbon**	**Off-Site Disposal**
IEQA, I.A.C., Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR Part 264, Subpart S (adopted at I.A.C. 141.5[455B]) [Corrective Action for Solid Waste Management Units]	Contaminated soils will be stockpiled in a CAMU prior to treatment. This alternative will comply with the substantive requirements for CAMUs.	Contaminated soils will be stockpiled in a CAMU prior to treatment. This alternative will comply with the substantive requirements for CAMUs	Contaminated soils will be stockpiled in a CAMU prior to treatment. This alternative will comply with the substantive requirements for CAMUs	Contaminated soils will be stockpiled in a CAMU prior to treatment. This alternative will comply with the substantive requirements for CAMUs
IEQA, I.A.C., Division 567, Title X, Chapter 141, Hazardous Waste 40 CFR Part 264, Subpart DD (adopted at I.A.C. 141.5[455B]) [Requirements for Composting of Hazardous Waste in Containment Buildings]	This alternative does not involve composting of contaminated soils in containment buildings	This alternative may involve composting of contaminated soils in containment buildings. The alternative will comply with design and operating standards, and closure and post-closure care	This alternative does not involve composting of contaminated soils in containment buildings	This alternative does not involve composting of contaminated soils in containment buildings
IEQA, I.A.C., Division 567, Title B, Chapter 23, Emission Standards for Contaminants I.A.C. 23.3(2)(c)(1) [Fugitive Dust Controls]	This alternative involves the excavation of contaminated soils and the transport of these soils to either treatment or disposal areas. The alternative also involves construction activities. Control measures will be implemented to limit fugitive dust emissions that may result from remedial actions	This alternative involves the excavation of contaminated soils and the transport of these soils to either treatment or disposal areas. The alternative also involves construction activities. Control measures will be implemented to limit fugitive dust emissions that may result from remedial actions	This alternative involves the excavation of contaminated soils and the transport of these soils to either treatment or disposal areas. The alternative also involves construction activities. Control measures will be implemented to limit fugitive dust emissions that may result from remedial actions	This alternative involves the excavation of contaminated soils and the transport of these soils to either treatment or disposal areas. The alternative also involves construction activities. Control measures will be implemented to limit fugitive dust emissions that may result from remedial actions

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- Chemical - specific ARARs relating to ambient air quality standards specified under IAC 28.1 (455B), visible emission standards specified under IAC 22.3 (3), particulate emission standards specified under IAC 23.3 (2) (a) and Table 1, and fugitive dust emissions standards specified under IAC 23.3 (2) (c) (1).

- CERCLA's preference for treatment specified under Section 121 (b).

- Land Disposal Restrictions for treated soils and residues specified under 40 CFR 268 Subparts A and D.

- Requirements for incineration of hazardous waste specified under 40 CFR 264, Subpart 0, for the selected remedy.

- Requirements for composting of hazardous waste in buildings specified under 40 CFR Part 264, Subpart DD, for the contingent remedy.

- Requirements for surface water quality criteria and discharge limitations specified under IAC 61.3 (455B) and 33 USC Section 402.

2.10.3 Cost Effectiveness

The selected remedy is cost-effective because it provides overall effectiveness proportional to its costs. LTTD Thermal Treatment, the preferred technology for treatment of explosives-contaminated soils, appears to be the least costly technology based on information currently available. If a combustion facility risk assessment and additional process development and economic evaluations show that LTTD Thermal Treatment cannot be conducted in a protective manner, appropriate documentation will be prepared for review and submitted to the administrative record, and the contingency remedy of Biological Treatment will be implemented. Solidification/stabilization of explosives plus metals contaminated soils and off-site disposal of SVOC-contaminated soils provides ~~overall~~ protectiveness equivalent to other alternatives, at lower costs.

2.10.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

Superfund 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 permanently destroys or degrades and stabilizes contaminants in explosives-contaminated soils, and permanently stabilizes contaminants in explosives plus metals contaminated soils. Off-site disposal of SVOC-contaminated soil contains contaminants rather than degrading them, and requires long-term landfill operation and maintenance to ensure continued effectiveness. On-site treatment for this small volume of SVOC-contaminated soil was determined to be not cost effective. The Army and EPA believe the preferred alternative provides the best balance of trade-offs among the alternatives with respect to the evaluating criteria.

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

Both LTTD Thermal Treatment and Biological Treatment will reduce explosives contaminant levels below remediation goals, although Thermal Treatment will provide a greater degree of reduction in contaminant toxicity and mobility. LTTD and bio-slurry treatment are not expected to change soil volumes significantly as a result of treatment; composting will result in a volume increase of 150 to 200%. Solidification/stabilization of explosives plus metals contaminated soils and off-site disposal of SVOC-contaminated soils will provide for reduction of contaminant mobility only.

2.11 Documentation of Significant Changes

The Proposed Plan specified management of thermal treatment residuals in the Soil Repository. This ROD provides for the potential management of these residuals outside of the Soil Repository in an appropriate manner protective of human health and the environment. Thermal treatment will destroy contaminants and, therefore, disposal of thermal treatment residuals outside the Soil Repository will not comprise protection under this alternative. This disposal method will save landfill space which may be better used for more highly contaminated materials from other sources and, therefore, is considered cost effective.

3.0 RESPONSIVENESS SUMMARY

The Proposed Plan for final action for the Soils OU #1 was released to the public on June 20, 1998. A public comment period was held from June 20, 1998 to July 20, 1998. During this period, no comment letters were received. In addition, a public meeting was held on July 9, 1998. At this meeting representatives from the Army and EPA were available to the public to discuss concerns, accept comments, and answer questions regarding the preferred alternative presented in the Proposed Plan.

This Responsiveness Summary serves two functions First, it summarizes the comments of the public. Second, it provides responses to the comments on the Proposed Plan that were made at the public meeting.

3.1 Overview

The preferred alternative selected jointly by the Army and EPA and presented in the Proposed Plan involved on-site LTTD Thermal Treatment of explosives-contaminated soils as the preferred remedy, with Biological Treatment as the contingency remedy pending results of feasibility testing and field demonstrations. The preferred alternative also included on-site solidification/stabilization of explosives plus metals contaminated soils and off-site disposal of SVOC-contaminated soil.

Verbal public comments on the preferred alternative were documented at the public meeting on July 9, 1998. No written comment letters were received during the public comment period.

Commentors expressed interest in the following issues:

- Alternative equipment for LTTD (use of existing on-site incinerators; use of mobile equipment).
- Usability of soil after treatment.
- Health risks of LTTD treatment
- Transportation and off-site disposal locations for SVOC - contaminated soil.

3.2 Background on Community Involvement

Overall, the opportunities for participation of local stakeholders in CERCLA actions have been provided through two principal mechanisms. First, documents prepared that lead to decisions have undergone public comment periods, with document availability announced in the local media. Second, an IAAAP Restoration Advisory Board (RAB) has been established to enable the community and representatives of government agencies to meet and exchange information about the IAAAP's environmental cleanup program and to provide the community an opportunity to review progress and participate in dialogue with decision makers.

The RI/FS and Proposed Plan for the Interim Soils OU were released to the public in November 1996 and May 1997, respectively. A public comment period was held from May 28, 1997 to June 30, 1997. In addition, a public meeting was held on June 5, 1997 at the Danville Community Center. There were no written or verbal comments regarding the Proposed Plan submitted to the Army at this meeting or during the comment period.

This Final FS and Proposed Plan for Soils OU#1 went through a similar public review and comment, in compliance with NEPA. The Proposed Plan for final action for the Soils OU #1 was released to the public on June 20, 1998. This document was made available to the public in both the administrative record and the site information repositories. The notice of availability for the Proposed Plan was published in the Burlington Hawk Eye on June 20, 1998 and later published in the Ft. Madison Daily Democrat. A public comment period was held from June 20, 1998 to July 20, 1998. In addition, a public meeting was held on July 9, 1998 at the Pzazz Best Western Motor Inn in Burlington, Iowa. At this meeting representatives from the Army and EPA were available to the public to discuss concerns, accept comments, and answer questions regarding the preferred alternative presented in the Proposed Plan. Comments submitted to the Army were considered in final selection of the remedial action .

The RAB was organized in mid-1997 and has held public meetings generally monthly. Typically these meetings include environmental cleanup progress reports, explanations of the regulatory process, and informational handouts and exhibits. Tapes, minutes, and attendance at the meetings is available from the IAAAP Environmental Affairs Office.

Documents prepared as part of removal or remedial actions at IAAAP have be placed in the site Administrative Record file, which is located in the following public information repositories:

Iowa Army Ammunition Plant
Visitor Reception Area
Building 100-101
Middletown, Iowa 52683-5000
(319) 753-7710

Burlington Public Library
501 N. Fourth Street
Burlington, Iowa 52601
(319) 753-1647

Danville City Hall
105 W. Shepard
Danville, Iowa 52623
(319) 392-4685

The Army has coordinated selection of this remedial action with the U.S. Environmental Protection Agency (EPA). The Army is the lead agency for implementing the remedial action at the IAAAP. As the support agency, the EPA oversees the cleanup activities conducted by the Army to ensure that requirements of CERCLA/SARA, the NCP, and the Federal Facilities Agreement between the Army and the EPA have been met. The State of Iowa has declined to participate in the review of CERCLA clean up activities at the IAAAP.

3.3 Summary of Public Comments and Agency Responses

This responsiveness summary includes statements made at the July 9, 1998 public meeting (no additional comments were submitted in writing during the comment period). It also includes Army and EPA 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. Individual comments are grouped into common issues to avoid repetitiveness in responses.

ISSUE 1: *Can existing on-site incinerators be used for treatment of contaminated soil?*

Due to differences in materials handling requirements, volumes, and operating conditions, existing on-site incinerators are not suitable for treatment of contaminated soils. Permitting issues and air emission control requirements would also be significantly different. The selected remedy uses equipment specifically designed for treating contaminated soils.

ISSUE 2: *Will the selected remedy destroy organisms present in the soil, making it difficult to use it for anything?*

LTTD will degrade other organic compounds in the soil in addition to degrading explosives. The degree of degradation will depend on the characteristics of particular compound (i.e., boiling point, vapor pressure) and the operating conditions used for the LTTD unit. LTTD exposes contaminated soil to a much lower temperature than incineration (typically 200 to 600 ^{0}F in the primary chamber for LTTD vs. 1400 to 1800 ^{0}F for incineration). While these LTTD operating conditions are known to be effective for destroying explosives contamination, information is not necessarily available to predict the degree of destruction for other, desirable, organic compounds. However, LTTD typically does not produce as much of a volume reduction as incineration and therefore can be presumed to be less destructive than incineration. Contaminated soil requiring treatment is primarily clay, so loss of productivity will be less significant than if it were primarily topsoil.

ISSUE 3: *To minimize capital costs, will treatment equipment be reusable at other facilities?*

The LTTD treatment equipment will be modular, trailer-mounted, mobile equipment brought to the site and operated by a contractor specializing in providing soil remediation services. While the equipment may require special modifications to adapt to site-specific conditions, it likely will have been used previously at other sites and will be intended for use again elsewhere in the future. The Army will be purchasing a service rather than purchasing a piece of equipment.

ISSUE 4: *Have sites been identified for off-site disposal of SVOC-contaminated soil? How would the soil be transported? How can we visualize a volume of 200 cubic yards?*

Cost estimates presented in the Proposed Plan and ROD were based on conversations with representatives from three commercial waste disposal companies: American Waste Group, Laidlaw Environmental Services of Illinois, Inc., and Waste Management, Inc. Disposal could be at any of several licensed waste disposal facilities operated by these or other companies. Competitive bids will be solicited prior to actual implementation, and a specific contractor and disposal facility will be identified at that time. Transportation would most likely be by truck. The largest roll-off box typically used for over-the-highway transportation of wastes has a volume of approximately 20 cubic yards. Assuming they are typically loaded half-full (10 cubic yards each), 200 cubic yards represents about 20 truckloads. Viewed another way, 200 cubic yards represents a block 15' by 15' by 24' in dimensions.

ISSUE 5: *Will the proposed cleanup process produce additional carcinogens that the public should be aware of? Will the LTTD unit have continuous monitoring of air emissions?*

LTTD operates by volatilizing contaminants in the soil (heating them until they are converted to a gaseous state) and burning them under controlled conditions in a secondary combustion chamber. Combustion results in essentially complete destruction of contaminants to carbon dioxide and water. However, no process in 100% efficient, and trace amounts of byproducts (products of partial combustion) may be expected to remain. The LTTD unit will be equipped with appropriate air emission control facilities, such as filters and wet scrubbers, to clean the off-gases prior to release to the atmosphere. The specific operating conditions of the LTTD unit (i.e., temperature, residence time, oxygen requirements) will be determined based on a trial burn, with the purpose of maximizing contaminant destruction as required to protect human health and the environment. In addition, a combustion risk assessment will be completed prior to implementation of the selected remedy. The combustion risk assessment is intended to identify potential byproducts and, through an evaluation of site-specific conditions such as prevailing winds, evaluate the potential impacts on receptors. The results of the risk assessment will be used to establish requirements for safe operation to control unacceptable risks. The combustion risk assessment will be reviewed by experts within both the Army and EPA who are experienced in thermal treatment of explosives-contaminated soils at other installations. Emissions monitoring during operation will ensure that the unit is operated in compliance with the requirements established by the risk assessment. Army and EPA representatives indicated that results of a combustion risk assessment would be shared with the public prior to implementing any thermal treatment operations associated with this ROD.